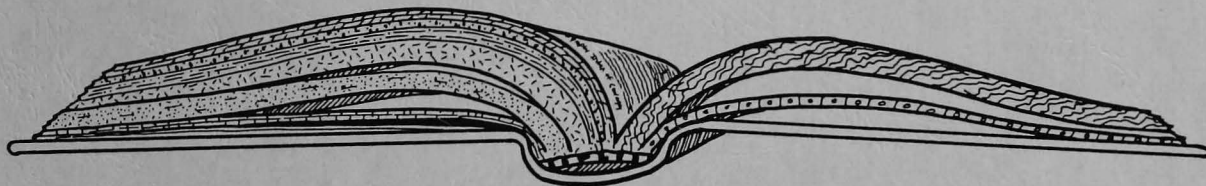


**Information Series 30**



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**Bibliography and Index of  
Colorado Geology,  
1984–1989**



**Colorado Geological Survey  
Department of Natural Resources  
Denver, Colorado  
1990**

**Information Series 30**

**Bibliography and Index of  
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**Selected from Publications Indexed in GeoRef**

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## FOREWORD

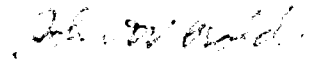
In recognition of the need to more effectively utilize the immense store of published literature on the state's geology, the Colorado Geological Survey is pleased to release Information Series 30. This document updates our series of geological bibliographies and indexes through 1989. To our knowledge Colorado is the only state with a current bibliography which also extends back as far as 1875. The joint effort and contracts with the American Geological Institute began in 1976 with Bulletin 37 covering the century from 1875 through 1974, continued with Bulletin 45 covering 1975 through 1980, Information Series 19 covering 1981–1982, Information Series 21 covering 1983 and is now complete with Information Series 30 covering 1984 through 1989. The citations in these publications are now in GEOREF and can be computer searched by arrangement with the American Geological Insti-

tute. (Current nation wide phone number is 1-800-336-4764.)

Although we believe this material to be complete and accurate, this compilation by the American Geological Institute has not been edited by the Colorado Geological Survey. If errors or omissions are found, we would appreciate their being called to our attention so they can be corrected in future bibliographies.

This series of bibliographies and indexes covers over 22,000 citations of geological literature. It will prove invaluable to those in academia, industry, government or research as they seek information on Colorado's geologic problems and mineral resources.

John W. Rold, Director



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## INSTRUCTION TO USERS

Persons searching for publications dealing with Colorado geology or mineral resources should be aware that Bulletin 37 covers 1875 to 1975, Bulletin 45 covers 1975–80, Information Series 19 covers 1981–1982, Information Series 21 covers 1983 and this publication Information Series 30 covers 1984–1989. Because later bibliographies have corrected errors or omissions in previous indexes, one may have to search later indexes even if the appropriate date is known.

For simplification by AGI the Sections on County Index and Rock Unit Index were merged into a broader Subject Index. The bibliography can be searched by location, i.e. the county or by the subject material or the rock unit name, and of

course if the author's name is known one can search the Author Index. In the Subject Index the publication is listed by title and author. To determine the exact citation and the source of the publication, one must then consult the alphabetically arranged Author Index. The full official title of the publication and location of the publisher are given in the Serials sections.

Most of the indexed publications are available for study in large technical or university libraries or can be obtained from the publisher. Of course if they're still in print. Publications of the U.S. Geological Survey and Colorado Geological Survey can be purchased from those agencies.

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*Pleistocene*: Pleistocene high altitude amphibians and reptiles from Colorado (Alamosa local fauna; Pleistocene, Irvingtonian) (Rogers, Karel L.)

**amphibolites see under metamorphic rocks****ancient ice ages see under glacial geology****Aneth Formation**

Helium potential of the Four Corners area (Casey, Tom Ann L.)

**angiosperm flora—paleoecology**

*Cretaceous*: Disruption of the terrestrial plant ecosystem at the Cretaceous-Tertiary boundary, Western Interior (Tschudy, R. H., et al.)

*Oligocene*: Paleoecologic, paleoclimatic, and evolutionary significance of the Oligocene Creede flora, Colorado (Wolfe, Jack A.)

**angiosperms see under paleobotany****angiosperms—Dicotyledoneae**

*Cretaceous*: Flora of the Lower Cretaceous Cedar Mountain Formation of Utah and Colorado; Part III, *Ilacinoxylon pittense* n. sp. (Thayn, G. F., et al.)

*Oligocene*: Attached leaves, inflorescences, and fruits of *Fagopsis*, an extinct genus of fagaceous affinity from the Oligocene Florissant flora of Colorado, U.S.A. (Manchester, Steven R.)

**Animas Formation**

Biostratigraphic correlation of K-T rocks from northwestern Colorado to San Juan Basin, Colorado and New Mexico (Newman, Karl R.)

— Biostratigraphy of Fruitland, Kirtland, and Animas formations (Cretaceous and Paleocene), northern San Juan Basin, Colorado (Newman, Karl R.)

— Early Tertiary paleogeography and paleotectonics of the San Juan Basin area, New Mexico and Colorado (Fassett, James E.)

— First day, road log from Durango, Colorado around northwest rim of San Juan Basin via Cedar Hill, Aztec and La Plata, New Mexico and Soda Springs, Marvel, and Breen, Colorado (Fassett, James E.)

— General surface- and ground-water quality in a coal-resource area near Durango, southwestern Colorado (Butler, David L.)

— Joint patterns on the northwest side of the San Juan Basin, (Southern Ute Indian Reservation), Southwest Colorado (Condon, Steven M.)

— Preliminary basin analysis of Pictured Cliffs to Ojo Alamo sequence in western and southern San Juan Basin, New Mexico (Hunt, Adrian)

— Preliminary report on potential sites suitable for relocation and/or reprocessing of the Durango uranium mill tailings pile (Colorado Geological Survey)

— Second day, road log from Durango, Colorado around northeast rim of San Juan Basin via Bayfield, Chimney Rock, Arboles, Allison, and Ignacio, Colorado and back to Durango (Fassett, James E.)

— Stratigraphic palynology of Cretaceous-Paleocene boundary rocks, San Juan Basin, Colorado and New Mexico (Newman, K. R.)

**Anvil Points Member**

New names for units in the lower part of the Green River Formation, Piceance Creek basin, Colorado (Johnson, Ronald C.)

— Simulated oil-shale mine dewatering using a confined multiaquifer model, Piceance Basin, Colorado, U.S.A. (Weeks, John B.)

**Apache Creek Sandstone Member**

Radiolaria from the Upper Cretaceous Pierre Shale, Colorado, Kansas, Wyoming (Bergstresser, Thomas J.)

**applied geophysics see geophysical surveys****aquifers see ground water**

**Arapahoe Aquifer**

- Bedrock aquifers in the Denver Basin, Colorado; a quantitative water-resources appraisal (Robson, S. G.)
- Geochemical aspects of artificial recharge by injection into the bedrock aquifers of the Denver groundwater basin (Ring, George T., et al.)
- Hydrology of the Arapahoe aquifer in the Englewood-Castle Rock area south of Denver, Denver Basin, Colorado (Hillier, D. E., et al.)
- Resolving a groundwater conflict in Colorado (Rice, Leonard)

**Arapahoe County—areal geology**

- maps*: Preliminary geologic map and lignite deposits of the Strasburg NW Quadrangle, Arapahoe and Adams counties, Colorado (Soister, P. E.)

**Arapahoe County—economic geology**

- coal*: Chemical analyses of coal samples from the Denver region (Khalsa, Nirbhao S.)
- fuel resources*: Codell Sandstone, new exploration play, Denver Basin (Weimer, Robert J.)
- Isoreflectance map of the J Sandstone in the Denver Basin of Colorado (Higley, D. K., et al.)
- Use of computer-generated maps of oil and gas development and exploration intensity for delineating producing trends, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)
- lignite*: Preliminary geologic map and lignite deposits of the Strasburg NW Quadrangle, Arapahoe and Adams counties, Colorado (Soister, P. E.)
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- oil and gas fields*: Character and origin of natural gas from Upper Cretaceous Codell Sandstone, Denver Basin, Colorado (Rice, Dudley D.)

- petroleum*: Core porosity, permeability, and vitrinite reflectance data from the Lower Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)

- water resources*: Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)
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- Conjunctive use of groundwater and surface water for irrigated agriculture; risk aversion (Bredehoeft, John D.)
- Hydrogeology of and potential mining impacts on strippable lignite areas in the Denver Aquifer, east-central Colorado (Driver, Nancy E.)

**Arapahoe County—environmental geology**

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- waste disposal*: Effects of wastewater effluent on the South Platte River from Littleton to Denver (Spahr, Norman E.)

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- trace elements*: Chemical analyses of coal samples from the Denver region (Khalsa, Nirbhao S.)

**Arapahoe County—geophysical surveys**

- magnetic surveys*: Location of abandoned wells by magnetic surveys; acquisition and interpretation of aeromagnetic data for five test areas (Frischknecht, F. C., et al.)
- Location of abandoned wells by magnetic surveys; location maps and aeromagnetic contour maps (Frischknecht, F. C., et al.)

**Arapahoe County—hydrogeology**

- ground water*: Hydrogeologic data from parts of the Denver Basin, Colorado (Major, Thomas J., et al.)
- hydrology*: A summary of urban runoff studies in the Denver metropolitan area, Colorado (Ellis, Sherman R.)
- Analysis of the August 14, 1980, rainstorm and storm runoff to the South Platte River in the southern Denver metropolitan area, Colorado (Blakely, Steven R., et al.)
- Analysis of urban storm-runoff data and the effects on the South Platte River, Denver metropolitan area, Colorado (Ellis, Sherman R., et al.)
- Bottom-sediment chemistry and water quality of the South Platte River in the Denver metropolitan area, Colorado (Steele, Timothy D.)
- Calibration and verification of a rainfall-runoff model and a runoff-quality model for several urban basins in the Denver metropolitan area, Colorado (Lindner-Lunsford, Juli B.)
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- Selected hydrologic data for the South Platte River through Denver, Colorado (Spahr, Norman E., et al.)
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- Well yields and chemical quality of water from water-table aquifers in the Greater Denver area, Front Range urban corridor, Colorado (Hillier, D. E., et al.)

**Arapahoe County—stratigraphy**

- Cretaceous*: Field trip guide, Codell Sandstone, northern Front Range (Sonnenberg, Stephen A.)

**Arapahoe Formation**

- Geologic road log from Denver Federal Center to Marshall, Colorado; a visit to the Boulder-Weld coal field and some considerations of burning, subsiding coal mines (Herring, James R.)

- Geophysical and lithological logs from the 1982 and 1983 coal drilling and coring program, Castle Rock 1/2' × 1' Quadrangle (Eakins, Wynn)
- Late Cretaceous nonmarine vertebrates of the Denver Basin (Carpenter, Kenneth)
- Paleozoic-Mesozoic section; Red Rocks Park, I-70 road cut, and Rooney Road, Morrison area, Jefferson County, Colorado (Weimer, Robert J.)
- Precision gravity survey over a portion of the Bromley Oilfield, Denver Basin, Colorado (Josten, Nicholas E.)
- The onset of the Laramide Orogeny (Bryant, Bruce)

**Arbuckle Group**

- Sohio to test Denver Basin's Arbuckle (McCaslin, John C.)

- archaeology* *see under* stratigraphy
- see under* applications *under* paleomagnetism
- see under* lichenometry *under* geochronology
- see under* methods *under* geochronology
- see under* stratigraphy *under* Chaffee County; data processing; Grand County; Great Plains; Gunnison County; Las Animas County; Quaternary; Rio Blanco County; Southwestern U.S.; Weld County; Western U.S.

**Archean** *see* Precambrian

- see under* geochronology *under* Great Plains

**archeology** *see* archaeology

**Archuleta County—areal geology**

- guidebook*: Field trip guidebook: paleotectonics; San Juan Mountains; Dolores Formation; Paleosols and depositional systems; Jurassic depositional systems; San Juan Basin; Quaternary deposits and soils; Durango area (Brew, Douglas C.)
- First day, road log from Durango, Colorado around northwest rim of San Juan Basin via Cedar Hill, Aztec and La Plata, New Mexico and Soda Springs, Marvel, and Breen, Colorado (Fassett, James E.)
- Second day, road log from Durango, Colorado around northeast rim of San Juan Basin via Bayfield, Chimney Rock, Arboles, Allison, and Ignacio, Colorado and back to Durango (Fassett, James E.)
- maps*: Geologic map of the Aztec 1' by 2' Quadrangle, northwestern New Mexico and southern Colorado (Manley, Kim, et al.)
- Geologic map of the Durango Quadrangle, southwestern Colorado (Steven, T. A., et al.)
- Geologic map of the Piedra Wilderness Study Area, Archuleta and Hinsdale counties, Colorado (Condon, S. M., et al.)
- Geologic reconnaissance map of the Bear Mountain and Oakbrush Ridge quadrangles, Hinsdale and Archuleta counties, Colorado (Hail, W. J., Jr.)
- Geologic reconnaissance map of the Chris Mountain and Pagosa Springs quadrangles, Archuleta County, Colorado (Hail, W. J., Jr.)
- San Juan Mountains*: Geology of the Chama-Southern San Juan Mountains Wilderness Study Area, Colorado (Brock, Maurice R.)
- Geology of the western San Juan Mountains (Baars, Don L.)
- Williams Creek region*: Geology of the Williams Creek area, Hinsdale and Archuleta counties (Moore, George E.)

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*coal*: Coal resources and coal-bed geometry, Fruitland Formation, Southern Ute Indian Reservation, Archuleta and La Plata counties, Colorado (Sandberg, Dorothy T.)

— Distribution of coal beds in the Fruitland Formation, Southern Ute Indian Reservation, Archuleta and La Plata counties, southwestern Colorado (Sandberg, Dorothy T.)

— First annual report; evaluation of coking-coal deposits in Colorado (Jones, David C.)

— Identification and importance of coal bed gas, San Juan Basin, southwestern Colorado and northwestern New Mexico (Rice, Dudley D., et al.)

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*copper ores*: Geochemical evaluation of mineral resources in the Chama-Southern San Juan Mountains Wilderness Study Area, Colorado (Brock, Maurice R., et al.)

*energy sources*: Chama-Southern San Juan Mountains Wilderness Study Area, Colorado (Brock, Maurice R.)

*fuel resources*: Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

*maps*: Distribution of coal beds in the Fruitland Formation, Southern Ute Indian Reservation, Archuleta and La Plata counties, southwestern Colorado (Sandberg, Dorothy T.)

— Mineral resource potential map of the Piedra Wilderness Study Area, Archuleta and Hinsdale counties, Colorado (Bush, A. L., et al.)

— Mineral resources of the Chama-Southern San Juan Mountains Wilderness Study Area, Mineral, Rio Grande, Archuleta, and Conejos counties, Colorado (U. S. Geological Survey)

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*mineral resources*: Chama-Southern San Juan Mountains Wilderness Study Area, Colorado (Brock, Maurice R.)

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— Geochemical map of the Piedra Wilderness Study Area, Archuleta and Hinsdale counties, Colorado (Franczyk, Karen J., et al.)

— Geophysical investigation of the Chama-Southern San Juan Mountains Wilderness Study Area, Colorado (Wynn, Jeffrey C.)

— Magnetic tape containing spectrographic and chemical analysis of stream sediments and rocks from the Chama-Southern San Juan Mountains Wilderness Study Area, Mineral, Rio Grande, Archuleta, and Conejos counties, Colorado (McDanal, S. K., et al.)

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— GRI geologic and economic appraisal of coalbed methane in the San Juan Basin (Kelso, B. S., et al.)

— Methane production characteristics for a deeply buried coalbed reservoir in the San Juan Basin (Jones, A. H., et al.)

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*maps*: Geochemical map of the Piedra Wilderness Study Area, Archuleta and Hinsdale counties, Colorado (Franczyk, Karen J., et al.)

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— Plan of study for the regional aquifer-system analysis of the San Juan structural basin, New Mexico, Colorado, Arizona, and Utah (Welder, G. E.)

— Using a geographic information system to assist in numerical analysis and to prepare cartographic products for the San Juan Basin Regional Aquifer-System Analysis, New Mexico and Colorado (Kernodle, J. M.)

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— Application of techniques to identify coal-mine and power-generation effects on surface-water quality, San Juan River basin, New Mexico and Colorado (Goetz, C. L., et al.)

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— Hydrology of coal-lease areas near Durango, Colorado (Brooks, Tom)

*maps*: Hydrogeology of the Dakota Sandstone in the San Juan structural basin, New Mexico, Colorado, Arizona, and Utah (Craig, Steven D., et al.)

**Archuleta County—paleontology**

*foraminifera*: Pennsylvanian fusulinids from the Piedra River valley, Archuleta County, Colorado (Baird, Donald Wallace)

*Reptilia*: Mosasaur remains from the Lewis Shale (Upper Cretaceous), southwestern Colorado (Kues, Barry S.)

**Archuleta County—stratigraphy**

*Cretaceous*: Distribution of coal beds in the Fruitland Formation, Southern Ute Indian Reservation, Archuleta and La Plata counties, southwestern Colorado (Sandberg, Dorothy T.)

— Geometry and depositional environment of Fruitland Formation coal beds, San Juan Basin, New Mexico and Colorado; anatomy of a giant coal-bed methane deposit (Fassett, James E.)

— Measured sections and environmental reconstructions of uppermost Jurassic to lowermost Upper Cretaceous rocks on the northern side of the San Juan Basin, southwestern Colorado (Aubrey, W. M.)

— North-south stratigraphic cross sections of Upper Cretaceous rocks, northern San Juan Basin, southwestern Colorado (Molenaar, C. M.)

— The ages of the continental, Upper Cretaceous, Fruitland Formation and Kirtland Shale based on a projection of ammonite zones from the Lewis Shale, San Juan Basin, New Mexico and Colorado (Fassett, James E.)

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*maps*: Distribution of coal beds in the Fruitland Formation, Southern Ute Indian Reservation,

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- Archuleta County—structural geology**
- folds:** Evolution of the Chama Basin and Archuleta Anticlinorium, eastern Archuleta County, Colorado (Dunn, David Evan)
- neotectonics:** Possible Pleistocene movement on a 30-km fault near Pagosa Springs, south-central Colorado (Moore, David W.)
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- Beaver Brook region:** Geology of the Beaver Brook-Soda Creek area, Colorado (Dowling, Helen E.)
- Calumet District:** Geology of the Calumet, Colorado mining district (Rainwater, Edward H.)
- central Colorado:** The geology of central Colorado (Robertson, J. D.)
- Colorado National Monument:** Colorado National Monument (Hall, Robert B.)
- Core Canyon:** Geology of Core Canyon area, Colorado (Parsons, Marshall Clay)
- Creede District:** The areal geology of the Creede mining district, Colorado (Larsen, Esper Signius)
- Cross Mountain:** Geology of Cross Mountain, Colorado, north of the Yampa River (Mueller, Paul M.)
- Dinosaur National Monument:** The Dinosaur National Monument area, Utah-Colorado (Hansen, Wallace R.)
- Dry Saint Vrain:** The petrology of the (Dry St. Vrain) area, Colorado (Dings, McClelland G.)
- eastern Colorado:** Road log, first day (total miles 180.2), Lakewood to Pueblo (Powers, Richard B., et al.)
- Road log, second day (total miles 105.2 plus 185 miles for return to Lakewood) Pueblo to northern Raton Basin (Molenaar, Cornelius M., et al.)
- Front Range:** Contributions to the geology of the Front Range of Colorado (Postell, William D.)
- Front Range AGU meeting (Spence, William)
- Front Range AGU meeting (Harthill, Norman)
- Overview of the geology of the east flank of the Front Range (Grose, T. L. T.)
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- Garden of the Gods:** The geology of Garden of the Gods: a laboratory manual and field trip guide for elementary and middle schools at Colorado Springs, Colorado (Neus, Brigitte P.)
- Georgetown Quadrangle:** General geology of the Georgetown Quadrangle, Colorado (Ball, Sydney H.)
- guidebook:** Colorado and Wyoming, with adjacent parts of Nebraska, South Dakota & Idaho; a geological field guidebook (Perkins, John W.)
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- Hahns Peak District:** Geology of the South Hahns Peak District (Barnwell, W. W.)
- Loveland region:** Geology of the foothills structures west of Loveland, Colorado (Culligan, Leland B.)
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- Colorado (base), 1968 (U. S. Geological Survey)
- Colorado geologic highway map (Christiansen, R. D.)
- Generalized geologic map showing distribution and basal configuration of the Browns Park Formation and Bishop Conglomerate in northwestern Colorado, northeastern Utah, and southern Wyoming (Luft, S. J.)
- Geologic map index of Colorado, 1977 (U. S. Geological Survey)
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- Geologic map of Colorado (Tweto, Ogden)
- Geologic map of the Leadville 1' by 2' Quadrangle, northwestern Colorado (Tweto, Ogden, et al.)
- Geologic map of the northwestern part of the Pueblo 1' by 2' Quadrangle, Colorado (Epis, R. C., et al.)
- Geologic map of the Vernal 1' by 2' Quadrangle, Colorado, Utah, and Wyoming (Rowley, Peter D., et al.)
- Preliminary geologic map of east half of Vernal 1' by 2' Quadrangle, Colorado (Tweto, Ogden)
- Preliminary geologic map of the Handie's Peak Quadrangle, Colorado (Luedke, R. G.)
- Preliminary geologic map of the Howardsville Quadrangle, Colorado (Luedke, R. G.)
- Preliminary geologic map of the Silverton Quadrangle, Colorado (Luedke, R. G.)
- Preliminary geologic map of the southwestern quarter of the Denver 1' x 2' Quadrangle, Colorado (Bryant, Bruce)
- Scenic trips into Colorado geology; Uncompahgre Plateau (Collins, Donna Bishop)
- Marble Mountain:** A note on the geology of Marble Mountain, Colorado (LaRock, Ed)
- Needle Mountains:** Proterozoic geology of the Needle Mountains; a summary (Tewksbury, Barbara J.)
- north-central Colorado:** Geology of the Independence Mountain area, North Park, Colorado (Walters, R. F.)
- Paradox Basin:** Northern Paradox Basin-Uncompahgre Uplift (Averett, Walter R.)
- Overview of the regional geology of the Paradox Basin study region (Woodward-Clyde Consultants)
- Perry Park:** Geology and Pennsylvanian paleontology of Perry Park, Colorado (Ellis, Charles Howard)
- regional:** Field Trip No. 6; Sedimentology, dolomitization, mineralization and karstification of the Leadville Limestone (Mississippian), central Colorado (De Voto, Richard H.)
- First day road log from Grand Junction to gateway via Unaweep Canyon (Dayvault, Richard D., et al.)
- Road log from Dewey Bridge to Grand Junction via the Dolores River, Coates Creek, Glade Park, and the Little Park road (Dexter, James J., et al.)
- Road log from Gateway to Moab via John Brown Canyon, La Sal Mountain State Forest, La Sal Mountains loop road, and Spanish Valley (Goodknight, Craig S., et al.)
- Second day road log from Moab, Utah, to Dewey Bridge, via Potash and Fisher towers (Chenoweth, William L.)
- Second day road log, Dewey Bridge to Grand Junction via Cisco, Utah (Young, Robert G.)
- Utility of Seasat SAR imagery for geologic analysis in Colorado, Wyoming, and Utah (Lundy, Gerald W.)
- San Juan Mountains:** Analytical data from geologic sampling in the eastern San Juan Mountains, Colorado, 1966-1968 (Sharp, W. N.)
- Guidebook to northern San Juan Mountains (Luedke, Robert G.)
- San Miguel Mountains:** Geology of the Wilson Peak Stock; San Miguel Mountains, Colorado (Bromfield, Calvin Stanton)
- Sugarloaf:** Geology and petrography of the Sugarloaf District, Boulder County, Colorado (Crawford, Ralph D.)
- western Colorado:** Road log from Grand Junction to Resource Enterprises' Deep Seam Project (coal bed methane) east of Collbran, Colorado (Young, R. G.)
- argon— isotopes**
- Ar-40/Ar-39:** Argon diffusion in partially out-gassed alkali feldspars; insights from  $^{40}\text{Ar}/^{39}\text{Ar}$  analysis (Zeitler, Peter K.)
- Arikarre Group**
- Simulated effects of future pumpage on the High Plains Aquifer, west-central United States (Weeks, J. B.)
- arsenates see under minerals**
- arsenic—geochemistry**
- metal ores:** Trace element distribution around precious/base metal veins, Idaho Springs Dist., CO (Budge, Suzanne)

*oil shale*: Speciation of arsenic in a Green River oil shale and oil shale retort waters (Jaganathan, James, et al.)

*artesian waters* *see* ground water

#### Arthropoda—Crustacea

*Cretaceous*: A new crab, *Eomunidopsis cobani* n. sp. (Crustacea, Decapoda), from the Pierre Shale (early Maastrichtian) of Colorado (Bishop, Gale A.)

#### Arthropoda—morphology

*ultrastructure*: Cambrian vertebrates; are they arthropods? (Thompson, Diane)

*artifacts* *see* archaeology

*Artiodactyla* *see under* Mammalia

#### Aspen Formation

Hydrocarbon generation in Lower Cretaceous Mowry and Skull Creek shales of the northern Rocky Mountain area (Burtner, R. L.)

*associations* *see* museums; survey organizations

#### associations—economic geology

*U. S. Department of Energy*: Geologic studies in support of the U.S. Department of Energy Multiwell Experiment, Garfield County, Colorado (Spencer, Charles W.)

— Overview of U.S. Department of Energy Multiwell Experiment, Piceance Creek basin, Colorado (Spencer, Charles W.)

— SURE: a system for uranium resource evaluation (Howarth, R. J., et al.)

#### associations—environmental geology

*U.S. Environmental Protection Agency*: Water-quality monitoring at hazardous waste disposal sites; is public health protection possible through monitoring programs? (Lee, G. Fred)

#### associations—general

*Continental Scientific Drilling Committee*: Scientific drilling to study the roots of active hydrothermal systems related to young magmatic intrusions (Muffler, L. J. Patrick)

*National Research Council*: Groundwater contamination: prevention beats costly cleanups (Rensberger, Judith)

#### associations—geophysics

*Computer Oriented Geological Society*: COGS; Computer Oriented Geological Society (Thomson, James A.)

#### atmosphere—composition

*carbon dioxide*: The Ogallala Aquifer and carbon dioxide; comparison and convergence (Glantz, Michael H.)

#### Atoka Formation

Point bars spur Las Animas activity (Shirley, Kathy)

*automatic data processing* *see* data processing

*avalanches* *see under* seismic sources *under* seismology

#### Aves—morphology

*growth*: Tiny dinosaurs; are they fully grown? (Callison, George)

#### Aves—Neornithes

*Eocene*: Giant groundbirds of North America (Aves, Diatrymidæ) (Andors, Allison Victor)

*Miocene*: A new cuckoo and a chachalaca from the early Miocene of Colorado (Martin, Larry D.)

#### Aves—occurrence

*Jurassic*: Eggshell fragments from the Jurassic Morrison Formation of Colorado (Hirsch, Karl F., et al.)

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#### Baca County—areal geology

*Baca County*: The subsurface geology of the Greenwood field area located in Morton County, Kansas and Baca County, Colorado (Strunk, Paul M.)

#### Baca County—economic geology

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— Missourian (early Late Pennsylvanian) climate in Midcontinent North America (Schutter, Stephen R.)

**breccia see under clastic rocks under sedimentary rocks**

*see under geochemistry under metals*  
*see under petrography under intrusions*

**Bridge Creek Limestone Member**

Ammonite record from Bridge Creek Member of Greenhorn Limestone at Pueblo Reservoir State Recreation Area, Colorado (Cobban, William A.)

— Anoxic events, a comparison of Cretaceous regimes (Fischer, Alfred G., et al.)

— Depletion of  $^{13}\text{C}$  in Cretaceous marine organic matter; source, diagenetic, or environmental signal? (Dean, Walter E., et al.)

— Foraminifera of the Cenomanian-Turonian boundary interval, Greenhorn Formation, Rock Canyon Anticline, Pueblo, Colorado (Leckie, R. Mark)

— High resolution stratigraphy and depositional history of the Greenhorn regressive hemicyclothem, Rock Canyon Anticline, Pueblo, Colorado (Glenister, Linda M.)

— High resolution stratigraphy and interpretation of the depositional environments of the Greenhorn Cyclothem regression (Turonian; Cretaceous), Colorado Front Range (Glenister, Linda Marie)

— Influence of paleoenvironmental factors on preservation of organic matter in Middle Cretaceous Greenhorn Formation, Pueblo, Colorado (Pratt, Lisa M.)

— Inorganic and organic geochemical cycles in petroleum source rocks of the Cretaceous Western Interior seaway; records of paleoceanographic change (Dean, Walter E., et al.)

— Pelagic/hemipelagic rhythmities of the Greenhorn Limestone (Upper Cretaceous) of northeastern New Mexico and southeastern Colorado (Hattin, Donald E.)

— Stratigraphy and depositional environments of the Bridge Creek Limestone Member of the Greenhorn Limestone at Rock Canyon Anticline near Pueblo, Colorado (Elder, William P.)

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— The rodents *Pseudotomus* and *Quadratomus* and the content of the tribe Manitshini (Paramyinae, Ischyromyidae) (Korth, William W.)

**brines see salt****Broadway Alluvium**

Depositional history of a vertebrate fossil locality near Lyons, Colo. (Clark, Peter)

**bromine—geochemistry**

*kerogen*: Comparison of the general chemical nature of various kerogens based on their reactivities towards bromine (Pfundt, Peter A.)

**brown coal see lignite****Browns Park Formation**

Airfall tuff in the Browns Park Formation, northwestern Colorado and northeastern Utah (Luft, Stanley J.)

— Geologic map and coal sections of the Sawmill Mountain Quadrangle, Rio Blanco County, Colorado (Reheis, Marith Cady C.)

— Geology and production history of the uranium deposits in the Maybell, Colorado, area (Chenoweth, William L.)

— History of faulting in the eastern Uinta Mountains, Colorado and Utah (Hansen, Wallace R.)

— Miocene hydrovolcanism in NW Colorado, USA, fuelled by explosive mixing of basic magma and wet unconsolidated sediment (Leat, P. T.)

— Neogene tectonics and geomorphology of the eastern Uinta Mountains in Utah, Colorado, and Wyoming (Hansen, Wallace R.)

— Paleontology, taphonomy, and stratigraphy of the Browns Park Formation (Oligocene and Miocene) near Maybell, Moffat County, Colorado (Honey, James G.)

— Post-Laramide tectonic history of the eastern Uinta Mountains, Utah, Colorado, and Wyoming (Hansen, Wallace R.)

— Structural development and oil occurrence on northeast flank of Uinta Mountains near Irish Canyon, northwestern Colorado (Roehler, Henry W.)

— The paleontology of the Brown's Park Formation in the Maybell, Colorado area, and a taphonomic study of two fossil quarries Colorado and Arizona (Honey, James Gilbert)

**Brule Formation**

Texasophis galbreathi, new species, the earliest New World colubrid snake (Holman, J. Alan)

— The Oligocene rodent *Ischyromys* in relation to the Paleosols of the Brule Formation (Howe, John Alfred)

— Vertebrate biochronology of Oligocene sediments in Southwest North Dakota (Kihm, Allen J.)

**Brushy Basin Shale Member**

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— Measured sections and environmental reconstructions of uppermost Jurassic to lowermost Upper Cretaceous rocks on the northern side of the San Juan Basin, southwestern Colorado (Aubrey, W. M.)

— Paleoecology of the dinosaur-bearing Morrison Formation (Dodson, Peter, et al.)

— Recent advances in Morrison sedimentology on the Colorado Plateau (Peterson, Fred)

— Small pterosaurs and dinosaurs from the Uncompahgre fauna (Brushy Basin Member, Morrison Formation: ?Tithonian), Late Jurassic, western Colorado (Jensen, James A.)

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Apatite fission-track age for the Bull Domingo boulder pipe, Custer County, Colorado (Sharp, W. N.)

**Bull Lake Till**

Low-energy seismic survey of Quaternary materials, Rocky Mountain National Park, Colorado (Locke, William W.)

**Burro Canyon Formation**

Chemical and mineralogical differences of marine and non-marine shales of the Dakota Sandstone and adjacent units, southwestern Colorado (Winsten, Miriam S.)

- Depositional environments of the Dakota Sandstone and adjacent units in the San Juan Basin utilizing discriminant analysis of trace elements in shales (Walters, Lester J., Jr., et al.)
- Evidence for glaciation in Unawep Canyon, Mesa County, Colorado (Cole, Rex D.)
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- Mid-Cretaceous alluvial-plain incision related to eustasy, southeastern Colorado Plateau (Aubrey, W. M.)
- Palynological evaluation of Cedar Mountain and Burro Canyon formations, Colorado Plateau (Tschudy, R. H., et al.)
- Petrography, porosity, and depositional environments of the Burro Canyon Formation and Dakota Sandstone of Southwest Colorado (Regli, Robert)
- Remains of ancient life in Cretaceous rocks of the Dinosaur Triangle (Young, Robert G.)
- Stratigraphic correlation of dinosaur quarries near Grand Junction, Colorado (Armstrong, Harley J.)
- The Black Canyon of the Gunnison, Colorado (Hansen, Wallace R.)
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**cadmium—geochemistry**

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**calcium—geochemistry**

*claystone*: Goyazite in kaolinitic altered tuff beds of Cretaceous age near Denver, Colorado (Triplehorn, Don M.)

*connate waters*: Geochemical techniques applied to the identification and disposal of connate coal water (Decker, A. D., et al.)

*ground water*: Thermodynamic controls on quality of water from underground coal mines in Colorado (Turk, John T.)

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*Ca-42/Ca-40*: Application of the potassium-calcium geochronometer to problems in geochronology and petrogenesis (Marshall, Brian David)

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Cambrian *see under* geochronology *under* Fremont County

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**Campbell Mountain Rhyolite**

Wallrock alteration at the Bulldog Mountain Mine, Creede mining district, Colorado (Vergo, Norma)

— Wallrock alteration at the Bulldog Mountain Mine, Creede, Colorado (Vergo, Norma)

**Canyon Springs Sandstone Member**

Middle Jurassic age of the fish-bearing horizon in the Cañon City Embayment, Colorado (Schultze, Hans-Peter)

**carbon—analysis**

*chemical analysis*: Sink float procedures for shale characterization (Vadovic, Charles J.)

**carbon—geochemistry**

*ground water*: Ground water age determinations, Piceance Creek basin, Colorado (Kimball, Briant A.)

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— Influence of paleoenvironmental factors on preservation of organic matter in Middle Cretaceous Greenhorn Formation, Pueblo, Colorado (Pratt, Lisa M.)

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— Depletion of <sup>13</sup>C in Cretaceous marine organic matter; source, diagenetic, or environmental signal? (Dean, Walter E., et al.)

— Diagenesis of late Proterozoic carbonates; the Beck Spring Dolomite of eastern California (Zempolich, William G., et al.)

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— Distinction between in-situ biogenic gas and migrated thermogenic gas in ground water, Denver Basin, Colorado (Rice, Dudley D.)

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— Ground water age determinations, Piceance Creek basin, Colorado (Kimball, Briant A.)

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- Origin and occurrence of fracture-filling cements in the Upper Cretaceous Mesaverde Formation at MWX, Piceance Creek basin, Colorado (Pitman, Janet K.)
- Origin and source-rock potential of the Sharon Springs Member of the Pierre Shale, Colorado and Kansas (Gautier, Donald L., et al.)
- Origin of solid bitumens, with emphasis on biological marker results (Curiale, Joseph A.)
- Paleofluids in the copper and uranium bearing sandstones, central Colorado Plateau; fluid inclusion and isotopic evidence in calcite (Meunier, J. D.)
- Preliminary interpretation of soil-gas and relationships to other hydrocarbon microseepage indicators, Four Corners Platform-San Juan Basin transitional area, Southwest Colorado and Northwest New Mexico (Cunningham, Kimberley I.)
- Relation of hydrocarbon occurrence to thermal maturity of organic matter in the Upper Cretaceous Niobrara Formation, eastern Denver Basin; evidence of biogenic versus thermogenic origin of hydrocarbons (Rice, Dudley D.)
- Stable carbon isotopic analysis of sedimentary organic matter by stepped combustion (Gilmour, I.)
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- Temperature effects on kerogen and on molecular and isotopic composition of organic matter in Pierre Shale near an igneous dike (Clayton, J. L.)
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carbonates *see under* mineralogy; minerals

carbonatites *see under* igneous rocks

Carboniferous *see* Mississippian; Pennsylvanian *see under* stratigraphy *under* Bent County; Western U.S.

#### Caribou Stock

Geology and geochemistry of the Caribou Mine, Boulder County, Colorado (Francis, Kevin Albert)

#### Carlile Shale

- Ammonites in clasts of the Juana Lopez Member of the Carlile Shale (Upper Cretaceous) near Pueblo, Colorado (Cobban, William A.)
- Biostratigraphic units and tectonism in the mid-Cretaceous foreland of Wyoming, Colorado, and adjoining areas (Merewether, E. A.)
- Character and origin of natural gas from Upper Cretaceous Codell Sandstone, Denver Basin, Colorado (Rice, Dudley D.)
- Character and origin of natural gases from Wattenberg area, Denver Basin, Colorado (Rice, Dudley D.)
- Codell and Juana Lopez in south-central Colorado (McLane, Michael)
- Codell Sandstone, new exploration play, Denver Basin (Weimer, Robert J.)
- Codwell Sandstone, Denver Basin; frontier exploration in a mature basin (Weimer, R. J.)
- Field trip guide, Codell Sandstone, northern Front Range (Sonnenberg, Stephen A.)
- Geologic aspects of the Codell Sandstone, Weld and Larimer counties, Colorado (Hively, R. E.)
- Geological aspects of the Codell Sandstone, Weld and Larimer counties, CO (Hively, Roger E.)
- High resolution stratigraphy and interpretation of the depositional environments of the Greenhorn Cyclothem regression (Turonian; Cretaceous), Colorado Front Range (Glenister, Linda Marie)
- Mid-Cretaceous biostratigraphic units, unconformities, and diastrophism in Wyoming, Colorado, and adjacent areas (Merewether, E. A.)
- Mid-Cretaceous Codell Sandstone Member of Carlile Shale, eastern Colorado (Merewether, E. A.)
- Mineralogy and genesis of the clay minerals of the Codell Sandstone, Denver Basin, Colorado (Henninggaard, Jeffrey, et al.)
- Mountain front thrust, southeastern Front Range and northeastern Wet Mountains, Colorado (Jacob, Arthur F.)
- Natural gamma-ray spectrometry, lithofacies, and depositional environments of selected Upper Cretaceous marine mudrocks, Western United States, including Tropic Shale and Tununk Member of Mancos Shale (Zelt, Frederick Bruce)
- Petrography, diagenesis and depositional environments of the Codell Sandstone and Juana Lopez members of the Carlile Shale (Upper Cretaceous), south-central Colorado (Resser, Kurt Douglas)
- Raton Basin, New Mexico; exploration frontier for fracture reservoirs in Cretaceous shales (Woodward, Lee A.)
- Relation of hydrocarbon occurrence to thermal maturity of organic matter in the Upper Cretaceous Niobrara Formation, eastern Denver Basin; evidence of biogenic versus thermogenic origin of hydrocarbons (Rice, Dudley D.)
- Relation of hydrocarbon type to maturity of organic matter in Upper Cretaceous chinks, eastern Denver Basin (Rice, Dudley D.)
- Stratigraphic and paleostructural controls on hydrocarbon migration in Cretaceous D and J sandstones of the Denver Basin (Tainter, Patrick A.)

- Stratigraphy of some of the Carlile Shale and Niobrara Formation near Morrison, Colorado (Pinel, Mark J.)
- Stratigraphy of the Codell Sandstone and Juana Lopez members of the Carlile Formation (Upper Cretaceous), El Paso and Fremont counties, Colorado (Aulia, Karsani)
- Stratigraphy of the upper Carlile Shale and lower Niobrara Formation (Upper Cretaceous), Fremont and Pueblo counties, Colorado (Pinel, Mark J.)
- Tectonic, sedimentary, and seismic models for D sandstone, Zenith Field area, Denver Basin, Colorado (Sonnenberg, Stephen A.)
- The Carlile-Niobrara (Upper Cretaceous) unconformity in southeastern Colorado, southwestern Kansas, and northeastern New Mexico (Laferriere, Alan P.)
- The marine transgressive surface as a sequence boundary; a case study of the upper Coniacian transgression in the San Juan Basin (Nummedal, Dag)
- Thermal maturity of Codell Sandstone-Carlile Shale interval (Cretaceous) in part of Denver Basin, Colorado (Ritchie, James G.)
- Undrilled shallow giant trap in Denver Basin, Colorado; mountain-front thrust (Jacob, Arthur F.)
- Use of rhythmic bedding patterns for locating structural features, Niobrara Formation, United States Western Interior (Laferriere, Alan P.)

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- Common-Pb isotopic characteristics of central San Juan ash flow tuffs (Matty, David J., et al.)
- Fish Canyon Tuff, Colorado; the problem of two magnetic polarities in a single tuff (Ellwood, Brooks B., et al.)
- High-resolution  $^{40}\text{Ar}/^{39}\text{Ar}$  chronology of Oligocene volcanic rocks, San Juan Mountains, Colorado (Lanphere, Marvin A.)
- Mafic fiamme from the Carpenter Ridge Tuff, central San Juan volcanic field; evidence for alkaline magmatism (Dorais, Michael J., et al.)
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  - The mafic enclaves of the Dinkley Creek Granodiorite and the Carpenter Ridge Tuff; a mineralogical, textural, and geochemical study of their origins with implications for the generation of silicic batholiths (Dorais, Michael John)
  - The Mammoth Mountain and Wason Park tuffs: magmatic evolution in the central San Juan volcanic field, southwestern Colorado (Webber, Karen Louise)
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**Carter Sandstone**

The Carter Sandstone Member of the Pierre Shale; a Cretaceous shoreline (Mieras, Barbara L.)

**cartography** *see* maps**Castle Butte Member**

Field Trip No. 6: Sedimentology, dolomitization, mineralization and karstification of the Leadville Limestone (Mississippian), central Colorado (De Voto, Richard H.)

**Castle Rock Conglomerate**

Oligocene paleogeography in the southern Denver Basin (Morse, David G.)

**Castlegate Sandstone**

Age of Douglas Creek Arch, Colorado and Utah (Johnson, Ronald C.)

- Structure contour map of the top of the Castlegate Sandstone, eastern part of the Uinta Basin and the western part of the Piceance Creek basin, Utah and Colorado (Johnson, R. C.)

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*see under* solution features *under* geomorphology

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- Remains of ancient life in Cretaceous rocks of the Dinosaur Triangle (Young, Robert G.)

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*see under* stratigraphy *under* Alamosa County; Chaffee County; Conejos County; Costilla County; Garfield County; Grand County; Mesa County; Moffat County; North America; Rio Blanco County; Saguache County

**ceramic materials** *see under* economic geology *under* Custer County; El Paso County; Fremont County; Pueblo County

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*claystone*: Goyazite in kaolinitic altered tuff beds of Cretaceous age near Denver, Colorado (Triplehorn, Don M.)

*granites*: Granite of Silver Plume type; a possible source of the uranium in deposits of the Tallahassee Creek and High Park areas, Fremont and Teller counties, Colorado (Hills, Francis Allan)

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**Chaffee County—areal geology**

*maps*: Geologic and structural maps and sections of the Marshall Pass mining district, Saguache, Gunnison, and Chaffee counties, Colorado (Olson, J. C.)

- Geologic map and details of the beryllium and molybdenum occurrences, Mount Antero, Chaffee County, Colorado (Sharp, W. N.)

- Geologic map of the Bonanza NE Quadrangle, Chaffee and Saguache counties, Colo. (Van Alstine, R. E.)

- Geologic map of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Hedlund, D. C.)

- Reconnaissance geologic map of the Mount Elbert 15-minute Quadrangle, Lake Chaffee, and Pitkin counties, Colorado (Tweto, Ogdén)

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- Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimelman, David R., et al.)
- Analytical results and sample locality map of stream-sediment and panned-concentrate samples from the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Domenico, James A., et al.)
- Analytical results for 102 water samples from sites draining the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Ficklin, W. H., et al.)
- Buffalo Peaks Wilderness Study Area, Colorado (Hedlund, D. C.)
- Geochemical evaluation of the mineral resources of the Browns Canyon area, Chaffee County, Colorado (Leibold, Anne M., et al.)
- Leadville 1' by 2' Quadrangle, Colorado; a pre-assessment (Wallace, Alan R., et al.)
- Maps showing water geochemistry of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, G. A., et al.)
- Mineral investigation of the Buffalo Peaks Wilderness Study Area, Chaffee, Lake, and Park counties, Colorado (Wood, Robert H., II)
- Mineral resource assessment of the San Isabel National Forest, Colorado; a prototype for 1:250,000-scale multidisciplinary assessments "from the literature" (Taylor, Richard B.)
- Mineral resource evaluation of the Browns Canyon area, Chaffee County, Colorado, using stream-sediment geochemistry (Leibold, Anne M.)
- Mineral resource potential map of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Hedlund, D. C., et al.)
- Mineral resources of the Browns Canyon Wilderness Study Area (CO-050-002), Chaffee County, Colorado (Zelten, Jeanne E.)
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- Stream-sediment and panned-concentrate geochemical maps of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, Gary A.)
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- pegmatite*: A Mount Antero postscript (Heinrich, E. W.)
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- polymetallic ores*: Chemical data concerning Proterozoic ores and rocks from the Sedalia Mine area, Chaffee County, Colorado (Sheridan, Douglas M., et al.)
- silver ores*: Buffalo Peaks Wilderness Study Area, Colorado (Hedlund, D. C.)
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- water resources*: Water-resources appraisal of the upper Arkansas River basin from Leadville to Pueblo, Colorado (Crouch, Thomas M., et al.)
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- trace elements*: Early Proterozoic bimodal volcanic rocks in central Colorado, U.S.A.: Part II, Geochemistry, petrogenesis and tectonic setting (Boardman, Shelby J.)
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- intrusions*: Reverse zoning in the resurgent intrusions of the Grizzly Peak Cauldron, Sawatch Range, Colorado (Fridrich, Christopher J.)
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## Chaffee County—soils

### Chaffee County—soils

*geochemistry*: Copper in soil samples downslope from copper-tungsten mine tailings, Cleora District, Chaffee County, Colorado (Cepeda, Joseph C.)

### Chaffee County—stratigraphy

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— Mudflows of Mt. Princeton/Chalk Creek, Chaffee County, Colorado (Dillon, Glen D.)

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*orogeny*: Evidence for Laramide compression from a small drape fold in central Colorado (Wright, Stephen F.)

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— Lower Paleozoic of Northwest Colorado; a summary (Ross, Reuben J., Jr.)

— Paleokarst and other dissolution features of the Devonian Dyer and Mississippian Leadville formations, central Colorado (Hall, John F., Jr.)

— Stratigraphy of the Devonian Chaffee Formation of northeastern Gunnison County, Colorado (Thomas, William Andrew)

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*mass spectroscopy*: Remote plutonium contamination and total inventories from Rocky Flats; discussion (Merrill, G. L., Jr., et al.)

*neutron activation analysis*: Vanadium concentrations in Colorado River basin waters (Linstedt, K. Daniel)

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*trace-element analyses*: A new method of analysis for trace elements in gold-silver deposits; comparison with Lake City data (Sanford, Richard F.)

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*applications*: Chemical analyses for use in modeling; problems and solutions (Wildeman, Thomas R., et al.)

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*sink float method*: Sink float procedures for shale characterization (Vadovic, Charles J.)

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— Discoveries hold interest in S.E. Colorado (Keener, William)

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*oil and gas fields*: Integrating airborne and subsurface magnetic data (Foote, Robert S.)

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*maps*: Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)

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— Water-bearing characteristics of geologic formations in northeastern New Mexico-southeastern Colorado (Kilmer, L. Clay)

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### Chinle Formation

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— Chemical characteristics of some major uranium deposits in western USA (Spirakis, Charles S.)

— Colorado National Monument (Hall, Robert B.)

— Comparison of the chemical composition of mineralized and unmineralized sandstone and conglomerate samples from the uranium-bearing Chinle Formation of the Colorado Plateau (Pierson, Charles T.)

— Dinosaur tracksites of western Colorado and eastern Utah (Lockley, Martin G.)

— Dinosaur trackways (Lockley, Martin G.)

— Geologic map and coal sections of the Thornburgh Quadrangle, Moffat and Rio Blanco counties, Colorado (Reheis, Marith Cady C.)

— Gold in the Chinle Formation of Utah, Colorado, Arizona and New Mexico (Heylman, Edgar B.)

— Mineral resources of the Dolores River Canyon Wilderness Study Area, Montrose and San Miguel counties, Colorado (Gerlitz, Carol N., et al.)

— Nonmarine depositional environments and Paleosol development in the Upper Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)

— Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)

— The paleobiological and paleoenvironmental importance of dinosaur footprints (Lockley, Martin G.)

- Thermal maturity and hydrocarbon source-rock potential of the Eagle Basin, northwestern Colorado (Nuccio, Vito F.)
- Upper Jurassic groundwater flow in the Colorado Plateau; the key to formation of uranium ore deposits (Sanford, Richard F.)
- Water-bearing characteristics of geologic formations in northeastern New Mexico-southeastern Colorado (Kilmer, L. Clay)

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- Modeling the reaction and movement of chromium in an alluvial aquifer near Telluride, Colorado (Grove, D. B., et al.)
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- Colorado*: Alteration and mineralization in the Uraivan mineral belt, Colorado (Rohl, Arthur N.)
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- Chemical and mineralogical differences of marine and non-marine shales of the Dakota Sandstone and adjacent units, southwestern Colorado (Winsten, Miriam S.)
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- Clay minerals associated with the amethyst vein system, Creede mining district, Southwest Colorado (Horton, Duane G.)
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- Genesis of acid-sulfate alteration and Au-Cu-Ag mineralization at Summitville, Colorado (including sections on supergene alteration and clay mineralogy of the deposit) (Stoffregen, Roger Eben)
- Geology and energy resources of the Piceance Creek basin (Donnell, John R.)
- Goyazite in kaolinitic altered volcanic ash beds of Cretaceous age near Denver, Colorado (Triplehorn, Don M.)
- Illitic material (sericite) from the San Juan Mountains, Colorado, U.S.A. (Srodon, Jan)
- Mineralogy and genesis of the clay minerals of the Codell Sandstone, Denver Basin, Colorado (Henningsgaard, Jeffrey, et al.)
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- Particle size and clay mineral distributions within sorted and nonsorted circles and the surrounding parent material, Niwot Ridge, Front Range, Colorado, U.S.A. (Rissing, Joseph M.)
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- Role of feldspar in determining the nature of authigenic minerals in burial diagenesis (Dutta, Prodig K.)
- Silt translocation in alpine soils; a periglacial phenomenon? (Burns, Scott F.)
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- Colorado Plateau*: The significance of clay mineralogy in the amenability of sandstone vanadium ores (Hausen, D. M.)
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- Rocky Mountains*: Clay petrology of the conformable Cretaceous/Tertiary boundary interval, Raton Basin, New Mexico and Colorado (Pollastro, Richard M., et al.)
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— The formation of illite at the expense of illite/smectite; mineralogical and morphological support for a hypothesis (Pollastro, Richard M.)

*San Miguel County*: Geochemical study of authigenic minerals in the Salt Wash Member of the Morrison Formation, Slick Rock District, San Miguel County, Colorado (Breit, George Nicholas)

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*United States*: Fluoride content of clays and shales (Thomas, Josephus, Jr., et al.)

*Western U.S.*: Gamma-ray spectrometry of marine shales in outcrop: a tool for petroleum exploration and basin analysis (Zelt, Frederick B.)

— Relationship between illite/smectite diagenesis and hydrocarbon generation in Lower Cretaceous Mowry and Skull Creek Shales of the Northern Rocky Mountain area (Burtner, R. L.)

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— Geology and petroleum potential, Colorado Park Basin province, north-central Colorado (Maughan, Edwin K.)

— Preliminary geologic map of the Bergen Park area, Jefferson and Clear Creek counties, Colorado (Sheridan, D. M.)

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*fluorspar*: Map showing hydrothermal alteration and fluorite occurrences in the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G.)

*gold ores*: Gold and silver find at Franklin (Anonymous)

— Gold in the Central City mining district, Colorado (Wallace, Alan R.)

— Preliminary studies of *Bacillus cereus* distribution near a gold vein and a disseminated gold deposit (Parduhn, Nancy L.)

— Trace elements distribution around precious and base metal veins, Idaho Springs District, Colorado (Budge, Suzanne)

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*lead-zinc deposits*: Geology of the lead-zinc-silver deposits of Silver Plume area, Clear Creek County, Colorado (Grybeck, Donald)

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— Map showing the distribution of selected mineral assemblages in nonmagnetic heavy-mineral concentrates from stream sediments from the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

— Mineral investigation of the Mount Evans Wilderness, Clear Creek and Park counties, Colorado (Korzeb, Stanley L.)

— Mineral investigation of the Vasquez Peak Wilderness Study Area and St. Louis Peak and Williams Fork Roadless areas, Clear Creek, Grand, and Summit counties, Colorado (Bielski, Alan M., et al.)

— Mineral resource potential map of the Vasquez Peak Wilderness Study Area, and the St. Louis Peak and Williams Fork Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Theobald, P. K., et al.)

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— Multiple hydrothermal mineralization events, Phoenix Vein, Idaho Springs District, Colorado (Myint, Khin M., et al.)

— Tertiary intrusive activity and mineralization in the Empire mining district, Grand, Gilpin and Clear Creek counties, Colorado (Myint, Khin Maung)

— Tertiary mineralization: Idaho Springs, Colorado (Budge, S., et al.)

— The petrology of Tertiary intrusions associated with epithermal veins in the Georgetown-Silver Plume District: Clear Creek County, Colorado (Connors, Katherine A.)

— The petrology of Tertiary intrusions associated with epithermal veins in the Georgetown-Silver Plume region, Clear Creek County, Colo. (Connors, Katherine A., et al.)

— Vasquez Peak Wilderness Study Area, and St. Louis Peak and Williams Fork Roadless Areas, Colorado (Theobald, P. K.)

*mineral resources*: Generalized geologic map of the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

— Geochemical data for the Vasquez Peak Wilderness Study Area (A2361), the Williams Fork Further Planning Area (2-114), and the St. Louis Peak Roadless Area (F2361), Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)

— Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridgetop soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)

— Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates of stream sediments from Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)

— Map showing the distribution of selected mineral assemblages in nonmagnetic heavy-mineral concentrates from stream sediments from the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

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— Mineralogy of the Patch Mine, Gilpin County, and the Alice Mine, Clear Creek County, Colorado (Kile, Daniel E.)

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— A strontium and oxygen isotope study of Laramide magmatic and hydrothermal activity near Central City, Colorado (Dickin, A. P., et al.)

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*coalification*: Comparative studies of the reflectivity of vitrinite and sporinite (Ting, Francis T. C.)

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*manganese*: Manganese binding by iron bacteria in wetlands; a potential analog for manganese-rich coal (Robbins, E. I., et al.)

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*production control*: Design guidelines and instrumentation for in-situ stress and rock discontinuity conditions in coal mines (O'Rourke, J. E.)

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#### Coal Creek Quartzite

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— Fluvial pattern influenced by underlying coal-bed morphology, Coalmont Formation, North Park Basin, Colorado (Roberts, Stephen B.)

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— Shifting coal depocenters in the Tertiary Coalmont Formation, North Park Basin, Colorado (Roberts, Stephen B.)

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#### Cochetopa Park Tuff

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— High-resolution  $^{40}\text{Ar}/^{39}\text{Ar}$  chronology of Oligocene volcanic rocks, San Juan Mountains, Colorado (Lanphere, Marvin A.)

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#### Cochetopa Succession

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#### Codell Sandstone Member

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— Character and origin of natural gases from Wattenberg area, Denver Basin, Colorado (Rice, Dudley D.)

— Codell and Juana Lopez in south-central Colorado (McLane, Michael)

— Codell Sandstone, D-J Basin's new objective (Anonymous)

— Codell Sandstone, new exploration play, Denver Basin (Weimer, Robert J.)

— Codwell Sandstone, Denver Basin; frontier exploration in a mature basin (Weimer, R. J.)

— Depositional environment of the Codell Sandstone in the northern Denver-Julesburg Basin, Colorado (Caraway, Donna C.)

— Early-time tight gas production forecasting technique improves reserves and reservoir description (Neal, D. B.)

— Exploration intensity map of the Upper Cretaceous Codell Sandstone, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)

— Field trip guide, Codell Sandstone, northern Front Range (Sonnenberg, Stephen A.)

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— Geological aspects of the Codell Sandstone, Weld and Larimer counties, CO (Hively, Roger E.)

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— Homey basin harbors challenging zones (Lyle, Don)

— Limited entry MHF: 1, Limited entry extended to massive hydraulic fracturing (Cramer, D. D.)

— Limited entry MHF; Conclusion, study indicates guidelines improve results (Cramer, D. D.)

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— Mid-Cretaceous Codell Sandstone Member of Carlile Shale, eastern Colorado (Merewether, E. A.)

— Mineralogy and genesis of the clay minerals of the Codell Sandstone, Denver Basin, Colorado (Henningsgaard, Jeffrey, et al.)

— Mountain front thrust, southeastern Front Range and northeastern Wet Mountains, Colorado (Jacob, Arthur F.)

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— Predicting the performance of tight gas reservoirs (Mian, Mohammad Asif)

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— Structure of the Raton Basin from a regional seismic line (Applegate, James K.)

— The Carlile-Niobrara (Upper Cretaceous) unconformity in southeastern Colorado, southwestern Kansas, and northeastern New Mexico (Laferrriere, Alan P.)

— Thermal maturity of Codell Sandstone-Carlile Shale interval (Cretaceous) in part of Denver Basin, Colorado (Ritchie, James G.)

— Undrilled shallow giant trap in Denver Basin, Colorado; mountain-front thrust (Jacob, Arthur F.)

— Wattenberg Field, Denver Basin, Colorado (Weimer, Robert J., et al.)

— Wattenberg Field, Denver Basin, Colorado (Weimer, Robert J., et al.)

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#### Coffman Member

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— Fossil Scenedesmus (Chlorophyta) and its paleoecological significance (Fleming, R. Farley)

— Palynology and biostratigraphy of the Upper Cretaceous Adaville Formation (southwestern Wyoming) and biostratigraphic comparison to the Niobrara Formation (Ridgway, Colorado) (Gallucci, Richard Nicholas)

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- isotopes*: Oxygen isotope variations in phosphate of biogenic apatites; III, Conodonts (Luz, Boaz, et al.)

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- Paleozoic*: Middle Devonian to Late Mississippian geologic history of the Overthrust Belt region, Western U.S. (Sandberg, Charles A., et al.)
- Pennsylvanian*: A new conodont locality in the Fountain Formation (Langford, Richard P.)
- Missourian (early Late Pennsylvanian) climate in Midcontinent North America (Schutter, Stephen R.)
- New interpretation of the stratigraphic relationship between the Fountain Formation and its Glen Eyrie Member (Suttner, Lee J., et al.)

- Quantitative analysis of Pennsylvanian shallow-water conodont biofacies, Utah and Colorado (Driese, Steven G., et al.)
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**conodonts—occurrence**

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**conodonts—paleoecology**

- Pennsylvanian*: Quantitative analysis of Pennsylvanian conodont biofacies patterns, northern Utah and Colorado (Driese, Steven G., et al.)

**conservation** *see under* environmental geology *see* land use; reclamation

*see under* environmental geology *under* Montezuma County; San Juan County; symposia *see under* soils

**conservation—natural resources**

- water resources*: Ground-water models for water resource planning (Moore, J. E.)

**construction materials** *see* gravel deposits *see under* economic geology *under* Chaffee County

**continental drift** *see* plate tectonics

**Cooper Arroyo Sandstone**

- The marine transgressive surface as a sequence boundary; a case study of the upper Coniacian transgression in the San Juan Basin (Nummedal, Dag)

**copper—geochemistry**

- copper ores*: Possible sedimentary sources of sulfur and copper in alkaline-suite porphyry-copper systems (Shannon, Spencer S., Jr., et al.)
- metal ores*: Trace element distribution around precious/base metal veins, Idaho Springs Dist., CO (Budge, Suzanne)
- oxides*: Adsorption of Cu, Pb, and Zn onto birnessite (Catts, John G.)
- peat*: Selected trace element anomalies in a Front Range bog, Larimer County, Colorado (Sarnecki, Joseph C.)
- soils*: Copper in soil samples downslope from copper-tungsten mine tailings, Cleora District, Chaffee County, Colorado (Cepeda, Joseph C.)
- Development of a DTPA soil test for zinc, iron, manganese, and copper (Lindsay, W. L.)
- Relative mobility of lead and copper in soils: an example from the Bonanza District, Saguache County, Colorado (Cepeda, Joseph C.)

**copper ores** *see under* economic geology: isotopes; mineral deposits, genesis *see under* dates *under* absolute age

*see under* economic geology *under* Archuleta County; Baca County; Boulder County; Chaffee County; Conejos County; Dolores County; Grand County; Jackson County; La Plata County; Mineral County; Montrose County; North America; Ouray County; Park County; Rio Grande County; Saguache County; San Juan County; San Miguel County; Western U.S.

*see under* fission-track dating *under* geochronol-

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*see under* geochemistry *under* copper; rare earths**copper ores—mineral exploration***geochemical methods*: Characteristics that distinguish types of epithermal deposits (Hayba, D. O., et al.)**corals—biostratigraphy***Mississippian*: Middle Devonian to Late Mississippian geologic history of the Overthrust Belt region, Western U.S. (Sandberg, Charles A., et al.)*Pennsylvanian*: A field guide to the Pennsylvanian biofacies of the Minturn Formation, Bond-McCoy area, central Colorado Trough (Houck, Karen J.)

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**Corcoran Member**

Appropriate stratigraphic nomenclature for coal reservoirs in Piceance Basin, Colorado (Decker, David)

— Book Cliffs coal field, western Colorado (Young, Robert G.)

— Depositional control of diagenesis in tight gas sands, Corcoran and Cozzette Sandstone members of Price River Formation (Upper Cretaceous), Book Cliffs of western Colorado (Palmer, Beth A.)

— Depositional systems of a tight gas-productive barrier-strandplain sequence; Corcoran and Cozzette sandstones, Northwest Colorado (Finley, Robert J.)

— Interference testing of the naturally fractured Cozzette Sandstone; a case study at the DOE MWX site (Branagan, Paul, et al.)

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— Reservoir properties and gas productivity of the Corcoran and Cozzette tight sandstones, Colorado (Finley, R. J.)

— Southern Piceance Basin model; Cozzette, Corcoran and Rollins sandstones (Brown, Charles A., et al.)

**Costilla County—areal geology***Sangre de Cristo Mountains*: Geology of the Lost-Lake Duling Pass area, Sangre de Cristo Mountains, Colorado (Okumura, Terrence A.)**Costilla County—economic geology***fuel resources*: Seismic lines in the San Luis Valley, south central Colorado (Gries, Robbie Rice)*industrial minerals*: Geology and hydrothermal alteration of the Sugarloaf Prospect, San Luis Hills, Conejos and Costilla counties, Colorado (Bartlett, R. Douglas)*mineral resources*: Mineral resource assessment of the San Isabel National Forest, Colorado; a prototype for 1:250,000-scale multidisciplinary assessments "from the literature" (Taylor, Richard B.)**Costilla County—environmental geology***land use*: Land use and land cover and associated maps for Trinidad, Colorado (U. S. Geological Survey)*maps*: Land use and land cover and associated maps for Trinidad, Colorado (U. S. Geological Survey)**Costilla County—geochemistry***maps*: Maps showing trace-element geochemistry of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R.)*trace elements*: Maps showing trace-element geochemistry of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R.)**Costilla County—geomorphology***glacial geology*: Identification of rock glaciers using enhanced Landsat MSS data (Berta, Susan M.)**Costilla County—geophysical surveys***remote sensing*: Identification of rock glaciers using enhanced Landsat MSS data (Berta, Susan M.)*seismic surveys*: Seismic lines in the San Luis Valley, south central Colorado (Gries, Robbie Rice)**Costilla County—hydrogeology***ground water*: Hydrogeology and simulated effects of ground-water development on an unconfined aquifer in the Closed Basin Division, San Luis Valley, Colorado (Leonard, Guy J.)*hydrology*: Spatial dependency of hydraulic geometry exponents in a subalpine stream (Phillips, Patrick J.)*maps*: Hydrologic analysis of the Rio Grande Basin north of Embudo, New Mexico; Colorado, and New Mexico (Hearne, Glenn A.)*thermal waters*: Geology of an Oligocene-age acid hot spring, San Luis Hills, Conejos and Costilla counties, Colorado (Bartlett, Robert D.)**Costilla County—stratigraphy***Cenozoic*: Map showing upper Cenozoic rocks and deposits and Quaternary faults, Rio Grande Rift, south-central Colorado (Colman, S. M., et al.)*Cretaceous*: Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado (Pillmore, Charles L.)*Paleocene*: Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado (Pillmore, Charles L.)*Quaternary*: Map showing upper Cenozoic rocks and deposits and Quaternary faults, Rio Grande Rift, south-central Colorado (Colman, S. M., et al.)**Costilla County—structural geology***neotectonics*: Map showing upper Cenozoic rocks and deposits and Quaternary faults, Rio Grande Rift, south-central Colorado (Colman, S. M., et al.)**Cow Ridge Member**

New names for units in the lower part of the Green River Formation, Piceance Creek basin, Colorado (Johnson, Ronald C.)

**Cozzette Member**

Appropriate stratigraphic nomenclature for coal reservoirs in Piceance Basin, Colorado (Decker, David)

— Book Cliffs coal field, western Colorado (Young, Robert G.)

— Depositional control of diagenesis in tight gas sands, Corcoran and Cozzette Sandstone members of Price River Formation (Upper

Cretaceous), Book Cliffs of western Colorado (Palmer, Beth A.)

— Depositional systems of a tight gas-productive barrier-strandplain sequence; Corcoran and Cozzette sandstones, Northwest Colorado (Finley, Robert J.)

— Geologic map and cross sections of parts of the Grand Junction and Delta 30' x 60' quadrangles, west-central Colorado (Ellis, Margaret S.)

— Interference testing of the naturally fractured Cozzette Sandstone; a case study at the DOE MWX site (Branagan, Paul, et al.)

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— Southern Piceance Basin model; Cozzette, Corcoran and Rollins sandstones (Brown, Charles A., et al.)

— Stratigraphy and depositional environments of a portion of upper Campanian Mesaverde Group, central Grand Hogback, Northwest Colorado (Madden, Dawn J.)

— Stratigraphy of Grand Hogback Coalfield, upper Campanian Mesaverde Group, Rifle Gap to New Castle, Garfield County, Colorado (Madden, Dawn J.)

— Stratigraphy, depositional environments, and paleogeography of coal-bearing strata in the Upper Cretaceous Mesaverde Group, central Grand Hogback, Garfield County, Colorado (Madden, Dawn J.)

**Creede Formation**

Creede Formation moat rocks and postcollapse history of Creede Caldera, CO (Heiken, Grant)

— Diagenesis in the Creede Formation, San Juan Mountains, Creede, Colorado (McCrink, Marie Taaffe)

— District-wide fluid mixing during precious/base-metal epithermal mineralization at Creede, Colorado (Hayba, Daniel O.)

— Fluid-inclusion evidence for hydrologic and hydrothermal processes in the Creede mineralizing system, Colorado (Hayba, Daniel O.)

— Lacustrine volcanoclastic sediments in the Creede Formation, San Juan Mountains, Colorado (Bodine, Marc W., Jr., et al.)

— Preliminary results of geophysical studies near the Creede mining district, Colorado (Williams, David L., et al.)

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— Results from preliminary geoelectrical surveys in the Creede mining district (Stanley, William D.)

— The Creede Formation silver deposit (Rice, John A.)

— The late Oligocene Creede flora, Colorado (Axelrod, Daniel I.)

— The significance of the Fisher Quartz Latite to the history of the Creede Caldera, southwestern Colorado (Ritch, Kurt D.)

**Cresson Breccia**

Textural and geochemical characteristics of gold mineralization from Cresson Mine, Crip-



## Crestone Conglomerate Member

ple Creek District, Colorado, U.S.A. (Saunders, J. A.)

## Crestone Conglomerate Member

Sedimentation model for the Crestone Conglomerate Member of the Sangre de Cristo Formation (Pennsylvanian-Permian), southern central Colorado (Flores, Richard J.)

— Sedimentology of a prograding alluvial fan sequence (Flores, Richard J.)

**Cretaceous** *see under* geochronology *under* Boulder County; Jefferson County

*see under* stratigraphy *under* Adams County; Arapahoe County; Archuleta County; Baca County; Boulder County; Colorado Plateau; Costilla County; Delta County; Douglas County; Eagle County; El Paso County; Fremont County; Garfield County; Grand County; Great Plains; Gunnison County; Huerfano County; Jackson County; Jefferson County; La Plata County; Larimer County; Las Animas County; Lincoln County; Mesa County; Moffat County; Montezuma County; Montrose County; North America; Ouray County; Pitkin County; Prowers County; Pueblo County; Rio Blanco County; Rocky Mountains; Routt County; San Juan County; San Miguel County; symposia; Teller County; Weld County

## Cretaceous—geochemistry

*organic materials*: Depletion of  $^{13}\text{C}$  in Cretaceous marine organic matter; source, diagenetic, or environmental signal? (Dean, Walter E., et al.)

*rare earths*: Searching land and sea for the dinosaur killer (Kerr, Richard A.)

## Cretaceous—sedimentary petrology

*sedimentation*: Cretaceous rhythmic bedding sequences; a plausible link between orbital variations and climate (Barron, Eric J., et al.)

## Cretaceous—stratigraphy

*biogeography*: The Upper Cretaceous (Cenomanian) ammonites *Metengonoceras dumbli* (Cragin) and *M. acutum* Hyatt (Cobban, William A.)

*biostratigraphy*: High resolution stratigraphy at the Cenomanian/Turonian boundary and the timing of paleoceanographic events (Bralower, Timothy J.)

*boundary*: Osmium-187/osmium-186 in manganese nodules and the Cretaceous-Tertiary boundary (Luck, J. M.)

— The K/T impact excavated oceanic mantle; evidence from REE abundances (Hildebrand, A. R.)

*chemostratigraphy*: The Cretaceous-Tertiary boundary problem; an assessment from lead isotope systematics (Dia, Aline, et al.)

*paleomagnetism*: Magnetic properties of K/T and E/O microspherules; origin by combustion? (Cisowski, Stanley M.)

**Crinolidea** *see under* Echinodermata

## Cripple Creek Granite

A redescription of the Cripple Creek Granite, Cripple Creek, Colorado (Steffen, Robert W.)

**Crocodylia** *see under* Reptilia

## Cross Creek Granite

The geology, microstructures, and small-scale structures in the vicinity of Upper Cataract Lake, Gore Range, Colorado (Sauls, Brian D.)

**cross-bedding** *see under* planar bedding structures *under* sedimentary structures

## Crowley County—hydrogeology

*ground water*: Quality of the ground water (Horr, C. A.)

*hydrology*: Assessment of long-term salinity changes in an irrigated stream-aquifer system (Konikow, Leonard F.)

— Calibration and use of an interactive-accounting model to simulate dissolved solids, streamflow, and water-supply operations in the Arkansas River basin, Colorado (Burns, Alan W.)

— Quality of the Arkansas River and irrigation-return flows in the lower Arkansas River valley, Colorado (Cain, Doug)

— Recalibration and predictive reliability of a solute-transport model of an irrigated stream-aquifer system (Person, Mark A.)

*maps*: Potential well yields from the Ogallala Aquifer in the northern High Plains of Colorado (Lindner-Lunsford, Juli B.)

— Relations of specific conductance to streamflow and selected water-quality characteristics of the Arkansas River basin, Colorado (Cain, Doug)

**crust** *see under* tectonophysics

*see under* geochemistry *under* Grand County; mercury; radon; Routt County; Southwestern U.S. *see under* tectonophysics *under* Basin and Range Province; Boulder County; Colorado Plateau; Mineral County; North America; Western U.S.

## crust—properties

*geodynamics*: A comparison of VLBI and satellite laser determined baseline lengths (Ryan, J.)

*mechanical properties*: Mechanics of pegmatite intrusion (Brisbin, W. C.)

**Crustacea** *see under* Arthropoda

**crystal chemistry** *see* crystal structure

## crystal chemistry—framework silicates, alkali feldspar

*amazonite*: Crystal chemistry and origin of color of amazonite, particularly that from the Pikes Peak Batholith, Colorado (Foord, Eugene E.)

## crystal chemistry—orthosilicates, epidote group

*allanite*: Synthesis and crystal chemistry of lanthanide allanites (Affholter, Kathleen Ann)

## crystal chemistry—sheet silicates, mica group

*biotite*: Alteration biotite chemistry and nature of deep hydrothermal system beneath Silverton District, Colo. (Gilzean, M. N.)

## crystal chemistry—sulfides

*arsenorenicerite*: Aspects of germanium mineralogy and geochemistry (Bernstein, Lawrence Richard)

## crystal chemistry—sulfosalts

*benjaminite*: The first find of copper-free benjaminite (Nenasheva, S. N., et al.)

## crystal growth—crystal form

*gold minerals*: The minerals of gold (Jones, Bob)

## crystal growth—framework silicates, silica minerals

*quartz*: Minerals; 1984 (Jones, Bob)

## crystal growth—native elements

*gold*: Colorado's crystalline gold (Jones, Bob)  
— Famous mineral localities; Breckenridge, Colorado (Raines, Ed)

## crystal growth—sheet silicates, mica group

*sericite*: Sericite from the Silverton Caldera, Colorado; correlation among structure, composition, origin, and particle thickness (Eberl, Dennis D., et al.)

## Crystal Lake Tuff

Epithermal mineralization related to caldera development, Pride of the West Mine, San Juan Co., Colorado (Hardwick, James F.)

— Epithermal vein and carbonate replacement mineralization related to caldera development, Cunningham Gulch, Silverton, Colorado (Hardwick, James Fredrick, Jr.)

**crystal structure** *see* crystal chemistry

## crystal structure—framework silicates, silica minerals

*quartz*: Rose quartz with several partings, Clara May Pegmatite, Chaffee Co., Colorado (Cobban, Robert)

## crystal structure—halides

*zunyite*: Near-infrared reflectance of zunyite; implications for field mapping and remote-sensing detection of hydrothermally altered high alumina rocks (Crowley, James K.)

## crystal structure—native elements

*gold*: Gold crystals (Jones, Bob)

## crystal structure—nitrates

*refinement*: Crystal structure of naturally occurring mercury(II) amidonitrate (Randall, C. J., et al.)

## crystal structure—orthosilicates, olivine group

*lailuinite*: Fe-deficient olivine structure type minerals from Colorado, U.S.A. and Japan (Sueno, Shigeo, et al.)

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*sidwillite*: Sidwillite; a new mineral from Lake Como, Colorado, U.S.A. (Cesbron, F.)  
*VO(OH)<sub>2</sub>*: The crystal structure of a new vanadium oxide mineral, VO(OH)<sub>2</sub> (Evans, Howard T., Jr.)

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*helvite group*: The crystal structures of helvite group minerals, (Mn,Fe,Zn)<sub>8</sub>(Be<sub>6</sub>Si<sub>6</sub>O<sub>24</sub>)S<sub>2</sub> (Hassan, H. Ishmael)

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*tetrahedrite*: Mineralogy and geochemistry of gold-silver veins at the Hock Hocking Mine, Alma, Colorado (Raabe, Kenneth Charles)

## crystal structure—sulfosalts

*benjaminite*: The first find of copper-free benjaminite (Nenasheva, S. N., et al.)

## crystal structure—tellurides

*calaverite*: Gold crystals (Jones, Bob)

**crystal structure—tellurites**

*magnolite*: The crystal structure of magnolite,  $\text{Hg}^{1+}_2\text{Te}^{4+}\text{O}_3$  (Grice, Joel Denison)

**crystallography** *see* mineralogy**Cuchara Formation**

- Alteration zones related to igneous activity, Spanish Peaks area, Las Animas and Huerfano counties, Colorado (Hutchinson, Robert M.)
- Tectonic framework of northeastern New Mexico and adjacent parts of Colorado, Oklahoma and Texas (Woodward, Lee A.)
- The hydrogeochemical effects of past mining on the Raton Basin, Colorado (Howard, W. Brant)

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- Paleogeography and facies distribution of the Todilto Limestone and Pony Express Limestone Member of the Wanakah Formation, Colorado and New Mexico (Ridgley, Jennie L.)

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- guidebook*: Log for joint SEPM-Colorado Scientific Society field trip from Westcliffe to Crestone, Colorado, September 20-21, 1986; late Paleozoic sedimentation and Laramide tectonics of the Sangre de Cristo Range (Lindsey, David A.)
- maps*: Geologic map and sections of the Valley View Hot Springs Quadrangle, Custer and Saguache counties, Colorado (Lindsey, D. A.)
- Geologic map of Electric Peak and south-western part of Beckwith Mountain quadrangles, Custer and Saguache counties, Colorado (Lindsey, D. A., et al.)
- Geologic map of Rito Alto Peak and north-eastern part of Mirage quadrangles, Custer and Saguache counties, Colorado (Lindsey, D. A., et al.)
- Geologic map of the Beck Mountain, Crestone Peak, and Crestone quadrangles, Custer, Huerfano, and Saguache counties, Colorado (Lindsey, D. A., et al.)
- Geologic map of the Horn Peak Quadrangle, Custer and Saguache counties, Colorado (Lindsey, D. A., et al.)
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- Reconnaissance geologic map of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Johnson, Bruce R., et al.)

**Custer County—economic geology**

- ceramic materials*: Fire clay deposits of eastern Fremont, western Pueblo and adjacent counties, Colorado (Waage, K. M.)
- geothermal energy*: Sangre de Cristo Wilderness Study Area, Colorado (Johnson, Bruce R.)
- lead ores*: Apatite fission-track age for the Bull Domingo boulder pipe, Custer County, Colorado (Sharp, W. N.)
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— Sangre de Cristo Wilderness Study Area, Colorado (Johnson, Bruce R.)

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*maps*: Land use and land cover and associated maps for Pueblo, Colorado (U. S. Geological Survey)

**Custer County—geochemistry**

*maps*: Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

— Maps showing trace-element geochemistry of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R.)

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**Custer County—hydrogeology**

*hydrology*: Proposed work plan for the study of hydrologic effects of ground-water development in the Wet Mountain Valley, Colorado (Robson, S. G.)

**Custer County—mineralogy**

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**Custer County—paleontology**

*Reptilia*: The fossil snake *Cheilophis huerfanoensis* Gilmore, 1938, from Eocene of Colorado; redescription and reappraisal of relationships (Rage, Jean-Claude)

**Custer County—petrology**

*crystalline rocks*: Genesis of the pre-Cambrian rocks of Tenmile Valley, Colorado (Cannon, Ralph S., Jr.)

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**Cutler Formation**

Alluvial sandstone composition and paleoclimate; I, Framework mineralogy (Suttner, Lee J.)

— Alluvial sandstone composition and paleoclimate; II, Authigenic mineralogy (Dutta, Prodip K.)

— Alluvial-fan sedimentation of the Cutler Formation (Permo-Pennsylvanian), near Gateway, Colorado (Mack, Greg H.)

— Bessie G; a high-grade epithermal gold telluride deposit, La Plata County, Colorado, U.S.A. (Saunders, James A.)

— Characteristic remanent magnetization of boulders and cobbles in red beds of Pennsylvanian and Permian age in Colorado (Larson, E. E.)

— Chemical and thermal evolution of diagenetic fluids and the genesis of uranium and copper ore in and adjacent to the Paradox Basin with emphasis on the Lisbon Valley and Temple Mountain areas, Utah and Colorado (Morrison, Stan Jay)

— Deep-burial diagenetic iron oxides and problems of cement stratigraphy; discussion of

alluvial sandstone composition and paleoclimate; II, Authigenic mineralogy; discussion and reply (Bjorlykke, Knut, et al.)

— Differentiation of debris flow and waterlaid alluvial conglomerates, with examples from the Permo-Pennsylvanian of Colorado (Shultz, Albert W.)

— Discovery of the Silver Creek molybdenum deposit, Rico, Colorado (Cameron, D. E., et al.)

— Evidence for glaciation in Unaweep Canyon, Mesa County, Colorado (Cole, Rex D.)

— Field Trip 4: Guide to the field study of alluvial fan and fan-delta deposits in the Fountain Formation (Pennsylvania-Permian), Colorado (Suttner, L. J., et al.)

— Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)

— Laramide oblique-slip, high-angle faults, southern San Juan Mountains, Colorado (Morse, Earl L.)

— Modern and ancient fluvial-eolian interactions (Langford, Richard Parker)

— Oxygen isotope analyses of early authigenic clays in sandstone; a new approach to paleoclimate interpretation (Dutta, Prodip K.)

— Paradox Basin; unravelling the mystery (Anonymous)

— Paradox Valley, Colorado; a collapsed salt anticline (Chenoweth, William L.)

— Petrography and geochemistry of Early Permian calcareous nodules of the Abo and Cutler formations, south-central New Mexico and southwestern Colorado (Schaal, William Conrad)

— San Luis Uplift; fact or fiction (Baars, D. L.)

— Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

— Subaerial debris-flow deposition in the upper Paleozoic Cutler Formation, western Colorado (Shultz, Albert W.)

— Tectonic and autocyclic controls on sedimentation of the Cutler Formation (Permo-Pennsylvanian), Gateway, Colorado (Mack, Greg H.)

— Tectonic and climatic controls on alluvial fan sedimentation of the Cutler Formation (Permo-Pennsylvanian) in southwestern Colorado (Rasmussen, Keith A.)

D

**D Sandstone**

Depositional environments and diagenesis of D Sandstone, Wild Horse Field, Weld County, Colorado (Wilson, Kevin M.)

— Exploration intensity map of the Upper Cretaceous D Sandstone, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)

— Investigation of stratigraphic and paleostructural controls on hydrocarbon migration and entrapment in Cretaceous D and J sandstones of the Denver Basin (Tainter, Patrick A.)

— Seismic-stratigraphic analysis of Lanyard-Lost Creek Field area, Denver Basin, Colorado; application to exploration and field delineation (Plybon, Steven C.)

— Tectonic and sedimentation model for D sandstone deposition, Zenith field area, Denver Basin, Colorado (Sonnenberg, Stephen A.)

**Dakota Aquifer**

Dakota Aquifer system in the state of Colorado (Pearl, R. H.)

— Evolution of formation fluids in the "J" Sandstone, Denver Basin, Colorado (Ottman, J. D.)

— Heat flow and ground water movement in the Central Great Plains (Gosnold, W. D.)

— Heat flow and ground water movement in the Central Great Plains (Gosnold, W. D.)

— Hydrology of the U.S. Army Pinon Canyon Maneuver Site, Las Animas County, Colorado (von Guercar, Paul, et al.)

— Low-temperature geothermal resources in the Dakota Aquifer (Sorey, M. L.)

— Paleohydrogeology of the Cretaceous Dakota Aquifer system in the Denver Basin; a computer approach (Tait, Donald)

— The Dakota Aquifer near Pueblo, Colorado; faults and flow patterns (Banta, Edward R.)

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— Age of Douglas Creek Arch, Colorado and Utah (Johnson, Ronald C.)

— Alteration related to red bed copper mineralizing brines and other fault-controlled solutions in Lisbon Valley, Utah, and the Slick Rock District, Colorado (Breit, G. N., et al.)

— An effective exploration strategy: stratigraphic and paleostructural controls in hydrocarbon migration in the Denver Basin (Tainter, Patrick A.)

— An interpretation of the subsurface structural style of the Beaver Creek Anticline, Moffat and Routt counties, Colorado (Morel, John A., et al.)

— Analysis of small scale structures developed during monoclinial folding; Biebel Monocline, Gunnison, Colorado (Wright, Stephen F.)

— Bentonite illitization in two contrasting cases; the Denver Basin and the southern Appalachian Basin (Elliott, William Crawford)

— Chemical analyses of coal samples from San Juan River region (Khalsa, Nirbhao S.)

— Chemical and mineralogical differences of marine and non-marine shales of the Dakota Sandstone and adjacent units, southwestern Colorado (Winsten, Miriam S.)

— Comparison of natural gases produced from Upper Cretaceous Fruitland Formation coal beds and adjacent reservoirs, San Juan Basin, New Mexico and Colorado (Rice, Dudley D.)

— Core porosity, permeability, and vitrinite reflectance data from the Lower Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)

— Core porosity, permeability, and vitrinite reflectance data from the Lower Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)

— Cretaceous and Pennsylvanian oil and gas production at Elk Springs and Winter Valley pools, Moffat County, Colorado (MacMillian, Logan)

- Cretaceous stratigraphy and paleontology in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Kues, Barry S.)
- Cross sections showing stratigraphic framework of Upper Cretaceous Dakota Sandstone, Mancos Shale, Mesaverde Group, and Mesaverde Formation, and lower Tertiary Wasatch Formation, west-central Piceance Basin, Garfield County, Colorado (Ellis, M. S.)
- Dakota Group (Lower Cretaceous) stratigraphy, northern Front Range, Larimer County, Colorado (Grube, John P.)
- Dakota Group of the northeast flank of the Canon City Embayment, Colorado (Blackwood, Charles F.)
- Delineating producing trends within plays by the use of computer-generated drill intensity maps, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)
- Depositional environments of the Dakota Sandstone and adjacent units in the San Juan Basin utilizing discriminant analysis of trace elements in shales (Walters, Lester J., Jr., et al.)
- Dinosaur footprints from the Dakota Group of Colorado and implications for iguanodontid-hadrosaurid evolution (Lockley, Martin G.)
- Dinosaur footprints from the Dakota Group of eastern Colorado (Lockley, Martin G.)
- Dinosaurs near Denver (Lockley, Martin G.)
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- Excavation of Dolores Tunnel nears completion (Willcut, Steven B.)
- Exploration radiometrics for petroleum hydrocarbon (Morse, Jerome G., et al.)
- Fluorescent spectral types of selected Colorado bituminous coals (Pasley, Mark A.)
- Frontal thrust structure, south-central Colorado (Ovellette, R. G.)
- Geologic map showing coal beds in the Dakota Sandstone, Harley Dome Quadrangle and parts of the Bitter Creek Well, Westwater 4 SE, and Westwater 4 SW quadrangles, Colorado and Utah (Ellis, M. S.)
- Geologic road log from Denver Federal Center to Marshall, Colorado: a visit to the Boulder-Weld coal field and some considerations of burning, subsiding coal mines (Herring, James R.)
- Goyazite in kaolinitic altered tuff beds of Cretaceous age near Denver, Colorado (Triplehorn, Don M.)
- Groundwater flow patterns in the Dakota Group Aquifer in an area near Pueblo, Colorado (Banta, Edward R.)
- Hydrodynamics of Denver Basin: explanation of subnormal fluid pressures (Belitz, Kenneth)
- Hydrodynamics of the Denver Basin: an explanation of subnormal fluid pressures (Belitz, Kenneth)
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- Identification and importance of coal bed gas, San Juan Basin, southwestern Colorado and northwestern New Mexico (Rice, Dudley D., et al.)
- Identification and significance of coal-bed gas, San Juan Basin, northwestern New Mexico and southwestern Colorado (Rice, Dudley D., et al.)
- In the footsteps of dinosaurs?: discussion (Farlow, James O.)
- Jointing at rock contacts in cyclic loading (Prost, G. L.)
- Measured sections and environmental reconstructions of uppermost Jurassic to lowermost Upper Cretaceous rocks on the northern side of the San Juan Basin, southwestern Colorado (Aubrey, W. M.)
- Median-permeability contour maps of the J Sandstone, Dakota Group, in the Denver Basin, Colorado, Nebraska, and Wyoming (Higley, D. K.)
- Median-porosity contour maps of the J Sandstone, Dakota Group, in the Denver Basin, Colorado, Nebraska, and Wyoming (Higley, D. K.)
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- Microearthquakes recorded by a micro-array at a "hard-rock" site near Crested Butte, Colorado (Cranswick, Edward)
- Mid-Cretaceous alluvial-plain incision related to eustasy, southeastern Colorado Plateau (Aubrey, W. M.)
- Mineral resources of the Eagle Mountain Wilderness Study Area, Pitkin County, Colorado (Soulliere, Sandra J., et al.)
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- More drilling heating up Raton Basin play (McCaslin, John C.)
- Occurrence and distribution of fluorescent macerals in coals from three coal basins of the United States (Cardott, Brian J.)
- Oligocene volcanic rocks as a uranium source for sandstone-type uranium deposits in central Colorado (Dickinson, Kendell A.)
- Origin of kaolinite in the Dakota Group (Cretaceous age), northern Front Range foothills, Colorado (Mozley, Peter Snow)
- Overview of the geology of the east flank of the Front Range (Grose, T. L. T.)
- Paleohydrogeology of the Cretaceous Dakota Aquifer system in the Denver Basin: a computer approach (Tait, Donald)
- Paleozoic-Mesozoic section: Red Rocks Park, I-70 road cut, and Rooney Road, Morrison area, Jefferson County, Colorado (Weimer, Robert J.)
- Petrography, porosity, and depositional environments of the Burro Canyon Formation and Dakota Sandstone of Southwest Colorado (Regli, Robert)
- Physical and chemical controls of Zn-Pb-Cu-Ag mineralization at the Big Four Mine, Summit County, Colorado (Karr, Leonard J.)
- Point Lookout (gas) (Lauth, Robert E.)
- Practical solutions to problems in the application of statistical analysis to oil and gas resource appraisal illustrated by case studies (Root, David H.)
- Preliminary investigations of an integrative gas geochemical technique for petroleum exploration (Hickey, James C.)
- Preliminary structure contour map on the base of the Cretaceous Dakota Sandstone in the San Juan Basin and vicinity, New Mexico, Arizona, Colorado, and Utah (Thaden, R. E.)
- Red Mesa (oil and gas) (Lauth, Robert E.)
- Regional correlation of Dakota Group disconformities: Front Range, New Mexico to Wyoming (Mateer, Niall J.)
- Remains of ancient life in Cretaceous rocks of the Dinosaur Triangle (Young, Robert G.)
- San Juan Sag: Cretaceous rocks in a volcanic-covered basin, south central Colorado (Gries, Robbie Rice)
- Seismic interpretation in the Piceance Basin, Northwest Colorado (Waechter, Noel B.)
- Seismic lines in the San Luis Valley, south central Colorado (Gries, Robbie Rice)
- Seismic profile: North Park Basin (Lange, J. K.)
- Seismic stratigraphic study of the Lower Cretaceous Dakota Group, Douglas Creek Arch, western Colorado (Eisenmenger, Karl Kenneth)
- Seismic-stratigraphic analysis of Lanyard-Lost Creek Field area, Denver Basin, Colorado: application to exploration and field delineation (Plybon, Steven C.)
- Shallow oil fields of the Denver Basin, Colorado and Nebraska, U.S.A. (deChadenes, J. F.)
- Sheep Mountain and Dike Mountain fields, Huerfano County, Colorado: a source of CO<sub>2</sub> for enhanced oil recovery (Roth, George)
- Sierra (oil) (Lauth, Robert E.)
- Stratigraphic correlation of dinosaur quarries near Grand Junction, Colorado (Armstrong, Harley J.)
- Stratigraphy and depositional environments of the Muddy Sandstone in North and Middle Parks basin, Jackson and Grand counties, Colorado (Murphy, W. Dale)
- Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)
- Stratigraphy of the Dakota Group north-west flank of the Canon City embayment, Colorado (Marsh, Philip Wienecke)
- Stratigraphy of upper Morrison and lower Dakota Group of Front Range, Colorado: new play in central Denver Basin? (Wyatt, Danny J.)
- Structural geology and stratigraphy of the Jack's Cabin cutoff area, Gunnison County, Colorado (Schlicht, Harold N.)
- Structure of the Raton Basin from a regional seismic line (Applegate, James K.)
- Studies of sedimentary environments in the Cretaceous Dakota Sandstone in northwestern Colorado (Lane, Donald Wilson)
- The Dakota Aquifer near Pueblo, Colorado: faults and flow patterns (Banta, Edward R.)
- The Dakota Formation of the San Juan Basin, New Mexico and Colorado (Owen, Don E.)
- The Dakota Group and the Kiowa-Skull Creek Cyclothem in the Canon City-Pueblo area, Colorado (Gustason, Edmund R.)
- The Dakota Sandstone: a diagenetic quartz arenite (Anderhalt, Robert)

- The Garden of the Gods and basal Phanerozoic nonconformity in and near Colorado Springs, Colorado (Noblett, Jeffrey B., et al.)
- The Ignacio Blanco gas field, northern San Juan Basin, Colorado (Harr, Clarence L.)
- Thermal maturity and hydrocarbon source-rock potential of the Eagle Basin, northwestern Colorado (Nuccio, Vito F.)
- Types and usages of drilling fluids utilized to install monitoring wells associated with metals and radionuclide ground water studies (Ericson, Wayne A., et al.)
- Upper Cretaceous geology, coal, and the potential for methane recovery from coalbeds in San Juan Basin; Colorado and New Mexico (Choate, R., et al.)
- Use of computer-generated maps of oil and gas development and exploration intensity for delineating producing trends, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)
- VSP interval velocities from traveltimes inversion (Stewart, R. R.)
- Water-bearing characteristics of geologic formations in northeastern New Mexico-southeastern Colorado (Kilmer, L. Clay)

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- coal*: Forecast of Colorado coal industry production and employment 1984-2000 (Rushworth, Peter)
- diamonds*: Use of reflectance spectra and digital processing to identify kimberlite diatremes in the Colorado-Wyoming district (Marks, Janet E.)
- fuel resources*: Application of principal axis ordination (Q-mode analysis) in classification of depositional environments of Morrow (Upper Carboniferous) strata in Southeast Colorado (Doyle, J. D.)
- Delineating producing trends within plays by the use of computer-generated drill intensity maps, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)
- Denver Basin exploration intensity map, Colorado, Nebraska, and Wyoming (Higley, D. K., et al.)
- Exploration intensity map of the Cretaceous J Sandstone, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, D. K., et al.)
- Exploration intensity map of the Paleozoic section, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)
- Exploration intensity map of the Upper Cretaceous Codell Sandstone, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)
- Exploration intensity map of the Upper Cretaceous D Sandstone, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)
- Exploration intensity map of the Upper Cretaceous Niobrara Formation, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)
- Exploration intensity map of the Upper Cretaceous Pierre Shale, Denver Basin, Colo-

rado, Nebraska, and Wyoming (Higley, Debra K., et al.)

- Large scale data management for basin evaluation; a case history (Schulman, Mel)
- Microcomputer data analysis and mapping applied to exploration in Cretaceous sands of Denver Basin (Schulman, Melvyn M.)
- Use of computer-generated maps of oil and gas development and exploration intensity for delineating producing trends, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)
- metal ores*: A stream sediment data base for the state of Colorado, U.S.A. (Bolivar, Stephen L.)
- Allard Stock, La Plata Mountains, Colorado; a porphyry copper-precious metals deposit in potassic alkaline rocks (Werle, James L., et al.)
- mineral exploration*: A stream sediment data base for the state of Colorado, USA (Bolivar, Stephen L.)
- Computer analysis of mineralization within evolving subvolcanic and caldera systems, Breckenridge and Bonanza regions, Colorado mineral belt, U.S.A. (Pride, D. E.)
- Display techniques for integrated data sets (Freeman, S. B., et al.)
- mineral resources*: Computer applications in geology (Silkwood, Harold)
- oil shale*: Computer-assisted interpretation of pyrolysis mass spectra of two oil shales and their corresponding kerogens (Chakravarty, T.)
- petroleum*: Development and implementation of a digital geologic database for petroleum exploration in the Uinta Basin, Utah-Colorado, U.S.A. (Dwyer, John L., et al.)
- Development and implementation of a digital geologic database for petroleum exploration in the Vernal Quadrangle, Utah-Colorado, U.S.A. (Dwyer, John L., et al.)
- Integrated geologic mapping, modeling, and exploration using grids (Houk, R. Zeke, et al.)
- reservoir rocks*: Core porosity, permeability, and vitrinite reflectance data from the Lower Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)
- uranium ores*: Problems of using rock volume data in predictive resource studies (Howarth, Richard J.)
- Resource characterization for uranium mineralization in the Montrose 1'x2' Quadrangle, Colorado (Bolivar, Stephen L., et al.)
- SURE: a system for uranium resource evaluation (Howarth, R. J., et al.)
- water resources*: A digital model applied to ground water recharge and management (Lee, Chin Y., et al.)
- A digital model applied to ground water recharge and management; discussion (Glover, Robert E.)
- A digital model applied to ground water recharge and management; reply (Lee, Chin Y.)

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- geologic hazards*: Mapping and evaluating geomorphic engineering aspects of high mountain terrain using a geographic information system; Sangre de Cristo Mountains, Colorado (Fitzgerald, Jeffrey W., et al.)

— Methane released during blasting at the White River Shale Project (Sapko, Michael J., et al.)

- mining geology*: Geological engineering: a bridge between geologist and miner (Stewart, Daniel R.)
- Ore zoning applied to geologic reserve estimation of molybdenum deposits (Ranta, D. E., et al.)
- petroleum engineering*: Improved fracturing technique yields increased production potential (Church, D. C.)
- rock mechanics*: A review of techniques for predicting the natural fragmentation characteristics of block caving orebodies (Stewart, Daniel R.)
- Reinforcement of large pillars by bolting (Mitchell, S. J., et al.)
- Stratigraphic variations in fracture properties (Young, Chapman, et al.)
- slope stability*: An approximate model for analysis of debris flows in mountainous regions (Morris, Richard N.)
- Computer simulation of rockfalls (Pfeiffer, Timothy J.)
- The cost-effective selection of landslide remedial measures by the use of personal computer models (Turner, A. Keith, et al.)
- tunnels*: Analysis and modelling of holographic measurements of in situ stress (Smither, C. L., et al.)
- Exploration strategy and technology; update and review (Sinha, Raghupati S.)
- waste disposal*: Applications of tailings flow analyses to field conditions (Bryant, Samuel Morris)
- waterways*: Prediction of the effects of a flood control project on a meandering stream (Gee, D. Michael)

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- land use*: Map atlas of basic data for computer-aided land-use planning studies of the northern part of Jefferson County, Colo. (Smedes, Harry W.)
- pollution*: A Galerkin-finite element two-dimensional transport model of groundwater restoration for the in situ solution of mining of uranium (Warner, James W.)
- Geochemical interactions between acidic tailings fluid and bedrock; use of the computer model MINTEQ (Davis, Andy)
- Geochemical interactions between uranium tailings fluids and subjacent bedrock, Canon City, Colorado; use of the computer model MINTEQ (Davis, Andrew Owen)
- Geochemistry of oil shale leachates and interaction with geologic substrates, Piceance Creek basin, Colorado (Esmaili, Esmail)
- Optimal hydraulic containment of contaminated ground water (Atwood, Dorothy Fisher)
- Rocky Mountain Arsenal, Colorado (Pendrell, Douglas J.)
- waste disposal*: Computer modeling of interaction of TOSCO II leachate with weathered Uinta Formation (Esmaili, Esmail, et al.)

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- cation exchange capacity*: Chemical interaction between major dissolved components in acidic uranium tailings fluids and adjacent bedrock (Gerlitz, Carol Nan)

- igneous rocks:** GRANNY, a data bank of chemical analyses of Laramide and younger high-silica rhyolites and granites from Colorado and north-central New Mexico (Steigerwald, C. H., et al.)
- isotopes:** Integration of 35 geological, geochemical, and geophysical data sets for the Montrose 1° × 2° Quadrangle, Colorado (Bolivar, Stephen L., et al.)
- leaching:** Geochemical results of leaching shale at ambient temperature and 100°C (Johnson, Kathryn O.)
- models:** Reconstruction of reaction pathways in a rock-fluid system using MINTEQ (Pavlik, H. F.)
- radon:** Surface water hydrology considerations in predicting radon releases from water-covered areas of uranium tailings ponds (Nielson, Kirk K.)
- X-ray analysis:** Multiphase quantitative analysis of Colorado oil shales involving overlap of the diffraction peaks (Smith, D. K., et al.)
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- landform description:** DEM editing using a polygon scan-conversion process (Anonymous)
- maps:** Stratifying alpine tundra for geomorphic studies using digitized aerial imagery (Frank, Thomas D.)
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- magnetic methods:** A new variable-magnetization terrain correction method for aeromagnetic data (Grauch, V. J. S.)
- well-logging:** A short-pulse electromagnetic transponder for hole-to-hole use (Wright, David L., et al.)
- Cross-hole, short-pulse radar experiments using a transponder (Wright, David L.)
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- data processing—geophysical surveys**
- geodesy:** Results of absolute gravity measurements by Geographical Survey Institute (Murakami, Masaki)
- magnetic surveys:** Geomagnetic observatories (Kuberry, R. W., et al.)
- remote sensing:** Contracted satellite data relay study (Anonymous)
- Evaluation of Landsat-4 thematic mapper data as applied to geologic exploration; summary of results (Dykstra, Jon D., et al.)
- Geologic data merging and analysis using an image processing system (Deister, Robin R. P., et al.)
- Improved lithologic separation and data base application (Bailey, G. B., et al.)
- seismic surveys:** Shallow seismic reflection data acquisition and processing techniques applied to the delineation of buried bedrock topography (Mitchell, Jay Preston)
- Vertical seismic profiles at the multi-well experiment site, Garfield County, Colorado (Lee, Myung W.)
- well-logging:** Acquisition and processing of azimuthal vertical seismic profiles at multi-well experiment site, Garfield County, Colorado (Lee, Myung W.)
- Catalog of thin sections available at the USGS Core Research Center, Denver, Colorado (Richards, Diana L.)
- data processing—geophysics**
- exploration:** COGS; Computer Oriented Geological Society (Thomson, James A.)
- data processing—hydrogeology**
- ground water:** A combined modeling program for evaluating the cover design at a uranium mill tailings disposal site (Wright, Will)
- A comparison of two different computer modeling approaches as applied to stream depletion determinations (Jehn, James L.)
- A digital model applied to ground water recharge and management (Lee, Chin Y., et al.)
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- A digital model applied to ground water recharge and management; reply (Lee, Chin Y.)
- A model analysis of ground water in the San Luis Valley, Colorado (Emery, Philip A.)
- A prototype computer interactive ground water monitoring methodology for surface water impoundments (Everett, Lorne G.)
- An assessment of the long-term hydrologic effects of artificial recharge on the Denver groundwater basin using computer simulation methods (Aikin, Andrea R.)
- Applicability of models to a large aquifer; the Ogallala Formation of Colorado (Luckey, Richard R.)
- Applicability of models to alluvial valleys; Arkansas River valley, Colorado, U.S.A. (Konikow, Leonard F.)
- Application of a mixing cell model to describe contaminant transport; an example of appropriate technology (Price, John B.)
- Application of pattern recognition techniques to environmental data (Meglen, Robert R.)
- Artificial groundwater recharge, San Luis Valley, Colorado (Sunada, Daniel K., et al.)
- Development of a pore interaction model for hydrodynamic dispersion during flow through porous media (Baker, Fred G.)
- Digital simulation of ground-water flow in the High Plains Aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Luckey, Richard R., et al.)
- Geochemical aspects of artificial recharge by injection into the bedrock aquifers of the Denver groundwater basin (Ring, George T., et al.)
- Hydraulic gradient control for groundwater contaminant removal (Atwood, Dorothy Fisher)
- Hydrogeology and simulated effects of ground-water development on an unconfined aquifer in the Closed Basin Division, San Luis Valley, Colorado (Leonard, Guy J.)
- Machine-readable files developed for the High Plains Regional Aquifer-System Analysis in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Ferrigno, Carmelo F.)
- Paleohydrogeology of the Cretaceous Dakota Aquifer system in the Denver Basin: a computer approach (Tait, Donald)
- Preliminary computer model of ground water flow and solute transport for MIS retorting at tract C-b, Piceance Basin, Colorado (Shepherd, Russell G.)
- Sensitivity analysis applied to unsaturated flow modeling of a retorted oil shale pile (Freshley, Mark D., et al.)
- Simulated effects of an artificial-recharge experiment near Proctor, Logan County, Colorado (Burns, Alan W.)
- Simulated oil-shale mine dewatering using a confined multi-aquifer model, Piceance Basin, Colorado, U.S.A. (Weeks, John B.)
- The impact of longwall mining on the hydrologic balance; premining data collection (Evans, Ginger S.)
- hydrology:** A surface and ground water model for the conjunctive use of a stream-aquifer system (Restrepo Mejia, Jorge I.)
- Allocation of augmented water supply under a priority water rights system (Graham, L. P., et al.)
- Application of the precipitation-runoff modeling system to small basins in the Parachute Creek basin, Colorado (Norris, J. Michael)
- Calibration and use of an interactive-accounting model to simulate dissolved solids, streamflow, and water-supply operations in the Arkansas river basin, Colorado (Burns, Alan W.)
- Comparison of two daily streamflow simulation models of an alpine watershed (Brendecke, Charles M., et al.)
- Evaluating institutional alternatives for managing an interrelated stream-aquifer system (Young, Robert A., et al.)
- Evaluation of selected one-dimensional stream water-quality models with field data (McCutcheon, S. C.)
- Harmonic analyses of stream temperatures in the upper Colorado River basin (Steele, Timothy Doak)
- Hydrologic analysis of the Rio Grande Basin north of Embudo, New Mexico; Colorado, and New Mexico (Hearne, Glenn A.)
- Recalibration and predictive reliability of a solute-transport model of an irrigated stream-aquifer system (Person, Mark A.)
- The use of a numerical model in predicting the effectiveness of a dewatering system (Martin, Phillippe L.)
- Use of rainfall-simulator data in precipitation-runoff modeling studies (Lusby, G. C.)
- data processing—maps**
- automatic cartography:** A test of a mineralogic mapping technique in the Italian Mountain area, Colorado (Truebe, Henry A.)
- data processing—mineralogy**
- miscellaneous minerals:** Bibliography for update and revision of USGS Bulletin 1114: Minerals of Colorado, a 100 year record by Edwin B. Eckel; bibliography data file disk (WORDSTAR: 1.44 mb) (Collins, Donley S., et al.)
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## data processing—sedimentary petrology

*sedimentation*: Application of principal axis ordination (Q-mode analysis) in classification of depositional environments of Morrow (Upper Carboniferous) strata in southeastern Colorado (Doyle, James D.)

## data processing—seismology

*earthquakes*: Data bases on historical seismicity; structure, quality of information, and applications (Gvishiani, A. D.)

## data processing—stratigraphy

*archaeology*: Archaeological site surveying program at the University of Nebraska (Weymouth, John W.)

*methods*: A review of graphic correlation (Phillips, F. Jay)

*nomenclature*: GEONAMES data base of geologic names of the United States through 1986; CO, NM, AZ (Luttrell, G. W., et al.)

## data processing—structural geology

*faults*: Structure in the vicinity of the C-JD-7 mining area, Paradox Valley, Montrose County, Colorado (Strauss, Robert G.)

## Dawson Aquifer

Bedrock aquifers in the Denver Basin, Colorado; a quantitative water-resources appraisal (Robson, S. G.)

## Dawson Arkose

Age of the Dawson Arkose, Southwestern Air Force Academy, Colorado, and implications for the uplift history of the Front Range (Kluth, Charles F.)

— Oligocene paleogeography in the southern Denver Basin (Morse, David G.)

— Oligocene volcanic rocks as a uranium source for sandstone-type uranium deposits in central Colorado (Dickinson, Kendall A.)

— Palynomorph assemblages from uppermost Cretaceous deposits, Denver Basin, Colorado (Nichols, Douglas J.)

— Two case histories on the design and pump testing of individual aquifers with dual completed wells (Jehn, James L.)

## Deadman Coal

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## DeBeque Formation

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— Early Eocene mammalian faunas of the Piceance Creek basin, northwestern Colorado (Kihm, Allen James)

— Fossil crocodylian eggs from the Eocene of Colorado (Hirsch, Karl F.)

— Mode and tempo of evolution: a model from early Eocene mammals of Colorado (Kihm, Allen J.)

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*compression*: Compressional Laramide deformation in the southeastern Uinta Mountains, northwestern Colorado, and northeastern Utah (Bernaski, Greg)

*flow lines*: Dyke emplacement at Spanish Peaks, Colorado (Smith, R. P.)

*sandstone*: Porosity dependence of deformation bands in the Entrada Sandstone, La Plata County, Colorado (Smith, Gary A.)

*strain*: Tilt observations using borehole tiltmeters; I, Analysis of tidal and secular tilt (Levine, Judah, et al.)

*stress*: Design guidelines and instrumentation for in-situ stress and rock discontinuity conditions in coal mines (O'Rourke, J. E.)

— Field relations between dikes and joints; emplacement processes and paleostress analysis (Delaney, Paul T., et al.)

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— Geologic characterization of a field laboratory for coalbed methane exploration and development (Wiman, Stephen K., et al.)

— Horizontal-stress directions in the Denver and Illinois basins from the orientations of borehole breakouts (Dart, Richard)

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— Origin and occurrence of fracture-filling cements in the Upper Cretaceous Mesaverde Formation at MWX, Piceance Creek basin, Colorado (Pitman, Janet K.)

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*uplifts*: Deformational style of Laramide uplifts in the Wyoming foreland (Brown, William G.)

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*guidebook*: New interpretations of Northwest Colorado geology; road log (Pruss, Edward F.)

*maps*: Geologic map and coal stratigraphic framework of the Cedaredge area, Delta County, Colorado (Dunrud, C. R.)

— Geologic map and coal stratigraphic framework of the Paonia area, Delta and Gunnison counties, Colorado (Dunrud, C. R.)

— Geologic map and cross sections of parts of the Grand Junction and Delta 30' x 60' quadrangles, west-central Colorado (Ellis, Margaret S.)

— Geologic map and cross sections of the Carbondale 30' by 60' Quadrangle, west-central Colorado (Ellis, M. S.)

— Geologic map of the Paonia and Gunnison area, Delta and Gunnison counties, Colorado (Ellis, M. S., et al.)

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— West Elk Wilderness, Colorado (Gaskill, D. L.)

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— Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

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**ecology** *see under* environmental geology; ichnofossils; invertebrates; vertebrates

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## F

### Fairfield Member

Preliminary thermal-maturity map of the Cameo and Fairfield or equivalent coal zone in the Piceance Creek basin, Colorado (Nuccio, V. F.)

### Fairport Chalky Shale Member

Codwell Sandstone, Denver Basin; frontier exploration in a mature basin (Weimer, R. J.)

— High resolution stratigraphy and interpretation of the depositional environments of the Greenhorn Cyclothem regression (Turonian; Cretaceous), Colorado Front Range (Glenister, Linda Marie)

— Mid-Cretaceous biostratigraphic units, unconformities, and diastrophism in Wyoming, Colorado, and adjacent areas (Merewether, E. A.)

### Farmington Sandstone Member

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— Biostratigraphy of Fruitland, Kirtland, and Animas formations (Cretaceous and Paleocene), northern San Juan Basin, Colorado (Newman, Karl R.)

— Joint patterns on the northwest side of the San Juan Basin, (Southern Ute Indian Reservation), Southwest Colorado (Condon, Steven M.)

— Preliminary basin analysis of Pictured Cliffs to Ojo Alamo sequence in western and southern San Juan Basin, New Mexico (Hunt, Adrian)

— Stratigraphic palynology of Cretaceous-Paleocene boundary rocks, San Juan Basin, Colorado and New Mexico (Newman, K. R.)

— Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

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— Map showing tectonic features of late Cenozoic origin in Colorado (Colman, Steven M.)

— Map showing upper Cenozoic rocks and deposits and Quaternary faults, Rio Grande Rift, south-central Colorado (Colman, S. M., et al.)

— Preliminary map showing known and suspected active faults in Colorado (Wikind, I. J.)

*dip-slip faults*: Regional fault study; central Front Range, Colorado (Dickson, Peter A., et al.)

*nappes*: Polyphase deformation in allochthonous rocks of the Precambrian Uncompahgre Formation, Needle Mountains, southwestern Colorado (Tewksbury, Barbara J.)

*normal faults*: Age and distribution of Quaternary faults in the Rio Grande Rift; evidence from morphometric analysis of fault scarps (Machette, Michael N.)

— Collapse of Rocky Mountain basement uplifts (Sales, John K.)

— Fracture studies at C-a Mine, Piceance Creek basin, Colorado (Verbeek, Earl R.)

— Localization of deformation along faults; implications to fault zone permeability (Teufel, Lawrence W.)

— Problems in defining joint sets by strike measurements alone (Grout, Marilyn A.)

— Recurrent late Quaternary faulting in the upper Arkansas Valley near Buena Vista, Colorado (Ostenaar, Dean A., et al.)

— Recurrent Quaternary normal faulting at Major Creek, Colorado: an example of youthful tectonism on the eastern boundary of the Rio Grande Rift Zone (McCalpin, James P.)

— Seismic and borehole evidence for important pre-Laramide faulting along the axial arch in Northwest Colorado (Stone, Donald S.)

— Seismic evidence of tectonic influence on development of Cretaceous listric normal faults, Boulder-Wattenberg-Greeley area, Denver Basin, Colorado (Davis, Thomas L.)

— Structural development and oil occurrence on northeast flank of Uinta Mountains near Irish Canyon, northwestern Colorado (Roehler, Henry W.)

— Tilting of Urad-Henderson and Climax porphyry molybdenum systems, central Colorado, as related to northern Rio Grande Rift tectonics (Geraghty, Ennis P., et al.)

— Trapdoor collapse of a conejos-age summit caldera at Bonanza, Colorado (Varga, Robert J.)

*overthrust faults*: Acoustic velocities, synthetic seismograms, and lithologies of thrust Precambrian rocks, Rocky Mountain foreland (Ray, R. Randy, et al.)

*reverse faults*: A model for the tectonic evolution of the PC-X (?) Red Creek Quartzite, Utah and Colorado (Sears, James W., et al.)

— History of faulting in the eastern Uinta Mountains, Colorado and Utah (Hansen, Wallace R.)

— Investigations of the activity of the Golden Fault, Colorado (Darrow, Arthur C.)

*strike-slip faults*: Extensional and compressional paleostress states in the western Colorado Plateau, central Utah (Barnhard, Theodore P.)

— Geophysical evidence for major strike-slip and subsequent extensional faulting in northern New Mexico and southern Colorado (Cordell, Lindrith)

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— Geometry, mechanisms, and mechanics of deformation in a Laramide thrust sheet (Evans, James Paul)

— Gravimetric evidence for thrusting and hydrocarbon potential of the east flank of the Front Range, Colorado (Bieber, David W.)

— Largest exposed anticline in Denver Basin area; model for mountain-front subthrust structures (Jacob, Arthur F.)

— Mountain front thrust, southeastern Front Range and northeastern Wet Mountains, Colorado (Jacob, Arthur F.)

— Proterozoic Uncompahgre Formation: remnant of a Precambrian fold and thrust belt (Houston, Betty Green)

— Revised interpretation of the age of allochthonous rocks of the Uncompahgre Formation, Needle Mountains, Colorado (Tewksbury, B. J.)

— Seismic investigation of the tectonic and stratigraphic history, eastern South Park, Park County, Colorado (Durrani, Javid A.)

— Syntectonic sedimentation and Laramide basement thrusting, Cordilleran foreland: timing of deformation (Beck, Richard A., et al.)

— The Proterozoic Uncompahgre Formation: remnant of a Precambrian fold and thrust belt (Houston, Becky G.)

— The Western Thrust Belt (Parker, John M.)

*wrench faults*: An overview of Laramide wrench faulting in the Southern Rocky Mountains with emphasis on petroleum exploration (Chapin, Charles E.)

— Tectonic significance of Proterozoic faults, San Juan Mountains, southwestern Colorado (Baars, Don L.)

— The San Luis Uplift, Colorado and New Mexico; an enigma of the Ancestral Rockies (Baars, D. L.)

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— Diffusion-equation model and degraded fault scarps, Colorado (Colman, S. M.)

— Quaternary geology and neotectonics of the eastern San Luis Valley, Rio Grande rift zone, Colorado (McCalpin, James)

*fault zones*: Paleomagnetic and petrographic study of sandstone dikes and the Cambrian Sawatch Sandstone, eastern flank of the

- southern Front Range, Colorado (Kost, Linda Suzanne)
- interpretation*: Distribution and structural geometry of faults and folds along the northwestern Uncompahgre Uplift, western Colorado and eastern Utah (Heyman, O. Glenn)
- Geology of the Lower Hot Springs faulted area, Cement Creek, Gunnison County, Colorado (Wood, Leonard E.)
- Laramide and Neogene structure of the northern Sangre de Cristo Range, south-central Colorado (Lindsey, David A., et al.)
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- fault scarps*: Possible Pleistocene movement on a 30-km fault near Pagosa Springs, south-central Colorado (Moore, David W.)
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- The definition of crustal provinces in the southern Rocky Mountain region using Sm-Nd isotopic characteristics (Bennett, Victoria)

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- reactivation*: Paleomagnetism of some Laramide intrusives, Jamestown mining district, Colorado (Sheldon, E. K.)

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- shear*: Geological deep drilling projects in the U.S.A. (Anonymous)
- stress*: Determination of the stress tensor from focal mechanism data (Ellsworth, William L. L.)

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- strike faults*: Tectonic implication of lineaments in the northern Paradox Basin, Utah and Colorado (Friedman, J. D., et al.)

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- en echelon faults*: Geology and petrography of Crested Butte Laccolith, Gunnison County, Colorado (Bevier, Mary Lou)
- Quaternary geology and neotectonics of the west flank of the northern Sangre de Cristo Mountains, south-central Colorado (McCalpin, James)

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- Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)

- Integrated geophysical survey of the Golden Thrust north of Golden, Colorado (Domoracki, William Joseph)
- Laramide deformation of the Wingate Sandstone, Northeast Uncompahgre Plateau, Colorado (Jamison, William R.)
- Laramide fault blocks and forced folds of the Livermore-Bellvue area, Colorado (Matthews, Vincent, III)
- Pennsylvanian-Permian Block faulting in subsurface of Piceance Basin, Colorado (Wächter, Noel B.)
- Recurrent intraplate deformation on the ancestral Rocky Mountain orogenic belt (Budnik, Roy T.)
- Recurrent motion on Precambrian-age basement faults, Palo Duro Basin, Texas Panhandle (Budnik, Roy T.)
- San Luis Uplift; fact or fiction (Baars, D. L.)
- Splinter blocks; an important aspect of block tectonics (Couples, Gary D.)
- Stratigraphy of the Trinidad Sandstone and Vermejo Formation (Upper Cretaceous), Canon City coal field, Fremont County, Colorado (Gaffke, Thresa M.)
- The geology and seismology of the Dudley Gulch Graben and related faults, Piceance Creek basin, northwestern Colorado (Eckert, Anne Douglas)
- The Pierce Field structure (Sonnenberg, Stephen A.)
- fault zones*: Different slip senses of major faults during different orogenies; the rule? (Muehlberger, William R.)
- Geology of northwest-trending fault zones in the east-central Colorado Front Range (Hornback, V. Q.)
- Meteoric hydrothermal circulation along the Trapdoor Ring Fault system of the Bonanza Caldera, N.E. San Juan volcanic field, Colorado (Smith, Brian M.)
- Quaternary tectonics of the Sangre de Cristo and Villa Grove fault zones (McCalpin, James)
- grabens*: Formation mechanisms of a Quaternary graben near Golden, Colorado (Krusi, Alan P.)
- On the formation of intercaldera grabens; a new interpretation for the generation of the Creede Graben (Gephart, John W.)
- Structure in the vicinity of the C-JD-7 mining area, Paradox Valley, Montrose County, Colorado (Strauss, Robert G.)
- rift zones*: Anatomy of a regional play in Rio Grande Rift basins of New Mexico and Colorado (Black, Bruce A.)
- Intracontinental rift comparisons; Baikal and Rio Grande rift systems (Lipman, P. W., et al.)
- Petrologic, paleomagnetic, and structural evidence of a Paleozoic rift system in Oklahoma, New Mexico, Colorado, and Utah (Larson, E. E., et al.)
- Petrologic, paleomagnetic, and structural evidence of a Paleozoic rift system in Oklahoma, New Mexico, Colorado, and Utah; discussion and reply (McLemore, Virginia T., et al.)
- Possible relationships between trenches, detachments and warping in intracontinental rifts (Masse, Pierre)

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- Cretaceous*: The "fern spike" at the Cretaceous-Tertiary boundary, Western Interior, United States (Tschudy, Robert H.)
- Pennsylvanian*: Biostratigraphic aspects of fossil plants near the Mississippian-Pennsylvanian boundary in North America (Jennings, James R.)
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- Cretaceous*: Disruption of the terrestrial plant ecosystem at the Cretaceous-Tertiary boundary, Western Interior (Tschudy, R. H., et al.)

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- Jurassic*: Middle Jurassic age of the fish-bearing horizon in the Cañon City Embayment, Colorado (Schultze, Hans-Peter)

**Fish Canyon Tuff**

- <sup>18</sup>O/<sup>16</sup>O relationships in Tertiary ash-flow tuffs from complex caldera structures in northern Nye County, Nevada, and the central San Juan Mountains, Colorado (Larson, Peter B.)
- Anisotropy of magnetic susceptibility data; an aid in evaluating remanent magnetic data (Ellwood, Brooks B.)
- Apatite fission-track geochronothermometer to 60°C; projected length studies (Wagner, G. A.)
- Argon diffusion in partially outgassed alkali feldspars; insights from <sup>40</sup>Ar/<sup>39</sup>Ar analysis (Zeitler, Peter K.)
- Central San Juan Caldera cluster, Colorado; new stratigraphic and structural interpretations and implications for mineralization (Lipman, Peter W., et al.)
- Comment on "... magmatic conditions of the Fish Canyon Tuff, central San Juan volcanic field, Colorado" by Whitney & Stormer (1985) (Grunder, A. L.)
- Common-Pb isotopic characteristics of central San Juan ash flow tuffs (Matty, David J., et al.)
- Contrasting volatile behavior in the Bishop and Fish Canyon tuffs; the applications of apatite solid solutions (Tacker, R. Chris)
- Determination of the depth of origin of large volume silicic magmas; two-feldspar + Fe-Ti oxide method (Stormer, J. C., Jr.)
- Etching characteristics of fission tracks in minerals, and fission track dating and calibration of zircon (Shin, Seong-cheon)
- Experimentally determined conditions in the Fish Canyon Tuff, Colorado, magma chamber (Johnson, Marie C.)
- Fish Canyon Tuff, Colorado; the problem of two magnetic polarities in a single tuff (Ellwood, Brooks B., et al.)
- Fission track isochrons; resolving the age of contaminated tephra (Walter, Robert C.)
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- Fugacities of sulfurous gases in pyrrhotite-bearing silicic magmas (Whitney, James A.)
- High-precision <sup>40</sup>Ar/<sup>39</sup>Ar ages of sanidine, biotite, hornblende, and plagioclase from the Fish Canyon Tuff, San Juan volcanic field,

- south-central Colorado (Kunk, Michael J., et al.)
- Magmatic paragenesis of the Fish Canyon ash-flow tuff, central Jose Mountains, Colorado (O'Leary, William J.)
  - Magmatic paragenesis of the Fish Canyon ash-flow tuff, central San Juan Mountains, Colorado (O'Leary, William J.)
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  - Primary sulfide inclusions within the Fish Canyon ash-flow tuff and their implications for the paragenesis of calc-alkaline silicic magmas and related ore deposits (Whitney, James A.)
  - Reply to a comment on "...magmatic conditions of the Fish Canyon Tuff ..." (Stormer, John C., Jr., et al.)
  - Statistical analysis of C. W. Naeser's Fish Canyon zircon data (Galbraith, R. F.)
  - Stratigraphy, petrology, and geochemistry of the Fish Canyon Tuff, Mount Hope Caldera, San Juan Mountains, CO. (Fleisher, Christopher J., et al.)
  - The Mammoth Mountain and Wason Park tuffs; magmatic evolution in the central San Juan volcanic field, southwestern Colorado (Webber, Karen Louise)
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  - Palynological interpretation of plant succession, paleoecology, and sediment accumulation in the Florissant Fm. lake beds (Oligocene), Colorado (Hascall, Allan P., et al.)
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- homogenization*: The Creede Formation silver deposit (Rice, John A.)
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  - Stable isotopic composition of fluid inclusions in a porphyry-style hydrothermal system near Silverton, San Juan Mountains, Colorado (Ringrose, C. R., et al.)
- metal ores*: Application of fluid inclusion and rock-gas analysis in mineral exploration (Kesler, Stephen E., et al.)
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- gold ores*: Gold in the Central City mining district, Colorado (Wallace, Alan R.)
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- interpretation*: Geology and hydrothermal alteration of the Sugarloaf Prospect, San Luis Hills, Conejos and Costilla counties, Colorado (Bartlett, R. Douglas)
- Paleofluids in the copper and uranium bearing sandstones, central Colorado Plateau; fluid inclusion and isotopic evidence in calcite (Meunier, J. D.)
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  - The origin and significance of the stratabound, carbonate-hosted gold deposits at Tennessee Pass, Colorado (Beatty, David W., et al.)
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- ore minerals*: Epithermal vein and carbonate replacement mineralization in Cunningham Gulch, Silverton, Colorado (Hardwick, James F.)
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  - Epithermal mineralization related to caldera development, Pride of the West Mine, San Juan Co., Colorado (Hardwick, James F.)
  - Geology and uranium mineralization of the Florida Mountain area, Needle Mountains, southwestern Colorado (Collier, James D.)
  - Mineralization characteristics of the Scotia-Vanderbilt vein system, Silverton, Colorado (Standen, Allan Richard)
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  - Physical and chemical controls of Zn-Pb-Cu-Ag mineralization at the Big Four Mine, Summit County, Colorado (Karr, Leonard J.)
  - Tops of epithermal veins in the Axell District, Platoro Caldera, San Juan Mountains, Colorado (Butler, Brian F.)
- paleosalinity*: Ore petrology and geochemistry of Tertiary gold telluride deposits of the Colorado mineral belt (Saunders, James A.)
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- enthalpy*: Ore mineralogy and fluid inclusion study of the southern Amethyst Vein system, Creede, Colorado (Robinson, Richard W.)

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- ore-forming fluids*: Gold in alkaline rocks (Anderson, Randall, et al.)  
— Mineralized veins and breccias of the Cripple Creek District, Colorado (Thompson, Tommy B., et al.)  
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- halite*: The origin of water in salt (Knauth, L. Paul)

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- cusped folds*: Proterozoic cusped basement-cover structure, Needle Mountains, Colorado (Harris, C. W., et al.)  
*interpretation*: Distribution and structural geometry of faults and folds along the northwestern Uncompahgre Uplift, western Colorado and eastern Utah (Heyman, O. Glenn)  
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- plunging folds*: Paleotectonic, stratigraphic, and diagenetic history of Weber Sandstone, Rangely area, Colorado (Koelme, Mark)

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- anticlines*: An interpretation of the subsurface structural style of the Beaver Creek Anticline, Moffat and Routt counties, Colorado (Morel, John A., et al.)  
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- anticlinoria*: Evolution of the Chama Basin and Archuleta Anticlinorium, eastern Archuleta County, Colorado (Dunn, David Evan)

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- Pennsylvanian*: Pennsylvanian fusulinids from the Piedra River valley, Archuleta County, Colorado (Baird, Donald Wallace)

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- Cretaceous*: Foraminifera and organic carbon content of transgressive deposits of Cretaceous marine cycles in Colorado (Von Holdt, Laura L.)  
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— Foraminifera of the Storm King Mountain Shale Member, Mancos Shale, western Colorado (Von Holdt, Laura Lynn)  
— Quantified assemblage zones; a case study in nearshore facies from the Lower Cretaceous of the Western United States (Metzger, Ellen P.)  
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— The Lower Cretaceous Gulf Coast (Tethyan)-Western Interior transition; microfossil evidence from northeastern New Mexico and adjacent states (Kietzke, Kenneth K.)  
*Mississippian*: Middle Devonian to Late Mississippian geologic history of the Overthrust Belt region, Western U.S. (Sandberg, Charles A., et al.)  
*Pennsylvanian*: Paleoecology of phylloid algal mud mounds, Honaker Trail Formation (Pennsylvanian), Southwest Colorado (Soar, Linda Katherine)

## foraminifera—fusulinids

- Pennsylvanian*: Fusulinids and Pennsylvanian stratigraphy of the Crested Butte area, Gunnison County, Colorado (Lucas, Robert Charles)

## foraminifera—paleoecology

- Cretaceous*: Foraminiferal and calcareous nanofossil paleoecology across the Cenomanian/Turonian boundary in the Western Interior of North America (Diner, Richard)  
— Foraminiferal evidence for the development of anoxic conditions, Niobrara Formation (Upper Cretaceous), Boulder, Colorado, with paleoceanographic implications for the Western Interior Seaway (Beatty, Charles A.)

## Fort Collins Member

- Stratigraphy and petrology of the Lower Cretaceous J Sandstone, Wattenberg Gas Field, Weld County, Colorado (Young, Genevieve B. C.)  
— Unconformities and valley fill sequences; key to understanding reservoirs at Lonetree and Poncho fields, Denver Basin, Colorado (Ethridge, Frank G.)

## Fort Hays Limestone Member

- Ammonites in clasts of the Juana Lopez Member of the Carlile Shale (Upper Cretaceous) near Pueblo, Colorado (Cobban, William A.)  
— Carbonate petrology of the Fort Hays Members, Cretaceous Niobrara Formation, Colorado (Billo, Saleh M.)  
— Codwell Sandstone, Denver Basin; frontier exploration in a mature basin (Weimer, R. J.)  
— Cyclic sedimentation in the Fort Hays Limestone Member, Niobrara Formation (Upper Cretaceous) in northeastern New Mexico and southeastern Colorado (Laferriere, Allen P.)

- Depositional cycles in the Niobrara Formation, Colorado Front Range (Barlow, Lisa K.)
  - Direct detection of Niobrara gas using seismic techniques: Yuma County, Colorado (Claussen, John P.)
  - Effects of climate, tectonics, and sea-level changes on rhythmic bedding patterns in the Niobrara Formation (Upper Cretaceous), U.S. Western Interior (Laferriere, Alan P., et al.)
  - Event stratigraphy, paleoenvironments, and petroleum source rock potential of the lower Niobrara Formation (Cretaceous), northern Front Range, Colorado (Barlow, Lisa Katharine)
  - Foraminifera of the Storm King Mountain Shale Member, Mancos Shale, western Colorado (Von Holdt, Laura Lynn)
  - Integrated geochemical and paleoecological approach to petroleum source rock evolution, Cretaceous Niobrara Formation, Lyons, Colorado (Barlow, L. K.)
  - Isotopic and sedimentological study of the lower Niobrara Formation, Lyons, Colorado (Pratt, Lisa M.)
  - Organic and inorganic constituents of the Niobrara Formation in Weld County, Colorado (Precht, William F.)
  - Petroleum potential of Niobrara Formation in Denver Basin (Hann, Megan)
  - Regional analysis of rhythmic bedding in the Fort Hays Limestone Member, Niobrara Formation (Upper Cretaceous), U.S. Western Interior (Laferriere, Alan Price)
  - Rhythmic bedding patterns in the Fort Hays Limestone Member, Niobrara Formation (Upper Cretaceous), U.S. Western Interior (Laferriere, Alan Price, et al.)
  - Stratigraphy of some of the Carlile Shale and Niobrara Formation near Morrison, Colorado (Pinel, Mark J.)
  - Stratigraphy of the upper Carlile Shale and lower Niobrara Formation (Upper Cretaceous), Fremont and Pueblo counties, Colorado (Pinel, Mark J.)
  - The Garden of the Gods and basal Phanerozoic nonconformity in and near Colorado Springs, Colorado (Noblett, Jeffrey B., et al.)
  - Use of rhythmic bedding patterns for locating structural features, Niobrara Formation, United States Western Interior (Laferriere, Alan P.)
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  - Cross section showing correlations of Upper Cretaceous Fox Hills Sandstone and Lance Formation, and lower Tertiary Fort Union and Wasatch formations, southeastern Washakie Basin, Wyoming, and eastern Sand Wash Basin, Colorado (Honey, J. G.)
  - Geologic map and coal sections of the Pine Ridge Quadrangle, Moffat County, Colorado (Prost, G. L.)
  - History of faulting in the eastern Uinta Mountains, Colorado and Utah (Hansen, Wallace R.)
  - Log-derived evaluation of shaly sandstone reservoirs (Fertl, Walter H.)
  - Paleoenvironmental significance of fossil chlorococcalean algae from the Raton Formation, Colorado and New Mexico (Fleming, R. Farley)
  - Porosity, permeability, and pore structure of the tight Mesaverde Sandstone, Piceance Basin, Colorado (Soeder, D. J.)
  - Potential selenium problems in Great Plains soils (Boon, David Y.)
  - Sulfur isotopic variations in low-sulfur coals from the Rocky Mountain region (Hackley, Keith C.)
  - The coal bed methane potential of the Sand Wash Basin, Green River coal region, Colorado (Boreck, Donna L., et al.)
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  - Analytical data for some minor elements in arkosic sandstones of the Fountain Formation, Colorado (Havens, R. G.)
  - Anatomy of redbed remanence in the late Paleozoic Fountain Formation, Colorado, as demonstrated by attritional demagnetization (Larson, E. E., et al.)
  - Application of a new technique for the detection and analysis of low concentrations of contaminants in soil (Voorhees, Kent J., et al.)
  - Caliche in the late Paleozoic Fountain Formation; rediscovery and implications (Loope, David B.)
  - Characteristic remanent magnetization of boulders and cobbles in red beds of Pennsylvanian and Permian age in Colorado (Larson, E. E.)
  - Climatic influence on Fountain sedimentation in the Manitou Embayment (Suttner, Lee J.)
  - Codell Sandstone, D-J Basin's new objective (Anonymous)
  - Cyclic sedimentation in an orogenic setting: the Fountain Formation (Pennsylvanian) near Colorado Springs (Kairo, Suzanne)
  - Deep-burial diagenetic iron oxides and problems of cement stratigraphy; discussion of alluvial sandstone composition and paleoclimate; II, Authigenic mineralogy; discussion and reply (Bjorlykke, Knut, et al.)
  - Depositional environments of the upper Fountain and Ingleside formations between Lyons and Loveland, Colorado (Schatz, Barry Allen)
  - Depositional systems and geologic history of the lower part of the Fountain Formation, Manitou Embayment, Colorado (Langford, Richard P.)
  - Depositional systems of Fountain Formation and its basinal equivalents, northwestern Denver Basin, Colorado (Napp, Kenneth F.)
  - Differentiation of debris flow and waterlaid alluvial conglomerates, with examples from the Permo-Pennsylvanian of Colorado (Shultz, Albert W.)
  - Field Trip 4; Guide to the field study of alluvial fan and fan-delta deposits in the Fountain Formation (Pennsylvania-Permian), Colorado (Suttner, L. J., et al.)
  - Fountain Formation near Canon City, Colorado; atypical stratigraphy and sedimentation (Shultz, Albert W.)
  - Geologic road log from Denver Federal Center to Marshall, Colorado; a visit to the Boulder-Weld coal field and some considerations of burning, subsiding coal mines (Herring, James R.)
  - Geology of Boulder, Colorado, United States of America (Bilodeau, Sally W., et al.)
  - Investigation of the Ken Caryl Fault at the Ken Caryl Trench Fault, Indian Hills Quadrangle, Colorado (Dickson, Peter A.)
  - Late Paleozoic remagnetization of Proterozoic crystalline rocks, Colorado Front Range, Colorado (Harlan, S. S.)
  - Low angular relationships between tensional microfractures and shear surfaces at fault incipience (Anders, Mark H.)
  - Marine trace fossils from the Lower Pennsylvanian part of the Fountain Formation, Manitou Springs, Colorado (Suttner, Lee J.)
  - New interpretation of the stratigraphic relationship between the Fountain Formation (Pennsylvanian) and its Glen Eyrie Member near Colorado Springs (Suttner, Lee J., et al.)
  - New interpretation of the stratigraphic relationship between the Fountain Formation and its Glen Eyrie Member (Suttner, Lee J., et al.)
  - Oligocene volcanic rocks as a uranium source for sandstone-type uranium deposits in central Colorado (Dickinson, Kendall A.)
  - Overview of the geology of the east flank of the Front Range (Grose, T. L. T.)
  - Oxygen isotope analyses of early authigenic clays in sandstone: a new approach to paleoclimate interpretation (Dutta, Prodip K.)
  - Paleozoic-Mesozoic section; Red Rocks Park, I-70 road cut, and Rooney Road, Morrison area, Jefferson County, Colorado (Weimer, Robert J.)
  - Precambrian structure, metamorphic mineral zoning, and igneous rocks in the foothills east of Estes Park, Colorado (Hutchinson, Robert M.)
  - Provenance and paleoclimatic interpretations from a petrographic comparison of Holocene sands and the Fountain Formation (Pennsylvanian) in the Colorado Range Front (Mack, Gregory Harold)
  - Provenance and sedimentology of the Fountain Formation near Canon City, Colorado (Shultz, Albert W.)

- Rare-earth element (REE) and mineralogic changes in size fractions of soils and sediment during weathering of the San Isabel Batholith, Wet Mountains, USA (Cullers, Robert L., et al.)
- Rare-earth element and mineralogic changes in Holocene soil and stream sediment; a case study in the Wet Mountains, Colorado, U.S.A. (Cullers, Robert L., et al.)
- Sedimentology and petrology of the Fountain Formation near Canon City, Colorado (Schultz, Albert West)
- Sedimentology of the Fountain fan-delta complex near Manitou Springs and Canon City, Colorado (Suttner, Lee J., et al.)
- Sedimentology of the Fountain fan-delta complex near Manitou Springs, Colorado (Langford, Richard P.)
- Stratigraphy and sedimentation of the Pennsylvanian-Permian Fountain Formation, Fremont County, Colorado (Warren, Tom Hillary)
- Stratigraphy and sedimentology of the Pennsylvanian and Lower Permian Fountain Formation in Perry Park, Douglas County, Colorado (Hendrickson, Denise M.)
- Stratigraphy of the Fountain and Casper formations of southeastern Wyoming and north central Colorado (Pederson, S. L.)
- Tectonic and climatic controls on alluvial fan sedimentation of the Cutler Formation (Permian-Pennsylvanian) in southwestern Colorado (Rasmussen, Keith A.)
- The effect of depositional environment on framework mineralogy and diagenesis within a nonmarine-marine transition zone; the lower Fountain fan delta (Pennsylvanian), Manitou Springs, Colorado (Hood, Lindsay Ann)
- The Garden of the Gods and basal Phanerozoic nonconformity in and near Colorado Springs, Colorado (Noblett, Jeffrey B., et al.)
- The nature and origin of dolomite in the upper Fountain Formation (Pennsylvanian), east flank of Colorado Front Range, central Colorado (Kindred, Valerie Prescott)
- The northeastern Front Range revisited: horizontal compression and crustal wedging in a classic locality for vertical tectonics (Erslev, Eric A., et al.)
- The Pierce Field structure (Sonnenberg, Stephen A.)
- The record of an evaporating lake system in the lower part of the Jurassic Ralston Creek Formation, Colorado (Donovan, R. Nowell)

**Fox Hills Aquifer**

Water resources of upper Crow Creek, Colorado (Kirkham, Robert M.)

**Fox Hills Formation**

- Cross section showing correlations of Upper Cretaceous Fox Hills Sandstone and Lance Formation, and lower Tertiary Fort Union and Wasatch formations, southeastern Washakie Basin, Wyoming, and eastern Sand Wash Basin, Colorado (Honey, J. G.)
- Depositional environments and diagenetic features of a Cretaceous clastic sequence, Fox Hills Sandstone of northern Great Plains Province (Wilde, Edith M.)
- Depositional environments of the Fox Hills Sandstone (Upper Cretaceous), Cheyenne Basin, Colorado (Nibbelink, Kenneth A.)

- Formation mechanisms of a Quaternary graben near Golden, Colorado (Krusi, Alan P.)
- Geologic road log from Denver Federal Center to Marshall, Colorado; a visit to the Boulder-Weld coal field and some considerations of burning, subsiding coal mines (Herring, James R.)
- Stratigraphy of the upper Pierre Shale, Fox Hills Sandstone, and lower Laramie Formation (Upper Cretaceous), Leyden Gulch area, Jefferson County, Jefferson County, Colorado (Camacho, Ricardo)
- The onset of the Laramide Orogeny (Bryant, Bruce)
- Tidal influences on Cretaceous Fox Hills barrier-strandplain sandstone geometries (Horne, John C., et al.)
- Upper Cretaceous and Tertiary cross sections, Moffat County, Colorado (Irwin, C. Dennis)
- Uranium distribution and sandstone depositional environments-Oligocene and Upper Cretaceous sediments, Cheyenne Basin, Colorado (Nibbelink, Kenneth A.)

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- reservoir rocks:* Distribution of natural fractures at depth in the Piceance Basin of Colorado (Teufel, Lawrence W.)
- Fracture studies in Cretaceous and Paleocene strata in and around the Piceance Basin, Colorado; preliminary results and their bearing on a fracture-controlled natural-gas reservoir at the MWX site (Verbeek, Earl R.)
- Origin and occurrence of fracture-filling cements in the Upper Cretaceous Mesaverde Formation at MWX, Piceance Creek basin, Colorado (Pitman, Janet K.)
- Results of the Multiwell Experiment; in situ stresses, natural fractures, and other geological controls on reservoirs (Lorenz, John C., et al.)

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- hydraulic fracturing:* A coupled model for fluid-driven fractures (Heuze, F. E., et al.)
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- processes:* Insolation-talus relationships, San Juan Mountains, Colorado (Hyers, Albert D.)

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- oil shale:* Fracture history of the northern Piceance Creek basin, northwestern Colorado (Verbeek, Earl R.)
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- extension fractures:* A technique for determining Precambrian fracture control on the localization of younger events, including mineralization in the Colorado mineral belt (Ririe, G. Todd)
- Origin and distribution of fractures in Tertiary and Cretaceous rocks, Piceance Basin, Colorado, and their relation to hydrocarbon occurrence (Pitman, Janet K.)
- joints:* Dynamic analysis of quartzites from the Sawatch and Parting formations, White River Uplift, Northwest Colorado (Dula, William F., Jr.)

- Early joints within penecontemporaneous slump blocks of the Eocene Uinta Formation, Piceance Creek basin, northwestern Colorado (Grout, Marilyn A.)
- Field relations between dikes and joints; emplacement processes and paleostress analysis (Delaney, Paul T., et al.)
- Field studies of joints; insufficiencies and solutions, with examples from the Piceance Creek basin, Colorado (Grout, Marilyn A.)
- Fracture history of the Plateau Creek and adjacent Colorado River valleys, southern Piceance Basin; implications for predicting joint patterns at depth (Grout, Marilyn A.)
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- Joint patterns on the northwest side of the San Juan Basin, (Southern Ute Indian Reservation), Southwest Colorado (Condon, Steven M.)
- Jointing in relatively undeformed strata; relation to basement and exploration implications (Prost, Gary Leo)
- Prediction of subsurface fracture patterns from surface studies of joints; an example from the Piceance Creek basin, Colorado (Verbeek, Earl R.)
- Problems in defining joint sets by strike measurements alone (Grout, Marilyn A.)
- Systematic joints within oil shales and associated rocks of the Green River Formation (Verbeek, Earl R.)
- The stability of discontinuously jointed rock slopes (Coffin, D. Todd)
- tension fractures:* A geophysical investigation of the San Juan Belt and its relationship to mineralization at Cripple Creek, Colorado (Whitacre, Thomas James)

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- effects:* Fracture studies at C-a Mine, Piceance Creek basin, Colorado (Verbeek, Earl R.)
- joints:* Geological and structural setting of the CSM/OCRD test site; CSM experimental mine, Idaho Springs, Colorado (Hutchinson, Robert M.)
- orientation:* Fracture geometries in three ore bodies mined by undercut caving as determined from oriented drill core and scanline mapping (Panek, Louis A.)
- preferred orientation:* Permeability of unsaturated, fractured metamorphic rocks near an underground opening (Montazer, Parviz)

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- Brush Hollow:* Geology of the Brush Hollow area, Fremont County, Colorado (Brown, Thomas D.)
- Chandler Syncline:* Geology of Chandler Syncline, Fremont County, Colorado (Mann, C. John)
- Fremont County:* Geology of a portion of Fremont County, Colorado (Wynne, Milo E.)
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- Geology of the Cotopaxi Inlier on the northern trend of the Sangre de Cristo Range, Fremont County, Colorado (Vargas, D. Francisco H.)
- Geology of the Milsap Creek and Temple Canyon areas, Fremont County, Colorado (Wahlstedt, Warren J.)
- maps:* Geology and resources of thorium and associated elements in the Wet Mountains area.

- Fremont and Custer counties, Colorado (Armbrustmacher, Theodore J.)
- Geology of the Steer Creek area northeast of Salida, Colorado (Thayer, James Bliss)
  - Reconnaissance geologic map of the Canon City Quadrangle, Fremont County, Colorado (Scott, G. R.)
  - Reconnaissance geologic map of the Cooper Mountain Quadrangle, Fremont County, Colorado (Wobus, R. A., et al.)
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  - Reconnaissance geologic map of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Johnson, Bruce R., et al.)
- Parkdale Colorado*: Geology of the Parkdale area, Fremont County, Colorado (McCullough, Douglas L.)
- Shaws Park Colorado*: The geology of Shaws Park, Fremont County, Colorado (Browder, George Thomas)
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- Fremont County—economic geology**
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- dolomite deposits*: Mineral resources of the Beaver Creek Wilderness Study Area, Fremont, El Paso, and Teller counties, Colorado (Lindsey, David A., et al.)
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  - Problems of using rock volume data in predictive resource studies (Howarth, Richard J.)
  - Thermal maturity of hydrocarbon-bearing formations in southwestern Wyoming and northwestern Colorado (Merewether, E. A., et al.)
- metal ores*: Analytical data report for a pilot-study of twenty stream-sediment, heavy-mineral concentrate, and rock samples from the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R., et al.)
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  - Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Beaver Creek Wilderness Study Area (CO-050-016), El Paso, Fremont, and Teller counties, Colorado (Detra, David E., et al.)
  - Mineral appraisal of the San Isabel National Forest, Colorado (U. S. Bureau of Mines, Intermountain Field Operations Center)
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  - Mineral resource assessment of the San Isabel National Forest, Colorado; a prototype for 1:250,000-scale multidisciplinary assessments "from the literature" (Taylor, Richard B.)
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- thorium ores*: Geology and resources of thorium and associated elements in the Wet Mountains area, Fremont and Custer counties, Colorado (Armbrustmacher, Theodore J.)
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- uranium ores*: Geology and uranium geochemistry of the western margin of the Thirtynine Mile volcanic field, Park, Chaffee and Fremont counties, Colorado (Smith, Larry B.)
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  - Problems of using rock volume data in predictive resource studies (Howarth, Richard J.)
  - The Hansen uranium orebody, Tallahassee Creek District, Fremont County, Colorado (Chapin, Charles E., et al.)
- vanadium ores*: The significance of clay mineralogy in the amenability of sandstone vanadium ores (Hausen, D. M.)
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- foundations*: Design and construction of replacement rock anchors for the Royal Gorge Suspension Bridge, Canon City, Colorado (Tocher, Richard J.)
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- waste disposal*: Hydrochemical studies of uranium mill tailing piles at Riverton, Wyoming, and Maybell, Colorado (Narasimhan, T. N., et al.)
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- maps*: Land use and land cover and associated maps for Pueblo, Colorado (U. S. Geological Survey)
- pollution*: Geochemical interactions between acidic tailings fluid and bedrock; use of the computer model MINTEQ (Davis, Andy)
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  - Maps showing trace-element geochemistry of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R.)
- trace elements*: Alkaline rock complexes in the Wet Mountains area, Custer and Fremont counties, Colorado (Armbrustmacher, Theodore J.)
- Chemical analyses of coal samples from the Raton Mesa region and the Canon City Field (Khalsa, Nirbhao S.)
  - Ground-water flow and quality near Canon City, Colorado (Hearne, Glenn A.)



## Fremont County—geochronology

- Maps showing trace-element geochemistry of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R.)

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*Cambrian*: Paleomagnetism of Cambro-Ordovician intrusives from Colorado (Lynnes, C. G., et al.)

*Ordovician*: Paleomagnetism of Cambro-Ordovician intrusives from Colorado (Lynnes, C. G., et al.)

*Paleozoic*: Paleomagnetism of Cambro-Ordovician intrusives from Colorado (Lynnes, C. G., et al.)

*Proterozoic*: A terrane of 1,350- to 1,400-m.y.-old silicic volcanic and plutonic rocks in the buried Proterozoic of the Mid-Continent and in the Wet Mountains, Colorado (Thomas, J. J., et al.)

- Evolution of the early Proterozoic Colorado Province; constraints from U-Pb geochronology; with Suppl. Data 87-31 (Reed, John C., Jr., et al.)

### Fremont County—geophysical surveys

*magnetic surveys*: The magnetic field and the geology of the Canon City area (Blum, Victor J.)

*maps*: Geologic interpretation of gravity and magnetic data in the Salida region, Colorado (Case, James E.)

*remote sensing*: High resolution geologic remote sensing of the Cripple Creek/Canon City area, Teller County, Colorado (Taranik, Dan L.)

- Plans for integrated airborne geophysical study of the Geophysics Environmental and Minerals demonstration area, south-central Colorado (Watson, Kenneth, et al.)

- The nature and characteristics of lineaments mapped from satellite and aerial imagery in an area of south-central Colorado bounded by 105°00' to 105°30' west longitude to 38°15' to 38°52'30" north latitude (Rowan, Charles David V.)

*surveys*: Geologic interpretation of gravity and magnetic data in the Salida region, Colorado (Case, James E.)

### Fremont County—hydrogeology

*ground water*: The Dakota Aquifer near Pueblo, Colorado; faults and flow patterns (Banta, Edward R.)

*hydrology*: Calibration and use of an interactive-accounting model to simulate dissolved solids, streamflow, and water-supply operations in the Arkansas River basin, Colorado (Burns, Alan W.)

- Proposed work plan for the study of hydrologic effects of ground-water development in the Wet Mountain Valley, Colorado (Robson, S. G.)

*maps*: Ground-water flow and quality near Canon City, Colorado (Heame, Glenn A.)

- Relations of specific conductance to streamflow and selected water-quality characteristics of the Arkansas River basin, Colorado (Cain, Doug)

### Fremont County—paleontology

*Pisces*: Cranial osteology, functional morphology, systematics and paleoenvironment of *Limnoscelis paludis* Williston (Fracasso, Michael Anthony)

*Reptilia*: A new species of sauropod dinosaur, *Haploanthosaurus delfsi* sp. nov., from the Upper Jurassic Morrison Fm. of Colorado (McIntosh, John S.)

— Cranial osteology, functional morphology, systematics and paleoenvironment of *Limnoscelis paludis* Williston (Fracasso, Michael Anthony)

- *Stegosaurus* named Colorado's state fossil (Sawdo, Ruth)

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*igneous rocks*: Komatiitic trends in early Proterozoic volcanic rocks in central Colorado (Sauer, Peter E.)

— Major- and minor-element distribution in alkaline rock complexes of the Wet Mountains area, Custer and Fremont counties, Colorado (Armbrustnacher, Theodore J.)

— Mineralogy and geochemistry of carbonatites from the Gem Park Complex, Fremont and Custer counties, Colorado (Papson, Ronald P.)

— The petrology of middle Proterozoic granites of the West McCoy Gulch, Texas Creek and Cotopaxi area, Fremont County, Colorado (Sassarini, Nick A.)

*intrusions*: Composite mid-Proterozoic anorogenic(?) mafic dikes, pillowed in and partially miscible with granite, Wet Mountains, Colorado (Noblett, J. B., et al.)

— Petrogenesis of an orbicular lamprophyre dike, Fremont County, Colorado (Alexander, D. H.)

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— Petrology of flecked gneisses in the northern Wet Mountains, Fremont County, Colorado (Trumbull, Robert B.)

— Petrology of flecked gneisses in the northern Wet Mountains, Fremont County, Colorado (Trumbull, Robert Bruce)

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— Stratigraphy of the Dakota Group north-west flank of the Canon City embayment, Colorado (Marsh, Philip Wienecke)

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  - Lower Paleozoic of Northwest Colorado; a summary (Ross, Reuben J., Jr.)
  - Manitou, Harding, Fremont and Leadville formations of northeastern Gunnison County, Colorado (Eldridge, Charles A.)
- Frontier Formation**
- Laboratory drying procedures and the permeability of tight sandstone core (Soeder, Daniel J.)
  - Mid-Cretaceous biostratigraphic units, unconformities, and diastrophism in Wyoming, Colorado, and adjacent areas (Merewether, E. A.)
  - Seismic profile; North Park Basin (Lange, J. K.)
  - Stratigraphy of the Upper Cretaceous Frontier Sandstone, North Park Basin, Jackson County, Colorado (Stites, Robert L.)
  - Tarrantoceras Stephenson and related ammonoid genera from Cenomanian (Upper Cretaceous) rocks in Texas and the Western Interior of the United States (Cobban, William A.)
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*see under* field studies *under* soil mechanics
- Fruitland Formation**
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  - An overview of geothermal studies in the San Juan Basin, New Mexico and Colorado (Clarkson, Gerry)
  - Assessment of natural gas from coalbeds by geologic characterization and production evaluation (Choate, Raoul, et al.)
  - Biostratigraphic correlation of K-T rocks from northwestern Colorado to San Juan Basin, Colorado and New Mexico (Newman, Karl R.)
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  - Chemical analyses of coal samples from San Juan River region (Khalsa, Nirbhao S.)
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  - Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)
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## Fryingpan Member

- Western Cretaceous coal seams project (McBane, Richard A.)

## Fryingpan Member

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**fuel resources** *see* bitumens; coal; energy sources; lignite; natural gas; oil and gas fields; oil sands; oil shale; petroleum

*see under* applications *under* remote sensing; well-logging

*see under* economic geology *under* Adams County; Alamosa County; Arapahoe County; Archuleta County; Baca County; Boulder County; Cheyenne County; Colorado Plateau; Conejos County; Costilla County; data processing; Delta County; Dolores County; Douglas County; Eagle County; Elbert County; Fremont County; Garfield County; Great Plains; Gunnison County; Hinsdale County; Huerfano County; Jackson County; Jefferson County; Kit Carson County; La Plata County; Larimer County; Lincoln County; Logan County; Mesa County; Moffat County; Montezuma County; Montrose County; Morgan County; Ouray County; Phillips County; Pitkin County; Prowers County; Pueblo County; Rio Blanco County; Rio Grande County; Rocky Mountains; Routt County; Saguache County; San Juan County; San Miguel County; Southwestern U.S.; Summit County; United States; Washington County; Weld County; Western U.S.; Yuma County  
*see under* economic geology

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*data processing*: Large scale data management for basin evaluation; a case history (Schulman, Mel)

*geophysical methods*: Delineating structural and stratigraphic traps using photogeologic-geomorphic methods (Urban, Stephanie B.)

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## fuel resources—production

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*shaly sandstone*: Log-derived evaluation of shaly sandstone reservoirs (Fertl, Walter H.)

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## fungi—paleoecology

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- Aztec Wash (oil) (Armstrong, Karen, et al.)
- Cinder Buttes (gas) (Matheny, J. Paul)
- Long Hollow (gas) (Mickel, Edward G.)

- Ramona (oil) (Armstrong, Karen, et al.)

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- Upper Cretaceous geology, coal, and the potential for methane recovery from coalbeds in San Juan Basin; Colorado and New Mexico (Choate, R., et al.)

**gamma-ray methods** *see under* radioactivity *under* well-logging

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- Field studies and modeling analysis of the Roan Creek landslide, Garfield County, Colorado (Umstot, David)

- Fluorine in Colorado oil shale (Dyini, John R.)

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- Regional stratigraphic and depositional study of rock units in upper Garden Gulch and Parachute Creek members of Green River Formation, Piceance Creek Basin, Colorado (Pitman, Janet K.)

- Sedimentology and petrology of profundal lacustrine sediments, Mahogany Zone of the Green River Formation, Piceance Creek basin, Northwest Colorado (Grabowski, George J., Jr.)

- Simulated oil-shale mine dewatering using a confined multiaquifer model, Piceance Basin, Colorado, U.S.A. (Weeks, John B.)

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- Composition, density and fabric effects on bulky waste capillary retention characteristics (Veyera, George E.)
- Geochemical techniques applied to the identification and disposal of connate coal water (Decker, A. D., et al.)
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*waterways*: Sediment discharge in the Colorado River near De Beque, Colorado (Butler, David L.)

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- impact statements*: Book Cliffs resource management plan (U. S. Bureau of Land Management, Vernal District)
- Federal prototype oil shale tract C-a, offtract lease; draft environmental impact statement (U. S. Bureau of Land Management)
- Glenwood Springs resource management plan (U. S. Bureau of Land Management, Grand Junction District Office)
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- Regional oil shale study geologic inventory and impact analysis; Piceance Creek basin Rio Blanco and Garfield counties, Colorado (Landon, Robert E.)
- Remedial actions at the former Union Carbide Corporation uranium mill sites, Rifle, Garfield County, Colorado (U. S. Department of Energy)
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- land use*: Land use and land cover and associated maps for Grand Junction, Colorado; Utah (U. S. Geological Survey)
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- maps*: Glenwood Springs resource management plan (U. S. Bureau of Land Management, Grand Junction District Office)
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- pollution*: Alkylpyridines in surface water, groundwaters, and subsoils of a drainage located adjacent to an oil shale facility (Riley, Robert G., et al.)
- Chemical effects and control of leachates from oil-shale spoil piles (Stollenwerk, Kenneth G.)
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- Effects of emissions from oil-shale retorts to the atmosphere (Turk, John T.)
- Emissions to the atmosphere (Turk, J. T.)
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- trace elements*: Geochemical variability of soils and biogeochemical variability of plants in the Piceance Basin, Colorado (Tuttle, M. L., et al.)
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- mass movements*: Debris-flow origin of high-level sloping surfaces on the northern flanks of Battlement Mesa, and surficial geology of parts of the North Mamm Peak, Rifle, and Rulison quadrangles, Garfield County, Colorado (Stover, Bruce King)
- solution features*: Ridgewalking the bench (LaRock, Ed)
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- gravity surveys*: Complete Bouguer profiles and principal facts for gravity stations in the Divide Creek Anticline area, Piceance Basin, Colorado (Abrams, Gerda A.)
- heat flow*: Thermal maturation and burial history of the Upper Cretaceous Mesaverde Group, including the Multiwell Experiment (MWX), Piceance Creek basin, Colorado (Nuccio, Vito F.)
- seismic surveys*: Acquisition and processing of azimuthal vertical seismic profiles at multiwell experiment site, Garfield County, Colorado (Lee, Myung W.)
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- Delineation of lenticular-type sand bodies by the vertical seismic profiling method (Lee, Myung W.)
- Detection and delineation of lenticular-type sand bodies by the vertical seismic profiling method (Lee, Myung W.)
- Interpretation of azimuthal vertical seismic profile survey at multi-well experimental site, Garfield County, Colorado (Lee, Myung W.)
- Pennsylvanian-Permian paleostructure and stratigraphy as interpreted from seismic data in the Piceance Basin, Northwest Colorado (Waechter, Noel B.)
- Seismic and borehole evidence for important pre-Laramide faulting along the axial arch in Northwest Colorado (Stone, Donald S.)
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- well-logging*: Fracture diagnostics results for the multiwell experiment's paludal zone stimulation (Hart, C. M., et al.)
- Holographic in situ stress measurements (Bass, Jay D., et al.)
- Neutronic properties of Mesaverde sands; I, Calibration of the Advanced Reactivity Measurement Facility (Lysne, P.)

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- Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Glenwood Springs (Geldon, Arthur L.)

- Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)
  - Mathematical modeling of the ground-water flow system (Taylor, O. J.)
  - Paleozoic and Mesozoic formations and their potential as ground-water reservoirs (MacLachlan, Marjorie E.)
  - Test-well drilling and logging (Welder, F. A.)
  - Water quality in the Piceance Basin (Tobin, Robert L.)
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  - Estimation of evaporation from Ned Wilson Lake, Flat Tops Wilderness Area, Colorado (Spahr, Norman E.)
  - Evaluation of sediment yield and sediment data-collection network in the Piceance basin, northwestern Colorado (Kircher, J. E.)
  - Hydraulic geometry and streamflow of channels in the Piceance Basin, Rio Blanco and Garfield counties, Colorado (Elliott, John G.)
  - Hydrologic data from Naval Oil Shale Reserves, Parachute Creek basin, northwestern Colorado, water years 1982-83 (Galyean, Kenneth C., et al.)
  - Hydrologic system of Piceance Basin (Taylor, O. James)
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  - maps*: Discharge and water quality of springs in Roan and Parachute Creek basins, northwestern Colorado, 1981-83 (Butler, David L.)
  - springs*: Characterization of Glenwood Springs and Dotsero Springs waters (Eisenhauer, R. J.)
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- Eocene*: Chart showing correlation of selected parts of the Eocene Uinta and Green River formations, southeastern Piceance Creek basin, Colorado (O'Sullivan, R. B.)  
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  - Isotopic composition of uranium and thorium in crystalline rocks (Rosholt, J. N.)
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  - Relationship between kerogens of various structural types and the products of their multistep oxidative degradation (Vitorovic#2, D., et al.)



- pyrolysis*: Direct determination of organic carbon in oil shale (Heistand, R. N.)
- reduction*: Alteration and mineralization in the Urvan mineral belt, Colorado (Rohl, Arthur N.)
- Iron photoreduction and oxidation in an acidic mountain stream (McKnight, D. M., et al.)
- solution*: Reactive iron transport in an acidic mountain stream in Summit County, Colorado; a hydrologic perspective (McKnight, Diane M.)

**geochemistry—properties**

- alkalinity*: Estimates of acidification of lakes in the Mt. Zirkel Wilderness Area, Colorado (Turk, J. T.)
- cation exchange capacity*: Chemical interaction between major dissolved components in acidic uranium tailings fluids and adjacent bedrock (Gerlitz, Carol Nan)
- physicochemical properties*: A six-component chlorite solid solution model and the conditions of chlorite formation in hydrothermal and geothermal systems (Walshe, John L.)
- Geochemical variability of soils and biogeochemical variability of plants in the Piceance Basin, Colorado (Tuttle, M. L., et al.)
- reactions*: The kinetics of smectite → illite reaction in contact metamorphic shales (Pytte, A. M.)
- salinity*: Composition of saltbush grown on oil-shale reclamation test plots, Colorado (Anderson, B. M.)
- thermodynamic properties*: Fugacities of sulfurous gases in pyrrhotite-bearing silicic magmas (Whitney, James A.)
- Heat capacities and entropies of rhodochrosite (MnCO<sub>3</sub>) and siderite (FeCO<sub>3</sub>) between 5 and 600 K (Robie, Richard A., et al.)

**geochemistry—surveys**

- Alamosa County*: Analytical data report for a pilot-study of twenty stream-sediment, heavy-mineral concentrate, and rock samples from the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R., et al.)
- Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate and rock samples from the Sangre de Cristo Wilderness Study Area, Saguache, Alamosa, Fremont, Custer, and Huerfano counties, Colorado (Adrian, Betty M., et al.)
- Maps showing trace-element geochemistry of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R.)
- Archuleta County*: Geochemical evaluation of mineral resources in the Chama-Southern San Juan Mountains Wilderness Study Area, Colorado (Brock, Maurice R., et al.)
- Geochemical map of the Piedra Wilderness Study Area, Archuleta and Hinsdale counties, Colorado (Franczyk, Karen J., et al.)
- Magnetic tape containing spectrographic and chemical analysis of stream sediments and rocks from the Chama-Southern San Juan Mountains Wilderness Study Area, Mineral, Rio Grande, Archuleta, and Conejos counties, Colorado (McDanal, S. K., et al.)
- Chaffee County*: Analytical results and sample locality map of stream-sediment and heavy-

- mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimbelman, David R., et al.)
- Analytical results and sample locality map of stream-sediment and panned-concentrate samples from the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Domenico, James A., et al.)
- Chemical data concerning Proterozoic ores and rocks from the Sedalia Mine area, Chaffee County, Colorado (Sheridan, Douglas M., et al.)
- Geology and uranium geochemistry of the western margin of the Thirtynine Mile volcanic field, Park, Chaffee and Fremont counties, Colorado (Smith, Larry B.)
- Maps showing water geochemistry of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, G. A., et al.)
- Mineral resource evaluation of the Browns Canyon area, Chaffee County, Colorado, using stream-sediment geochemistry (Leibold, Anne M.)
- Stream-sediment and panned-concentrate geochemical maps of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, Gary A.)

*Clear Creek County*: Analytical results for 32 water samples from a hydrogeochemical survey of the Geneva Creek area, central Colorado (McHugh, J. B., et al.)

- Geochemical and mineralogical data for altered rocks and soils collected in and near the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
- Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridgetop soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)
- Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates of stream sediments from Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)
- Maps showing anomaly patterns for silver, molybdenum, lead, and zinc in altered rocks and soils, Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
- Colorado*: Geochemical characterization methods for potential radioactive-waste repository sites (Anonymous)
- Sample design and analysis for regional geochemical studies (Klusman, R. W.)
- Conejos County*: Geochemical evaluation of mineral resources in the Chama-Southern San Juan Mountains Wilderness Study Area, Colorado (Brock, Maurice R., et al.)
- Magnetic tape containing spectrographic and chemical analysis of stream sediments and rocks from the Chama-Southern San Juan Mountains Wilderness Study Area, Mineral, Rio Grande, Archuleta, and Conejos counties, Colorado (McDanal, S. K., et al.)

*Costilla County*: Maps showing trace-element geochemistry of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R.)

*Custer County*: Analytical data report for a pilot-study of twenty stream-sediment, heavy-mineral concentrate, and rock samples from the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R., et al.)

— Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

— Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate and rock samples from the Sangre de Cristo Wilderness Study Area, Saguache, Alamosa, Fremont, Custer, and Huerfano counties, Colorado (Adrian, Betty M., et al.)

— Geology and resources of thorium and associated elements in the Wet Mountains area, Fremont and Custer counties, Colorado (Armbrustmacher, Theodore J.)

— Maps showing trace-element geochemistry of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R.)

*Delta County*: Magnetic tape containing spectrographic and chemical analyses of stream sediments, rocks, and panned concentrates from the West Elk Wilderness and vicinity, Delta and Gunnison counties, Colorado (McDanal, S. K., et al.)

*Eagle County*: Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Bull Gulch Wilderness Study Area (CO-070-430), Eagle County, Colorado (Detra, David E., et al.)

*El Paso County*: Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

— Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Beaver Creek Wilderness Study Area (CO-050-016), El Paso, Fremont, and Teller counties, Colorado (Detra, David E., et al.)

*Fremont County*: Analytical data report for a pilot-study of twenty stream-sediment, heavy-mineral concentrate, and rock samples from the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R., et al.)

— Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

— Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate and rock samples from the Sangre de Cristo Wilderness Study Area, Saguache, Alamosa, Fremont, Custer, and Huerfano counties, Colorado (Adrian, Betty M., et al.)

— Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate,

- and rock samples from the Beaver Creek Wilderness Study Area (CO-050-016), El Paso, Fremont, and Teller counties, Colorado (Detra, David E., et al.)
- Geology and resources of thorium and associated elements in the Wet Mountains area, Fremont and Custer counties, Colorado (Armbrustmacher, Theodore J.)
  - Geology and uranium geochemistry of the western margin of the Thirtynine Mile volcanic field, Park, Chaffee and Fremont counties, Colorado (Smith, Larry B.)
  - Ground-water flow and quality near Canon City, Colorado (Heame, Glenn A.)
  - Maps showing trace-element geochemistry of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R.)
- Garfield County:* Geochemical variability of soils and biogeochemical variability of plants in the Piceance Basin, Colorado (Tuttle, M. L., et al.)
- Grand County:* Geochemical and mineralogical data for altered rocks and soils collected in and near the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
- Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates derived from stream sediments and ridgetop soils from the upper Keyser Creek basin in the St. Louis Peak Roadless Area, Grand County, Colorado (Barton, H. N.)
  - Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridgetop soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)
  - Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates of stream sediments from Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)
  - Maps showing anomaly patterns for silver, molybdenum, lead, and zinc in altered rocks and soils, Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
- Gunnison County:* An evaluation of an area of potential molybdenum mineralization, Chicago Park, Gunnison County, Colorado (Daly, Cathryn Hayes)
- Analytical results and sample locality map of stream-sediment, panned-concentrate, and rock samples from the Fossil Ridge Wilderness Study Area, Gunnison County, Colorado (Adrian, Betty M., et al.)
  - Analytical results and sample locality map of stream-sediment, soil, heavy-mineral-concentrate, and rock samples from the Maroon Bells-Snowmass Wilderness, Gunnison and Pitkin counties, Colorado (McHugh, J. B., et al.)
  - Geochemical map and interpretations for the Fossil Ridge Wilderness Study Area, Gunnison County, Colorado (Clark, J. Robert)
  - Magnetic tape containing spectrographic and chemical analyses of stream sediments, rocks,
- and panned concentrates from the West Elk Wilderness and vicinity, Delta and Gunnison counties, Colorado (McDanal, S. K., et al.)
- Hinsdale County:* Compilation of rock-chip and stream-sediment geochemical data for the American Flats Wilderness Study Area, Ouray and Hinsdale counties, Colorado (Hon, Ken)
- Geochemical data for mineralized rocks in the Lake City area, San Juan volcanic field, Southwest Colorado (Sanford, Richard F., et al.)
  - Geochemical map of the Piedra Wilderness Study Area, Archuleta and Hinsdale counties, Colorado (Franczyk, Karen J., et al.)
- Huerfano County:* Analytical data report for a pilot-study of twenty stream-sediment, heavy-mineral concentrate, and rock samples from the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R., et al.)
- Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate and rock samples from the Sangre de Cristo Wilderness Study Area, Saguache, Alamosa, Fremont, Custer, and Huerfano counties, Colorado (Adrian, Betty M., et al.)
  - Geochemical map of the Spanish Peaks Wilderness Study Area, Huerfano and Las Animas counties, Colorado (Budding, K. E.)
  - Maps showing trace-element geochemistry of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R.)
- Jackson County:* Evaluation of surface metallic and nonmetallic resource potential (Snyder, George L.)
- Jefferson County:* Analytical results and sample locality map of stream sediment, heavy-mineral-concentrate, and rock samples from the Lost Creek Wilderness Area, Jefferson and Park counties, Colorado (Domenico, James A.)
- La Plata County:* Geochemical data from the West Needle and West Needle Contiguous Wilderness Study Areas, San Juan and La Plata counties, Colorado (Birmingham, Scott D.)
- Geologic and geochemical maps of the West Needle Wilderness Study Area, San Juan and La Plata counties, Colorado (Van Loenen, R. E.)
- Lake County:* Analytical results and sample locality map of stream-sediment and panned-concentrate samples from the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Domenico, James A., et al.)
- Maps showing water geochemistry of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, G. A., et al.)
  - Stream-sediment and panned-concentrate geochemical maps of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, Gary A.)
- Las Animas County:* Geochemical map of the Spanish Peaks Wilderness Study Area, Huerfano and Las Animas counties, Colorado (Budding, K. E.)
- Mesa County:* Geochemical variability of soils and biogeochemical variability of plants in the Piceance Basin, Colorado (Tuttle, M. L., et al.)
- Mineral County:* Geochemical evaluation of mineral resources in the Chama-Southern San Juan Mountains Wilderness Study Area, Colorado (Brock, Maurice R., et al.)
- Magnetic tape containing spectrographic and chemical analysis of stream sediments and rocks from the Chama-Southern San Juan Mountains Wilderness Study Area, Mineral, Rio Grande, Archuleta, and Conejos counties, Colorado (McDanal, S. K., et al.)
- Moffat County:* Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the Diamond Breaks Wilderness Study Area (CO-010-214/UT-080-113), Moffat County, Colorado, and Daggett County, Utah (Delaney, Tracy A., et al.)
- Montrose County:* Analytical results and sample locality maps of stream-sediment and heavy-mineral-concentrate samples from Dolores River Canyon Wilderness Study Area (CO-030-290), Montrose and San Miguel counties, Colorado (Bullock, John H., Jr., et al.)
- Ouray County:* Compilation of rock-chip and stream-sediment geochemical data for the American Flats Wilderness Study Area, Ouray and Hinsdale counties, Colorado (Hon, Ken)
- Geochemical data, Red Mountains mining district, San Juan Mountains, Colorado (Fisher, Frederick S.)
- Park County:* Analytical results and sample locality map of stream sediment, heavy-mineral-concentrate, and rock samples from the Lost Creek Wilderness Area, Jefferson and Park counties, Colorado (Domenico, James A.)
- Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimbelman, David R., et al.)
  - Analytical results and sample locality map of stream-sediment and panned-concentrate samples from the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Domenico, James A., et al.)
  - Analytical results for 32 water samples from a hydrogeochemical survey of the Geneva Creek area, central Colorado (McHugh, J. B., et al.)
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  - Maps showing water geochemistry of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, G. A., et al.)
  - Stream-sediment and panned-concentrate geochemical maps of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, Gary A.)
- Pitkin County:* Analytical results and sample locality map of stream-sediment, soil, heavy-mineral-concentrate, and rock samples from the Maroon Bells-Snowmass Wilderness, Gunnison and Pitkin counties, Colorado (McHugh, J. B., et al.)
- Mineral resources of the Eagle Mountain Wilderness Study Area, Pitkin County, Colorado (Soulliere, Sandra J., et al.)
- Pueblo County:* Analytical results and sample locality map of stream-sediment and heavy-

mineral-concentrate samples from the western three-quarters of the Pueblo 1° by 2° Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

*Rio Blanco County*: Geochemical variability of soils and biogeochemical variability of plants in the Piceance Basin, Colorado (Tuttle, M. L., et al.)

*Rio Grande County*: Geochemical evaluation of mineral resources in the Chama-Southern San Juan Mountains Wilderness Study Area, Colorado (Brock, Maurice R., et al.)

— Magnetic tape containing spectrographic and chemical analysis of stream sediments and rocks from the Chama-Southern San Juan Mountains Wilderness Study Area, Mineral, Rio Grande, Archuleta, and Conejos counties, Colorado (McDanal, S. K., et al.)

*Routt County*: Evaluation of surface metallic and nonmetallic resource potential (Snyder, George L.)

*Saguache County*: Analytical data report for a pilot-study of twenty stream-sediment, heavy-mineral concentrate, and rock samples from the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R., et al.)

— Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1° by 2° Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

— Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate and rock samples from the Sangre de Cristo Wilderness Study Area, Saguache, Alamosa, Fremont, Custer, and Huerfano counties, Colorado (Adrian, Betty M., et al.)

— Maps showing trace-element geochemistry of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R.)

*San Juan County*: Geochemical data from the West Needle and West Needle Contiguous Wilderness Study Areas, San Juan and LaPlata counties, Colorado (Birmingham, Scott D.)

— Geochemical data, Red Mountains mining district, San Juan Mountains, Colorado (Fisher, Frederick S.)

— Geologic and geochemical maps of the West Needle Wilderness Study Area, San Juan and LaPlata counties, Colorado (Van Loenen, R. E.)

*San Miguel County*: Analytical results and sample locality maps of stream-sediment and heavy-mineral-concentrate samples from Dolores River Canyon Wilderness Study Area (CO-030-290), Montrose and San Miguel counties, Colorado (Bullock, John H., Jr., et al.)

— Geochemical data, Red Mountains mining district, San Juan Mountains, Colorado (Fisher, Frederick S.)

*Summit County*: A reconnaissance study of the bioavailability of copper, iron, lead, magnesium, manganese, silver and zinc on the polymetallic Aqueduct Prospect, Breckenridge, Colorado (McDonald, Cecilia Louise)

— Analytical results for 32 water samples from a hydrogeochemical survey of the Geneva Creek area, central Colorado (McHugh, J. B., et al.)

— Geochemical and mineralogical data for altered rocks and soils collected in and near the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

— Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridgetop soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)

— Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates of stream sediments from Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)

— Maps showing anomaly patterns for silver, molybdenum, lead, and zinc in altered rocks and soils, Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

— Statistical analysis of trace element distributions in rocks and soils of the Breckenridge mining district, Summit County, Colorado (Hasenohr, Edward Joseph)

*Teller County*: Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1° by 2° Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

— Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Beaver Creek Wilderness Study Area (CO-050-016), El Paso, Fremont, and Teller counties, Colorado (Detra, David E., et al.)

**geochronology** *see* absolute age

**geochronology**

*absolute age*: Distribution of rubidium, strontium, zirconium and iron of Porphyry Mountain and age of the Silver Plume Granite, Jamestown, Colorado (Solter, Donald D.)

— Petrogenetic studies and precise age determinations using the K-Ca geochronometer (Marshall, Brian D.)

— The uranium-lead systems in zircon-domains of a single grain (Scha#1.rer, U.)

— U-Th-Pb systematics of zircon inclusions in rock-forming minerals; a study of armoring against isotopic loss using the Sherman Granite of Colorado-Wyoming, USA (Aleinikoff, John N.)

*Cambrian*: High-precision <sup>40</sup>Ar/<sup>39</sup>Ar ages of sanidine, biotite, hornblende, and plagioclase from the Fish Canyon Tuff, San Juan volcanic field, south-central Colorado (Kunk, Michael J., et al.)

— U-Pb zircon geochronology of Proterozoic and Cambrian plutons in the Wet Mountains and southern Front Range, Colorado (Bickford, M. E., et al.)

*Cenozoic*: Isotopic ages of igneous intrusions in southeastern Utah: relation to space-time-composition patterns of Cenozoic igneous activity in Nevada, Utah and Colorado (Sullivan, Kim R.)

*Cretaceous*: A regionally extensive altered air-fall ash for use in correlation of lithofacies in

Upper Cretaceous Williams Fork Formation, northeastern Piceance Creek and southern Sand Wash basins, Colorado (Johnson, Edward A.)

— Age and paleothermal anomaly of the Eagle Mine ore body, Gilman District, Colorado; a fission-track study (Naeser, Charles W.)

— Application of the K-Ca system to granite petrogenesis and the dating of authigenic minerals in sedimentary rocks (Marshall, Brian D.)

— Fission track dating of bentonites and bentonitic mudstones from the Morrison Formation, Utah and Colorado (Kowallis, Bart J.)

— Fission-track dating; application to the thermal history of mountains and basins (Naeser, Charles W.)

*Holocene*: Climatic response of densitometric properties in semiarid site tree rings (Cleaveland, Malcolm K.)

— Dendroecological studies in the Front Range, Colorado, U.S.A. (Kienast, Felix)

— Lichenometric dating of tundra game-drive structures (Benedict, James B.)

— Reinterpretation of Holocene alluvial chronology in major valleys of the northern Colorado piedmont (Madole, Richard F.)

*lichenometry*: Use of *Silene acaulis* for dating; the relationship of cushion diameter to age (Benedict, James B.)

*Miocene*: K-Ar alteration ages in the Mineral Point District, Eureka Graben area, western San Juan Mountains, Colorado (Larson, P. B.)

*Oligocene*: Etching characteristics of fission tracks in minerals, and fission track dating and calibration of zircon (Shin, Seong-cheon)

— Evolution of the early Oligocene Bonanza Caldera, Northeast San Juan volcanic field, Colorado (Varga, Robert J.)

— Fission-track dating calibration of the Fish Canyon Tuff standard in French reactors (Carpe#2.na, J.)

— High-resolution <sup>40</sup>Ar/<sup>39</sup>Ar chronology of Oligocene volcanic rocks, San Juan Mountains, Colorado (Lanphere, Marvin A.)

— High-resolution <sup>40</sup>Ar/<sup>39</sup>Ar geochronology, central San Juan caldera complex, Colorado (Lanphere, Marvin A.)

*Pleistocene*: <sup>40</sup>Ar-<sup>39</sup>Ar dating of young samples (Hammerschmidt, Konrad)

— Geological significance of a new radiocarbon date from the Lindenmeier Site (Haynes, C. Vance)

— New radiocarbon dates for some old Folsom sites using accelerator technology (Haynes, C. Vance, Jr., et al.)

— Probable late Pleistocene age for the type Triple Lakes moraines, Arapaho Cirque, Colorado Front Range, U.S.A. (Davis, P. Thompson)

*Precambrian*: Application of the potassium-calcium geochronometer to problems in geochronology and petrogenesis (Marshall, Brian David)

— Origin of Colorado mineral belt Laramide-Tertiary magmatism; lead and strontium isotope evidence (Stein, Holly J.)

— Precambrian geology of the northern Front Range, Colorado (Braddock, William A.)

— Preliminary investigation of the geology and geochronology of the Precambrian core of the

- Wet Mountains, Colorado (Himmelberg, G. R.)
- Rb-Sr ages of the Uinta Mountain Group of Utah and Colorado (Chaudhuri, S.)
  - Rb-Sr geochronologic studies of Precambrian rocks near Eldora, Colorado (Abashian, M. S.)
  - Zircon geochronology of Precambrian rocks in southeastern Wyoming and northern Colorado (Premo, Wayne R.)
- Proterozoic:** A lead, strontium, and sulfur isotope study of Laramide-Tertiary intrusions and mineralization in the Colorado mineral belt with emphasis on climax-type porphyry molybdenum systems plus a summary of other newly acquired isotopic and rare earth element data (Stein, Holly Jayne)
- Chemical characteristics and U-Pb zircon ages of Proterozoic rocks in the Wet Mountains region, Colo., USA (Cullers, Robert L.)
  - Evolution of the continental crust in Colorado during the Proterozoic (Reed, J. C., Jr.)
  - Geochronology and geochemistry of Proterozoic metamorphic rocks, near Eldora, Colorado (Abashian, Mark S.)
  - Nd in the Colorado Front Range and implications for crust formation and mantle evolution in the Proterozoic (DePaolo, Donald J.)
  - U-Pb dating of domains of a single zircon grain (Schaefer, U.)
  - U-Pb zircon chronology of early and middle Proterozoic igneous events in the Gunnison, Salida, and Wet Mountains areas, Colorado (Bickford, M. E., et al.)
  - U-Pb zircon geochronology of early Proterozoic plutonism in N. Colorado and SE Wyoming (Premo, Wayne R.)
  - U-Pb zircon geochronology of Proterozoic and Cambrian plutons in the Wet Mountains and southern Front Range, Colorado (Bickford, M. E., et al.)
  - Uranium-lead system in fragments of a single zircon grain (Scha#1.rer, Urs)
- Quaternary:** Quaternary geochronology and distribution of Mammuthus on the Colorado Plateau (Agenbroad, Larry D.)
- Resetting of whole rock and mineral Rb-Sr ages by subsequent Proterozoic orogenies (Bickford, M. E.)
  - Thermoluminescence (TL) dating studies on colluvial and alluvial sediments from Utah and Colorado; preliminary results (Forman, S. L., et al.)
- Tertiary:** Application of the K-Ca system to granite petrogenesis and the dating of authigenic minerals in sedimentary rocks (Marshall, Brian D.)
- Fission-track ages of zircons from three Tertiary porphyries near Tincup, Colorado (Naeser, C. W.)
  - Fission-track dating; application to the thermal history of mountains and basins (Naeser, Charles W.)
  - K/Ar geochronology of the composite volcano and trap-door caldera at Bonanza, NE San Juan Mountains, and implications for mid-Tertiary volcanism in Colorado (Smith, Brian M.)
  - Statistical analysis of C. W. Naeser's Fish Canyon zircon data (Galbraith, R. F.)
- geochronology—fission-track dating**
- accuracy:* Precision, accuracy and meaning of fission track ages (Poupeau, G.)
- apatite:* Apatite fission-track age for the Bull Domingo boulder pipe, Custer County, Colorado (Sharp, W. N.)
- applications:* Fission-track dating applied to mineral exploration (Naeser, C. W.)
- copper ores:* Petrogenesis of the A.O. porphyry copper complex in Jackson and Grand Counties, northwestern Colorado (Karimpour, M. H.)
- experimental studies:* Apatite fission-track geochrono-thermometer to 60°C; projected length studies (Wagner, G. A.)
- intrusive rocks:* Isotopic age determinations, unaltered and hydrothermally altered igneous rocks, north-central Colorado mineral belt (Bookstrom, Arthur A., et al.)
- isochrons:* Fission track isochrons; resolving the age of contaminated tephra (Walter, Robert C.)
- metasedimentary rocks:* Heating, cooling, and uplift during Tertiary time, northern Sangre de Cristo Range, Colorado (Lindsey, David A., et al.)
- Oligocene:* The Mount Antero and California intrusions, Chaffee County, Colorado; evidence for early evolution of pegmatitic fluids (Shannon, James R.)
- ore bodies:* Age and paleothermal anomaly of the Eagle Mine ore body, Gilman District, Colorado; a fission-track study (Naeser, Charles W.)
- thermal history:* Fission-track dating; application to the thermal history of mountains and basins (Naeser, Charles W.)
- tuff:* Etching characteristics of fission tracks in minerals, and fission track dating and calibration of zircon (Shin, Seong-cheon)
- Fission-track dating calibration of the Fish Canyon Tuff standard in French reactors (Carpe#2.na, J.)
- volcanic ash:* Paleontology, taphonomy, and stratigraphy of the Browns Park Formation (Oligocene and Miocene) near Maybell, Moffat County, Colorado (Honey, James G.)
- zircon:* Fission-track ages of zircons from three Tertiary porphyries near Tincup, Colorado (Naeser, C. W.)
- Statistical analysis of C. W. Naeser's Fish Canyon zircon data (Galbraith, R. F.)
- geochronology—lichenometry**
- archaeology:* Lichenometric dating of tundra game-drive structures (Benedict, James B.)
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- magnetostratigraphy:* Contemporary archaeomagnetic results and the accuracy of archaeomagnetic dates (Eighmy, Jeffrey L.)
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- secular variations:* Secular variation of archaeomagnetic direction in the American Southwest, A.D. 750-1425 (Sternberg, Robert S.)
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— Location of abandoned wells by magnetic surveys; location maps and aeromagnetic contour maps (Frischknecht, F. C., et al.)

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— Interpretation of azimuthal vertical seismic profile survey at multi-well experimental site, Garfield County, Colorado (Lee, Myung W.)

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— Delineation of lenticular-type sand bodies by the vertical seismic profiling method (Lee, Myung W.)

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— Preliminary results of resistivity investigations of Colorado-Wyoming kimberlite diatremes (Memmi, J. M., et al.)

— Resistivity sections, upper Arkansas River basin, Colorado (Zohdy, A. A. R., et al.)

— Schlumberger electric soundings near Yellow Creek, Piceance Creek basin, Colo. (Campbell, D. L.)

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— A study of residual gravity maps to delineate deep controls of ore deposits in the Colorado mineral belt (Kutina, Jan)

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- Gravity anomalies and lithospheric flexure beneath the Denver Basin; evidence for a buoyant subcrustal load (Babits, Steven J.)
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- Deep terrestrial heat flow measurements in New Mexico and neighboring geologic provinces (Reiter, Marshall)
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  - Statistical techniques using NURE airborne geophysical data and NURE geochemical data (Campbell, K.)
  - Stratifying alpine tundra for geomorphic studies using digitized aerial imagery (Frank, Thomas D.)
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— Tertiary intrusive activity and mineralization in the Empire mining district, Grand, Gilpin and Clear Creek counties, Colorado (Myint, Khin Maung)

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— Lake Devlin and Pinedale glacial history, Front Range, Colorado (Madole, Richard F.)

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— Quaternary deposits and soils in the Durango area, southwestern Colorado (Gillam, Mary L., et al.)

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— Discussion of; "Movement of ice-cemented rock glaciers by hydrostatic pressure; an example from Mount Mestas, Colorado", by John Giardino (Osborn, G.)

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  - Rock glaciers and site characteristics on the Blanca Massif, Colorado, U.S.A. (Parson, Charles G.)
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  - Significance of landsliding in rock glacier formation and movement (Vick, Steven G.)
  - Sourcewall relief chiefly influences the current supply of rockfall debris to rock glaciers, northern Sangre de Cristo Mountains, Colorado (Grout, Marilyn A.)
  - Surface fabric characteristics of an ice-cemented rock glacier (Giardino, John R., et al.)
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  - polygons*: Stone polygons; observations of surficial activity (Vitek, John D.)
  - stone polygons*: Characteristics of relict stone polygons, Sangre de Cristo Mountains, Colorado, U.S.A. (Vitek, John D.)
- glaciation see under glacial geology**
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  - Region 3, Colorado Plateau and Wyoming Basin (Taylor, O. James)
  - The stratigraphy of the Nugget Sandstone (Doelger, Nancy M.)
- Glen Eyrie Member**
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  - Fountain Formation near Canon City, Colorado; atypical stratigraphy and sedimentation (Shultz, Albert W.)
  - New interpretation of the stratigraphic relationship between the Fountain Formation (Pennsylvanian) and its Glen Eyrie Member near Colorado Springs (Suttner, Lee J., et al.)
  - New interpretation of the stratigraphic relationship between the Fountain Formation and its Glen Eyrie Member (Suttner, Lee J., et al.)
- Glencairn Shale Member**
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  - Cretaceous stratigraphy and paleontology in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Kues, Barry S.)
  - Texigryphaea in the Glencairn Formation near Two Buttes, Colorado, with notes on an assemblage of Texigryphaea from the Kiowa Formation of southern Kansas (Kues, Barry S.)
  - The Dakota Group and the Kiowa-Skull Creek Cyclothem in the Canon City-Pueblo area, Colorado (Gustason, Edmund R.)
  - The Dakota Group of northeastern New Mexico and southern Colorado (Mateer, Niall J.)
  - The Lower Cretaceous Gulf Coast (Tethyan)-Western Interior transition; microfossil evidence from northeastern New Mexico and adjacent states (Kietzke, Kenneth K.)
- global tectonics see plate tectonics**
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- Water-bearing characteristics of geologic formations in northeastern New Mexico-southeastern Colorado (Kilmer, L. Clay)
- glossaries—general**
- Colorado*: Atlas of Colorado (Erickson, Kenneth A.)
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- gold—geochemistry**
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  - metal ores*: Trace element distribution around precious/base metal veins, Idaho Springs Dist., CO (Budge, Suzanne)
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- gold ores—affinities**
- trace elements*: Three major types of epithermal precious-metal deposits (Bonham, Harold F., Jr.)
- gold ores—genesis**
- environment*: Characteristics of bulk-minable gold-silver deposits in Cordilleran and island-arc settings (Bonham, Harold F., Jr.)
  - epithermal processes*: Characteristics of boiling-water-table and carbon dioxide models for epithermal gold deposition (Cunningham, Charles G.)
- gold ores—mineral exploration**
- biogeochemical methods*: Recent studies of the distribution of *Bacillus cereus* near subsurface gold deposits (Parduhn, Nancy L., et al.)
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  - Characteristics that distinguish types of epithermal deposits (Hayba, D. O., et al.)
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- Goose Egg Formation**
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  - Permian tectonism in the Rocky Mountain foreland and its importance in exploration for Minnelusa and Lyons sandstones (Moore, W. Richard)
  - Permian tectonism in the Rocky Mountain foreland and its importance in exploration for Minnelusa and Lyons sandstones (Moore, W. Richard)
- Gothic Formation**
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  - Algal limestones within the Minturn Formation, Meeker to Dotsero area, western Colorado (Irtem, Oguz)
  - Late Paleozoic stratigraphy and syndepositional tectonism, Northwest Colorado (De Voto, Richard H., et al.)
  - Stratigraphic analysis of the Gothic Formation (Desmoinesian), Pitkin and Gunnison counties, Colorado (Levorsen, Mark K.)
  - Stratigraphy and sedimentology of the Pennsylvanian Gothic Formation in the Crested Butte area, Colorado (Leighton, Cheryl D.)
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  - The Eagle Basin; a new exploration frontier (Dodge, Constance Nuss)
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  - guidebook*: Time, rocks, and the Rockies; a geologic guide to roads and trails of Rocky Mountain National Park (Chronic, Halka)
  - maps*: Generalized geologic map of the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
  - Geologic map of the Mount Richthofen Quadrangle and the western part of the Fall

- River Pass Quadrangle, Grand and Jackson counties, Colorado (O'Neill, J. Michael)
- Geologic map of the Westwater 30' by 60' Quadrangle, Grand and Uintah counties, Utah and Garfield and Mesa counties, Colorado (Gualtieri, J. L.)
  - Geologic map showing coal beds in the Dakota Sandstone, Harley Dome Quadrangle and parts of the Bitter Creek Well, Westwater 4 SE, and Westwater 4 SW quadrangles, Colorado and Utah (Ellis, M. S.)
  - Geology and petroleum potential, Colorado Park Basin province, north-central Colorado (Maughan, Edwin K.)
  - Preliminary geologic map of the Kremmling Quadrangle, Grand County, Colorado (Izett, G. A.)
  - Preliminary geologic map of the Trail Mountain Quadrangle, Grand County, Colorado (Izett, G. A.)
  - Preliminary geologic map of the western and southern parts of the Byers Peak, the northwestern part of the Loveland Pass, and the eastern part of the Ute Peak 7 1/2-minute quadrangles, Clear Creek and Grand counties, Colorado (Eppinger, R. G., et al.)
  - Reconnaissance geologic map of the Dillon 15-minute Quadrangle, Summit, Eagle, and Grand counties, Colorado (Tweto, Ogden)
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- Rabbit Ears Pass:* Geology of Rabbit Ears Pass area, Jackson and Grand counties, Colorado (Scott, R. W.)
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#### Grand County—economic geology

- coal:* Geologic map showing coal beds in the Dakota Sandstone, Harley Dome Quadrangle and parts of the Bitter Creek Well, Westwater 4 SE, and Westwater 4 SW quadrangles, Colorado and Utah (Ellis, M. S.)
- copper ores:* Application of trace elements and isotopes for discriminating between porphyry molybdenum, copper, and tin systems and the implications for predicting the grade (Karimpour, M. H.)
- Indian Peaks Wilderness, Colorado (Pearson, Robert C.)
  - Petrogenesis of the A.O. porphyry copper complex in Jackson and Grand Counties, northwestern Colorado (Karimpour, M. H.)
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- fluorspar:* Map showing hydrothermal alteration and fluorite occurrences in the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G.)
- gold ores:* Gold in the Central City mining district, Colorado (Wallace, Alan R.)
- Mineral resources of the Black Ridge Canyons Wilderness Study Area, Mesa County, Colorado, and Grand County, Utah, and

- Westwater Canyon Wilderness Study Area, Grand County, Utah (Dickerson, Robert P., et al.)
- maps:* Geology, structure, and uranium deposits of the Moab Quadrangle, Colorado and Utah (Williams, P. L.)
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  - Map showing the distribution of selected mineral assemblages in nonmagnetic heavy-mineral concentrates from stream sediments from the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
  - Mineral investigation of the Vasquez Peak Wilderness Study Area and St. Louis Peak and Williams Fork Roadless areas, Clear Creek, Grand, and Summit counties, Colorado (Bielski, Alan M., et al.)
  - Mineral resource potential map of the Vasquez Peak Wilderness Study Area, and the St. Louis Peak and Williams Fork Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Theobald, P. K., et al.)
  - Mineral resources of the Black Ridge Canyons (CO-070-113)/Black Ridge Canyons West (CO-070-113A/UT-060-116/117), and Westwater Canyon (UT-060-118) Wilderness Study Areas, Mesa County, Colorado, and Grand County, Utah (Chatman, Mark L.)
  - Mineral resources of the Black Ridge Canyons Wilderness Study Area, Mesa County, Colorado, and Grand County, Utah, and Westwater Canyon Wilderness Study Area, Grand County, Utah (Dickerson, Robert P., et al.)
- metal ores:* Tertiary intrusive activity and mineralization in the Empire mining district, Grand, Gilpin and Clear Creek counties, Colorado (Myint, Khin Maung)
- Vasquez Peak Wilderness Study Area, and St. Louis Peak and Williams Fork Roadless Areas, Colorado (Theobald, P. K.)
- mineral resources:* Generalized geologic map of the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
- Geochemical data for the Vasquez Peak Wilderness Study Area (A2361), the Williams Fork Further Planning Area (2-114), and the St. Louis Peak Roadless Area (F2361), Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)
  - Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates derived from stream sediments and ridgetop soils from the upper Keyser Creek basin in the St. Louis Peak Roadless Area, Grand County, Colorado (Barton, H. N.)
  - Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridgetop soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)

- Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates of stream sediments from Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)
  - Indian Peaks Wilderness, Colorado (Pearson, Robert C.)
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  - Maps showing anomaly patterns for silver, molybdenum, lead, and zinc in altered rocks and soils, Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
  - Mineral investigation of the Vasquez Peak Wilderness Study Area and St. Louis Peak and Williams Fork Roadless areas, Clear Creek, Grand, and Summit counties, Colorado (Bielski, Alan M., et al.)
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  - Mineral resources of the Black Ridge Canyons Wilderness Study Area, Mesa County, Colorado, and Grand County, Utah, and Westwater Canyon Wilderness Study Area, Grand County, Utah (Dickerson, Robert P., et al.)
  - Remote sensing study in support of mineral resource appraisal of the Black Ridge Canyons and Black Ridge Canyons West Wilderness Study Areas, Mesa County, Colorado, and Grand County, Utah, and the Westwater Canyon Wilderness Study Area, Grand County, Utah (Lee, Keenan)
  - Remote sensing study in support of mineral resource appraisal of wilderness study areas near Moab, Utah; Dolores River Canyon Wilderness Study Area, Montrose and San Miguel counties, Colorado; Lost Spring Canyon Wilderness Study Area, Grand County, Utah; Behind the Rocks Wilderness Study Area, Grand and San Juan counties, Utah; and Butler Wash Wilderness Study Area, San Juan County, Utah (Lee, Keenan)
  - Vasquez Peak Wilderness Study Area, and St. Louis Peak and Williams Fork Roadless Areas, Colorado (Theobald, P. K.)
- molybdenum ores:* Application of trace elements and isotopes for discriminating between porphyry molybdenum, copper, and tin systems and the implications for predicting the grade (Karimpour, M. H.)
- oil shale:* Water resources and potential hydrologic effects of oil-shale development in

- the southeastern Uinta Basin, Utah and Colorado (Lindskov, K. L.)
- petroleum*: Geology and petroleum potential, Colorado Park Basin province, north-central Colorado (Maughan, Edwin K.)
- pyrite ores*: Ferric iron oxidation of pyrites from Gilman, Colorado (Pyrih, Roman Z.)
- tin ores*: Application of trace elements and isotopes for discriminating between porphyry molybdenum, copper, and tin systems and the implications for predicting the grade (Karimpour, M. H.)
- uranium ores*: Geology, structure, and uranium deposits of the Moab Quadrangle, Colorado and Utah (Williams, P. L.)
- Indian Peaks Wilderness, Colorado (Pearson, Robert C.)
- water resources*: Water resources and potential hydrologic effects of oil-shale development in the southeastern Uinta Basin, Utah and Colorado (Lindskov, K. L.)
- Grand County—engineering geology**
- reservoirs*: Sediment discharge in Muddy Creek and the effect of sedimentation rate on the proposed Wolford Mountain Reservoir near Kremmling, Colorado (Ruddy, Barbara C.)
- waste disposal*: Paradox Basin, Utah; hydrology (Wilson, William E.)
- Grand County—environmental geology**
- geologic hazards*: Regional hydrology of the Dolores River basin, eastern Paradox Basin, Colorado and Utah (Weir, J. E., Jr., et al.)
- impact statements*: Book Cliffs resource management plan (U. S. Bureau of Land Management, Vernal District)
- Kremmling Resource Area, Volume 3 (U. S. Bureau of Land Management, Craig District Office)
- Sediment discharge in Muddy Creek and the effect of sedimentation rate on the proposed Wolford Mountain Reservoir near Kremmling, Colorado (Ruddy, Barbara C.)
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- land use*: Land use and land cover and associated maps for Grand Junction, Colorado; Utah (U. S. Geological Survey)
- Land use and land cover and associated maps for Moab, Utah; Colorado (U. S. Geological Survey)
- maps*: Land use and land cover and associated maps for Grand Junction, Colorado; Utah (U. S. Geological Survey)
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- pollution*: Geologic influence on sensitivity of watersheds in Rocky Mountain National Park to acidification (Herzog, Dave)
- Uncertainty in phosphorus retention, Williams Fork Reservoir, Colorado (LaBaugh, James W.)
- Grand County—geochemistry**
- aluminum*: Aluminum chemistry; fractionation, speciation, and mineral equilibria of soil interstitial water of an alpine watershed, Front Range, Colorado (Litaor, M. Iggy)
- crust*: Precambrian petrochemistry of the northern Park Range, Colorado, and its implications for studies of crustal derivation (Snyder, George L., et al.)
- maps*: Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates derived from stream sediments and ridgetop soils from the upper Keyser Creek basin in the St. Louis Peak Roadless Area, Grand County, Colorado (Barton, H. N.)
- Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridgetop soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)
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- Maps showing anomaly patterns for silver, molybdenum, lead, and zinc in altered rocks and soils, Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
- trace elements*: Analytical data on the crystalline rocks of the Strawberry Lake area, Grand County, Colorado (Young, Edward J.)
- Geochemical and mineralogical data for altered rocks and soils collected in and near the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
- Grand County—geochronology**
- Paleocene*: Geology of the Granby and Strawberry Lake 7 1/2' quadrangles, Grand County, Colorado (Schroeder, David Alan)
- Proterozoic*: Evolution of the early Proterozoic Colorado Province; constraints from U-Pb geochronology; with Suppl. Data 87-31 (Reed, John C., Jr., et al.)
- Tertiary*: Petrogenesis of the A.O. porphyry copper complex in Jackson and Grand Counties, northwestern Colorado (Karimpour, M. H.)
- Grand County—geomorphology**
- aeolian features*: Grain-size sampling and characterization of eolian lag surfaces within alpine tundra, Niwot Ridge, Front Range, Colorado, U.S.A. (Thorn, Colin E.)
- fluvial features*: Adjustments of point bar morphology during a snowmelt runoff period (Harvey, Michael D., et al.)
- weathering*: Holocene alpine soils in gneissic cirque deposits, Colorado Front Range (Birkeland, P. W., et al.)
- Grand County—geophysical surveys**
- gravity surveys*: Principal facts for gravity stations in the La Sal Mountains area, Grand and San Juan counties, Utah, and Mesa and Montrose counties, Colo. (Joesting, H. R.)
- Principal facts for gravity stations in the Moab-Needles area, Grand and San Juan counties, Utah; and for the Lisbon Valley area, San Juan County, Utah, and Montrose and San Miguel counties, Colo. (Joesting, H. R., et al.)
- Principal facts for new and reprocessed gravity data in and around the Westwater Canyon and Black Ridge Canyons areas, Utah and Colorado (Morin, Robert L.)
- maps*: Geophysical maps of the Vazquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Moss, C. K.)
- remote sensing*: Air-photo lineament analysis; east-central Front Range, Colorado (Steele, S. G.)
- Remote sensing study in support of mineral resource appraisal of the Black Ridge Canyons and Black Ridge Canyons West Wilderness Study Areas, Mesa County, Colorado, and Grand County, Utah, and the Westwater Canyon Wilderness Study Area, Grand County, Utah (Lee, Keenan)
- Remote sensing study in support of mineral resource appraisal of wilderness study areas near Moab, Utah; Dolores River Canyon Wilderness Study Area, Montrose and San Miguel counties, Colorado; Lost Spring Canyon Wilderness Study Area, Grand County, Utah; Behind the Rocks Wilderness Study Area, Grand and San Juan counties, Utah; and Butler Wash Wilderness Study Area, San Juan County, Utah (Lee, Keenan)
- surveys*: Geophysical maps of the Vazquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Moss, C. K.)
- Grand County—hydrogeology**
- ground water*: Ground water in the southeastern Uinta Basin, Utah and Colorado (Holmes, Walter F.)
- Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Greenwood Springs (Geldon, Arthur L.)
- Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)
- hydrology*: Geologic influence on sensitivity of watersheds in Rocky Mountain National Park to acidification (Herzog, Dave)
- Longwave radiation in mountainous areas and its influence on the energy balance of alpine snowfields (Olyphant, Greg A.)
- Quantity and quality of streamflow in the southeastern Uinta Basin, Utah and Colorado (Lindskov, K. L.)
- Trend analysis of salt load and evaluation of the frequency of water-quality measurements for the Gunnison, the Colorado, and Dolores rivers in Colorado and Utah (Kircher, James E., et al.)
- Variability of bed load measurement (Pitlick, John)
- Grand County—paleontology**
- Vertebrata*: Continuing study of new Jurassic/Cretaceous vertebrate faunas from Colorado and Utah (Jensen, James A.)
- Grand County—petrology**
- igneous rocks*: Constraints on the petrogenesis of magmatic epidote-bearing dikes, Front Range, Colorado (Dawes, Ralph L.)
- Tabulation of modal and chemical analyses for Silver Plume Quartz Monzonite (Silver Plume Granite), Berthoud Plutonic Suite, Front Range, Colorado (Gable, Dolores J.)

## Grand County—sedimentary petrology

*intrusions*: A suite of magmatic epidote-bearing and related dikes, Front Range, Colorado (Dawes, Ralph L.)

— Tertiary intrusive activity and mineralization in the Empire mining district, Grand, Gilpin and Clear Creek counties, Colorado (Myint, Khin Maung)

*maps*: Precambrian petrochemistry of the northern Park Range, Colorado, and its implications for studies of crustal derivation (Snyder, George L., et al.)

## Grand County—sedimentary petrology

*diagenesis*: Diagenesis of the mid-Middle Park Formation, central Grand County, Colorado (Remy, Robert Reginald)

## Grand County—soils

*maps*: Soil survey of Grand County area, Colorado (Alstatt, David)

## Grand County—stratigraphy

*archaeology*: Geology of the Pontiac Pit archaeological site, Rocky Mountain National Park, Colorado (Madole, Richard F.)

*Cenozoic*: Cretaceous through Holocene history of the Douglas Creek Arch, Colorado and Utah (Johnson, Ronald C.)

— Rapid alteration of primary magnetizations in Tertiary and Quaternary tephra from the Western United States (Summa, Lori L.)

*Cretaceous*: Cretaceous through Holocene history of the Douglas Creek Arch, Colorado and Utah (Johnson, Ronald C.)

— Geologic map showing coal beds in the Dakota Sandstone, Harley Dome Quadrangle and parts of the Bitter Creek Well, Westwater 4 SE, and Westwater 4 SW quadrangles, Colorado and Utah (Ellis, M. S.)

— Stratigraphy and depositional environments of the Muddy Sandstone in North and Middle Parks basin, Jackson and Grand counties, Colorado (Murphy, W. Dale)

*Holocene*: Holocene alpine soils in gneissic cirque deposits, Colorado Front Range (Birkeland, P. W., et al.)

*Jurassic*: Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Dewey Bridge, Utah, to Uravan, Colorado (O'Sullivan, R. B.)

*Miocene*: Miocene mammals from the central Colorado Rocky Mountains (Kron, Donald Gordon)

*Paleozoic*: Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)

*Pleistocene*: New pollen and beetle analyses at the Mary Jane site, Colorado; evidence for late glacial tundra conditions (Short, Susan K.)

*Precambrian*: Precambrian petrochemistry of the northern Park Range, Colorado, and its implications for studies of crustal derivation (Snyder, George L., et al.)

*Quaternary*: Geology of the Pontiac Pit archaeological site, Rocky Mountain National Park, Colorado (Madole, Richard F.)

— Relative dating and soils of late Quaternary deposits, Devil's Thumb Lake valley, Colorado Front Range (Albino, Katharine Chase)

## Grand County—structural geology

*faults*: Distribution and structural geometry of faults and folds along the northwestern Uncompahgre Uplift, western Colorado and eastern Utah (Heyman, O. Glenn)

*tectonics*: Air-photo lineament analysis; east-central Front Range, Colorado (Steele, S. G.)

— Cretaceous through Holocene history of the Douglas Creek Arch, Colorado and Utah (Johnson, Ronald C.)

— Laramide deformation of the Uncompahgre Plateau; geometry and mechanisms (Heyman, O. G., et al.)

— Regional compression as the cause for Laramide deformation of the northwestern Uncompahgre Plateau, western Colorado and eastern Utah (Heyman, Oscar Glenn)

## Graneros Shale

Biostratigraphic units and tectonism in the mid-Cretaceous foreland of Wyoming, Colorado, and adjoining areas (Merewether, E. A.)

— Character and origin of natural gas from Upper Cretaceous Codell Sandstone, Denver Basin, Colorado (Rice, Dudley D.)

— Cretaceous stratigraphy and paleontology in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Kues, Barry S.)

— Depositional history of the Graneros Shale (Cenomanian), Rock Canyon Anticline (Kauffman, Erle G.)

— High resolution stratigraphy and depositional history of the Greenhorn regressive hemicyclothem, Rock Canyon Anticline, Pueblo, Colorado (Glenister, Linda M.)

— Investigation of the Rampart Range Fault at the Air Force Academy Trench Site, Colorado Springs, Colorado (Dickson, Peter A.)

— Iridium abundance maxima in the upper Cenomanian extinction interval (Orth, C. J., et al.)

— Mid-Cretaceous biostratigraphic units, unconformities, and diastrophism in Wyoming, Colorado, and adjacent areas (Merewether, E. A.)

— Mountain front thrust, southeastern Front Range and northeastern Wet Mountains, Colorado (Jacob, Arthur F.)

— Natural gamma-ray spectrometry, lithofacies, and depositional environments of selected Upper Cretaceous marine mudrocks, Western United States, including Tropic Shale and Tununk Member of Mancos Shale (Zelt, Frederick Bruce)

— Raton Basin, New Mexico; exploration frontier for fracture reservoirs in Cretaceous shales (Woodward, Lee A.)

— Stratigraphic and paleostructural controls on hydrocarbon migration in Cretaceous D and J sandstones of the Denver Basin (Tainter, Patrick A.)

— Tectonic, sedimentary, and seismic models for D sandstone, Zenith Field area, Denver Basin, Colorado (Sonnenberg, Stephen A.)

— Undrilled shallow giant trap in Denver Basin, Colorado; mountain-front thrust (Jacob, Arthur F.)

*granites see under igneous rocks*

*granulites see under metamorphic rocks*

## Grassy Mountain Quartz Latite

I, An  $^{18}\text{O}/^{16}\text{O}$  investigation of the Lake City Caldera, San Juan Mountains, Colorado; II,  $^{18}\text{O}/^{16}\text{O}$  relationships in Tertiary ash-flow tuffs from complex caldera structures in central Nevada and San Juan Mountains, Colorado (Larson, Peter Brennan)

*gravel see under clastic sediments under sediments*

*gravel deposits see under economic geology see under economic geology under Larimer County; Las Animas County; Weld County*

*gravity field see under Earth*

*gravity methods see under geophysical methods*

*gravity surveys see under geophysical surveys see under geophysical surveys under Boulder County; Garfield County; Grand County; Hinsdale County; Jefferson County; Lincoln County; Mesa County; Mineral County; mineral exploration; Moffat County; Montrose County; Park County; Rocky Mountains; Routt County; San Juan County; San Miguel County; Summit County; Weld County*

## Great Basin—environmental geology

*land use*: Program for the Colorado River-Great Basin region, 1952-1957 (U. S., Colorado River-Great Basin Field Committee)

*pollution*: The salty Colorado (Miller, Taylor O., et al.)

## Great Dune Sand

Conditions favourable for the formation of warm-climate aeolian sand sheets (Kocurek, Gary)

## Great Plains—areal geology

*guidebook*: Guidebook to the archaeological geology of the Colorado Piedmont and High Plains of southeastern Wyoming (Holliday, Vance T.)

## Great Plains—economic geology

*fuel resources*: Delineating producing trends within plays by the use of computer-generated drill intensity maps, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)

*natural gas*: Geologic aspects of tight gas reservoirs in the Rocky Mountain region (Spencer, Charles W.)

— The Niobrara gas play; exploration and development of a low-pressure, low-permeability gas reservoir (Brown, C. A., et al.)

*water resources*: Digital simulation of groundwater flow in the High Plains Aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Luckey, Richard R., et al.)

— Geohydrology of the High Plains Aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Gutentag, Edwin D., et al.)

— Hydrology of area 53, Northern Great Plains and Rocky Mountain coal provinces, Colorado, Wyoming, and Utah (Driver, Nancy E., et al.)

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**Green Knobs Diatreme**

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**Green River Formation**

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- ground water—movement**  
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*monitoring:* Types and usages of drilling fluids utilized to install monitoring wells associated with metals and radionuclide ground water studies (Ericson, Wayne A., et al.)
- ground water—pollution**  
*abandoned wells:* Location of abandoned wells by magnetic surveys; acquisition and interpretation of aeromagnetic data for five test areas (Frischknecht, F. C., et al.)  
— Location of abandoned wells by magnetic surveys; location maps and aeromagnetic contour maps (Frischknecht, F. C., et al.)  
*controls:* Hydraulic gradient control for groundwater contaminant removal (Atwood, Dorothy Fisher)  
*liability:* Colorado communicator (Kumli, Karl F.)  
*radioactive waste:* Geochemical interactions between acidic tailings fluid and bedrock; use of the computer model MINTEQ (Davis, Andy)  
*water quality:* Reconnaissance appraisals of anthropogenic effects on regional ground-water quality (Cain, Doug, et al.)
- ground water—resources**  
*water management:* Conjunctive use of groundwater and surface water for irrigated agriculture; risk aversion (Bredehoeft, John D.)  
— Ground-water models for water resource planning (Moore, J. E.)
- ground water—surveys**  
*Adams County:* Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)  
— Bedrock aquifers in the Denver Basin, Colorado; a quantitative water-resources appraisal (Robson, S. G.)  
— Design and construction of a subsurface gasoline recovery system in Westminster, Colorado (Ganser, Donald R.)  
— Ground water/surface water conjunctive use project in Beebe Draw, Adams and Weld counties, Colorado (Mangelson, Kenneth A.)

- Hydrogeologic data from parts of the Denver Basin, Colorado (Major, Thomas J., et al.)
- Operating experiences in the containment and purification of groundwater at the Rocky Mountain Arsenal (Hager, Donald G.)
- Optimal hydraulic containment of contaminated ground water (Atwood, Dorothy Fisher)
- RMA Southern Tier Contamination Survey (Tucker, Richard C.)
- Role of solute-transport models in the analysis of groundwater salinity problems in agricultural areas (Konikow, L. F.)
- Water-quality monitoring at hazardous waste disposal sites; is public health protection possible through monitoring programs? (Lee, G. Fred)
- Well yields and chemical quality of water from water-table aquifers in the Greater Denver area, Front Range urban corridor, Colorado (Hillier, D. E., et al.)
- Alamosa County:* A model analysis of ground water in the San Luis Valley, Colorado (Emery, Philip A.)
- Fluoride in the confined ground water of the San Luis Valley, Colorado (Glanzman, Richard K.)
- Potentiometric surface, 1980, and water-level changes, 1969-80, in the unconfined valley-fill aquifers of the San Luis Basin, Colorado and New Mexico (Crouch, Thomas M.)
- Quality of ground water in agricultural areas of the San Luis Valley, south-central Colorado (Edelmann, Patrick)
- Arapahoe Aquifer:* Hydrology of the Arapahoe aquifer in the Englewood-Castle Rock area south of Denver, Denver Basin, Colorado (Hillier, D. E., et al.)
- Resolving a groundwater conflict in Colorado (Rice, Leonard)
- Arapahoe County:* Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)
- Bedrock aquifers in the Denver Basin, Colorado; a quantitative water-resources appraisal (Robson, S. G.)
- Hydrogeologic data from parts of the Denver Basin, Colorado (Major, Thomas J., et al.)
- Hydrologic data for the drainage basins of Chatfield and Cherry Creek lakes, Denver metropolitan area, Colorado (Gibbs, Johnnie W., et al.)
- Well yields and chemical quality of water from water-table aquifers in the Greater Denver area, Front Range urban corridor, Colorado (Hillier, D. E., et al.)
- Archuleta County:* Geochemical kinetics (Claassen, Hans C.)
- Hydrology of coal-lease areas near Durango, Colorado (Brooks, Tom)
- Arkansas River basin:* Selected hydrographs and statistical analyses characterizing the water resources of the Arkansas River basin, Colorado (Burns, Alan W.)
- Arkansas River valley:* Applicability of models to alluvial valleys; Arkansas River valley, Colorado, U.S.A. (Konikow, Leonard F.)
- Bent County:* Assessment of long-term salinity changes in an irrigated stream-aquifer system (Konikow, Leonard F.)
- Recalibration and predictive reliability of a solute-transport model of an irrigated stream-aquifer system (Person, Mark A.)
- Relations of specific conductance to streamflow and selected water-quality characteristics of the Arkansas River basin, Colorado (Cain, Doug)
- Boulder County:* Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)
- Assessment and remediation of shallow ground-water system at a pharmaceutical manufacturing facility in Boulder, Colorado (Pivonka, Lee J., et al.)
- Hydrogeologic data from parts of the Denver Basin, Colorado (Major, Thomas J., et al.)
- Methods and field audit results of a remedial design using a verified ground water model (Hecox, Gary R., et al.)
- Shallow ground water in the Boulder-Fort Collins-Greeley area, Front Range urban corridor, Colorado, 1975-77 (Schneider, P. A., Jr.)
- Well yields and chemical quality of water from water-table aquifers in the Greater Denver area, Front Range urban corridor, Colorado (Hillier, D. E., et al.)
- Chaffee County:* Geochemical characterization of the Mt. Harvard 15-minute quadrangle, Colorado, using NURE data (Ludlam, John R.)
- Water-resources appraisal of the upper Arkansas River basin from Leadville to Pueblo, Colorado (Crouch, Thomas M., et al.)
- Cheyenne County:* Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)
- Water-level records for the northern High Plains of Colorado, 1970-86 (Reed, Raymond L.)
- Clear Creek County:* The isotopic analysis of water from the Henderson Mine, Clear Creek County, Colorado (Friedman, Irving)
- Colorado:* A 3-D digital model for groundwater management (Qazi, A. R.)
- A case history; surface static collection and analysis of chlorinated hydrocarbons from contaminated ground water (Malley, Michael J., et al.)
- A combined modeling program for evaluating the cover design at a uranium mill tailings disposal site (Wright, Will)
- A comparison of two different computer modeling approaches as applied to stream depletion determinations (Jehn, James L.)
- A digital model applied to ground water recharge and management (Lee, Chin Y., et al.)
- A digital model applied to ground water recharge and management; discussion (Glover, Robert E.)
- A digital model applied to ground water recharge and management; reply (Lee, Chin Y.)
- A Galerkin-finite element two-dimensional transport model of groundwater restoration for the in situ solution of mining of uranium (Warner, James W.)
- A reconnaissance of ground-water contamination at selected landfills in Colorado (Schneider, Paul A., Jr.)
- A semi-empirical method for predicting hydrologic impacts of underground mining in fracture-controlled groundwater flow systems (O'Hayre, Arthur P., et al.)
- A system for geologic evaluation of pollution potential at mountain dwelling sites (Waltz, James P.)
- A water handbook for metal mining operations (Wildeman, Thomas R.)
- Administration of Colorado ground water law (Cuykendall, John H.)
- Algorithm for surface/ground-water allocation under appropriation doctrine (Illan-gasekare, T. H.)
- Analysis of groundwater contamination by a new surface static trapping/mass spectrometry technique (Voorhees, Kent J., et al.)
- Analysis of the groundwater quality management policies for Colorado and Wyoming (Kinney, Thomas E.)
- Applicability of models to a large aquifer; the Ogallala Formation of Colorado (Luckey, Richard R.)
- Application of a mixing cell model to describe contaminant transport; an example of appropriate technology (Price, John B.)
- Application of a new technique for the detection and analysis of low concentrations of contaminants in soil (Voorhees, Kent J., et al.)
- Appraisal of shallow ground-water resources, Pueblo Army Depot, Colorado (Welder, F. A.)
- Availability and chemical quality of ground water in the Crystal River and Cattle Creek drainage basins near Glenwood Springs, west-central Colorado (Brogden, R. E.)
- Beyond ground water models with stream boundaries; an improved stream-aquifer model (Kraeger-Rovey, Catherine)
- Case study of ground-water conservation for a municipal development near Colorado Springs, Colorado (McGregor, F. Robert)
- Chemistry of the Argo Tunnel water, Idaho Springs, Colorado (Wildeman, Thomas R.)
- Cleanup strategy for Rocky Mountain Arsenal (Campbell, Donald L.)
- Colorado ground-water quality (Hearne, Glenn A., et al.)
- Colorado high mountain aquifer study (Roche, W. Martin)
- Colorado; ground-water quality (Hearne, Glenn A., et al.)
- Colorado; ground-water resources (Hurr, R. Theodore)
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- Conjunctive use of ground water and surface water for irrigated agriculture; risk aversion (Bredehoeft, John D.)
- Conjunctive use project in Beebe Draw, Colorado (Mangelson, Kenneth A.)
- Design and monitoring considerations for a hazardous waste management facility near Byers, Colorado (Heath, Regan A.)
- Design of containment/treatment system for contaminated ground water, northwest boundary, Rocky Mountain Arsenal, Colorado (Zeltinger, James M.)
- Detection and delineation of a fuel oil flume in a layered bedrock deposit (Folkes, D. J., et al.)

- Developing and implementing a coordinated ground-water protection program for Colorado (Gearhart, Mary J.)
- Development of a pore interaction model for hydrodynamic dispersion (Baker, F. G.)
- Development of a pore interaction model for hydrodynamic dispersion during flow through porous media (Baker, Fred G.)
- Development of a subsurface hydrologic model and use for integrated management of surface and subsurface water resources (Morel-Seytoux, Hubert J.)
- Draft environmental impact statement; Wolf Ridge Corporation mine plan for a nahcolite solution mine (Frank, Willy)
- Effect of solid-solution ratio on the variability of distribution coefficient values in a complex rock-fluid system (Pavlik, Hannah F.)
- Effects of MIS retorting on groundwater (Hester, Norman E.)
- Estimated use of water in Colorado, 1985 (Litke, David W.)
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- Field verification of the concept of reach transmissivity (Morel-Seytoux, Hubert J., et al.)
- Geohydraulics at the unconformity between bedrock and alluvial aquifers (Waltz, J. P.)
- Geologic factors in the evaluation of water pollution potential at mountain dwelling sites (Burns, L. K., et al.)
- Geological and hydrogeological investigation for a hazardous waste management facility near Byers, Colorado (Brazie, Mike E.)
- Geology and hydrology of the deep bedrock aquifers in eastern Colorado (Robson, S. G.)
- Geology and hydrology of the Rio Grande Rift area (Wilkins, David W.)
- Geomorphic and lithologic controls of diffuse-source salinity, Grand Valley, western Colorado (Johnson, Richard K.)
- Ground water hydrology and water law; bridging the gap with models (Kraeger-Rovey, Catherine)
- Ground water recharge as affected by surface vegetation and management (Klute, A., et al.)
- Ground-surface water technical and quasi-legal relationships (Darr, Russell)
- Ground-water decontamination at the Rocky Mountain Arsenal (Hager, D. G., et al.)
- Ground-water quality near a sewage-sludge recycling site and a landfill near Denver, Colorado (Robson, S. G.)
- Ground-water reconnaissance of selected sites in Rocky Mountain National Park and Shadow Mountain National Recreation Area, Colorado (Welder, F. A.)
- Ground-water resources of the alluvial aquifers in northeastern Larimer County, Colorado (Hurr, R. Theodore)
- Groundwater containment systems (Hager, Donald B.)
- Groundwater contamination and aquifer reclamation at the Rocky Mountain Arsenal, Colorado (Konikow, Leonard F.)
- Groundwater contamination control and treatment, Rocky Mountain Arsenal, Colorado (MacRoberts, Paul B., et al.)
- Groundwater contamination in parts of the Denver-Arapahoe disposal site (Renda, Christine A.)
- Groundwater contamination; prevention beats costly cleanups (Rensberger, Judith)
- Groundwater law in Arizona and neighboring states (Smith, George E. P.)
- Groundwater quality regulation in Colorado (Looft, Thomas J.)
- Hydraulic conductivity of mountain soils (Williams, Owen R., et al.)
- Hydraulic gradient control for groundwater contaminant removal; a three-stage planning procedure (Atwood, Dorothy Fisher)
- Hydrogeochemical characterization of the Durango, Colorado, tailings and raffinate pond areas (Kearl, Peter)
- Hydrogeologic characterization of the Colony Shale Oil Project area (Day, Michael J.)
- Hydrogeologic controls on migration of an oil-spill plume in alluvial deposits near Fort Collins, Colorado (Waltz, J. P.)
- Hydrogeologic maps of the alluvial aquifer in and adjacent to the Rocky Mountain Arsenal, Colo. (Konikow, L. F.)
- Hydrogeology and phytogeomorphology of the mountains and foothills near Denver, Colorado (Emerick, J. C.)
- Hydrogeology of crystalline rocks in the Colorado Front Range (Lovelace, Kenneth A., Jr.)
- Implications of an assessment of potential organic contamination of ground water at an inactive uranium mill (Price, John B.)
- Influence of irrigation on salinity and nitrate changes in a stream-aquifer system (Konikow, Leonard F.)
- Influence of the unsaturated zone on groundwater salinity in an irrigated stream-aquifer system (Person, M. A.)
- Investigating subsurface fuel releases (Holbrook, Tim)
- Investigation of a previously unexplored basaltic aquifer using complementary geophysical methods (Harmon, Eric J.)
- Landslide stability achieved with horizontal drains (Spitzer, Roy H., et al.)
- Location of irrigation wells and application rates for irrigated cropland during 1980 in the Northern High Plains of Colorado (Borman, R. G.)
- Long-term salinity changes in an irrigated stream-aquifer system (Konikow, Leonard F.)
- Management information from water quality monitoring programs (Averett, Robert C.)
- Management of contaminated groundwater with aquifer simulation and linear programming; the development of a hydraulic gradient control procedure (Atwood, Dorothy Fisher)
- Mecker Dome salinity investigation (Feast, Charles F.)
- Modeling the reaction and movement of chromium in an alluvial aquifer near Telluride, Colorado (Grove, D. B., et al.)
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- Potential new sources of water for energy resource development in northwestern Colorado (Welder, Frank A.)
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- Predicting the performance of water wells in crystalline rocks, Front Range, Colorado (Graves, Timothy)
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- Rocky Mountain Arsenal, Colorado (Pendrell, Douglas J.)
- Role of numerical simulation in analysis of groundwater quality problems (Konikow, L. F.)
- Salinity control by pumping and deep well injection; the Paradox Valley unit (Jensen, Errol G.)
- Selected soda springs of Colorado and their origins (Evans, William C., et al.)
- Sensitivity analysis applied to unsaturated flow modeling of a retorted oil shale pile (Freshley, Mark D., et al.)
- Site characterization studies of a volcanic cap rock (Swolfs, Henri S.)
- Site selection, characterization, and design of an industrial waste treatment/disposal facility (Brazie, Mike E.)
- Specific yield by geophysical logging potential for the Denver Basin (McWhorter, David B.)
- Summary appraisals of the nation's ground-water resources; Upper Colorado Region (Price, Don)
- Summary of hydrologic information for the Denver coal region, Colorado (Norris, J. Michael, et al.)
- Summary of water-resources activities of the U.S. Geological Survey in Colorado, fiscal year 1986 (Stewart, Julie M.)
- Summary of water-resources activities of the U.S. Geological Survey in Colorado; fiscal year 1987 (Stewart, Julie M.)
- Synthetic fuels development in the upper Colorado region; technical report (U. S. Water Resources Council)
- The Colorado experience in resolving surface-ground water conflicts (Kahn, Jeffrey J.)
- The cost-effective selection of landslide remedial measures by the use of personal computer models (Turner, A. Keith, et al.)
- The Denver Basin: its bedrock aquifers (Bittinger, M. W.)
- The hydrogeochemical effects of past mining on the Raton Basin, Colorado (Howard, W. Brant)
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- Thermodynamic controls on quality of water from underground coal mines in Colorado (Turk, John T.)
- Transient calibration of computer model of ground water flow and transport, Piceance Basin, Colorado (Shepherd, Russell G.)
- Two case histories on the design and pump testing of individual aquifers with dual completed wells (Jehn, James L.)
- U.S. Geological Survey ground-water studies in Colorado (Weeks, John B.)
- Use of horizontal drains: case histories from the Colorado Division of Highways (Barrett, Robert K.)
- Value and role of conjunctive use of surface and ground waters in river basin water management (Morel-Seytoux, Hubert J.)
- Water for the South Platte Basin (Hendricks, D. W., et al.)
- Water-level changes 1964-71, northern High Plains of Colorado (Hofstra, W. E., et al.)
- Water-level changes in northern High Plains of Colorado, 1964 to 1976 and 1972 to 1976 (Borman, R. G.)
- Water-quality data-collection activities in Colorado and Ohio; Phase I, Inventory and evaluation of 1984 programs and costs (Hren, Janet, et al.)
- Water-quality data-collection activities in Colorado and Ohio; Phase II, Evaluation of 1984 field and laboratory quality-assurance practices (Childress, Carolyn J. Oblinger, et al.)
- Waterlogging in an alluvial aquifer near Lake Minnequa, Pueblo, Colorado (Emmons, P. J.)
- Colorado Plateau:** General hydrogeology of the aquifers of Mesozoic age, upper Colorado River basin, excluding the San Juan basin; Colorado, Utah, Wyoming, and Arizona (Freethy, G. W., et al.)
- Occurrence and treatment of uranium in point of use systems in Colorado (Varani, Frederick T., et al.)
- Region 3, Colorado Plateau and Wyoming Basin (Taylor, O. James)
- Selected drill-stem test data for the upper Colorado River basin (Teller, Ralph W.)
- Colorado River basin:** Analysis of groundwater and surface water supply interrelationships in the Upper Colorado River basin using natural radon-222 as a tracer (Jacoby, Gordon C., Jr., et al.)
- Delineation and correlation of salinity to landforms and geologic formations, upper Colorado River basin (Whittig, L. D., et al.)
- Conejos County:** A model analysis of ground water in the San Luis Valley, Colorado (Emery, Philip A.)
- Geochemical kinetics (Claassen, Hans C.)
- Potentiometric surface, 1980, and water-level changes, 1969-80, in the unconfined valley-fill aquifers of the San Luis Basin, Colorado and New Mexico (Crouch, Thomas M.)
- Quality of ground water in agricultural areas of the San Luis Valley, south-central Colorado (Edelmann, Patrick)
- Costilla County:** Hydrogeology and simulated effects of ground-water development on an unconfined aquifer in the Closed Basin Division, San Luis Valley, Colorado (Leonard, Guy J.)
- Crowley County:** Assessment of long-term salinity changes in an irrigated stream-aquifer system (Konikow, Leonard F.)
- Quality of the ground water (Horr, C. A.)
- Recalibration and predictive reliability of a solute-transport model of an irrigated stream-aquifer system (Person, Mark A.)
- Relations of specific conductance to streamflow and selected water-quality characteristics of the Arkansas River basin, Colorado (Cain, Doug)
- Custer County:** Proposed work plan for the study of hydrologic effects of ground-water development in the Wet Mountain Valley, Colorado (Robson, S. G.)
- Water-resources appraisal of the upper Arkansas River basin from Leadville to Pueblo, Colorado (Crouch, Thomas M., et al.)
- Dakota Aquifer:** Dakota Aquifer system in the state of Colorado (Pearl, R. H.)
- Evolution of formation fluids in the "J" Sandstone, Denver Basin, Colorado (Ottman, J. D.)
- Heat flow and ground water movement in the Central Great Plains (Gosnold, W. D.)
- Hydrology of the U.S. Army Pinon Canyon Maneuver Site, Las Animas County, Colorado (von Guerard, Paul, et al.)
- Low-temperature geothermal resources in the Dakota Aquifer (Sorey, M. L.)
- Paleohydrogeology of the Cretaceous Dakota Aquifer system in the Denver Basin; a computer approach (Tait, Donald)
- The Dakota Aquifer near Pueblo, Colorado; faults and flow patterns (Banta, Edward R.)
- Delta County:** Reconnaissance of ground-water resources in the lower Gunnison River basin, southwestern Colorado (Brooks, Tom)
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- Denver Aquifer:** Hydrogeology of and potential mining impacts on strippable lignite areas in the Denver Aquifer, east-central Colorado (Driver, Nancy E.)
- Denver Basin:** A two-dimensional, finite difference model of the Pleistocene Nussbaum Alluvium in the southern Denver Basin; a case history in the use of vertical variability parameter estimation (Paschke, S. S.)
- An assessment of the long-term hydrologic effects of artificial recharge on the Denver groundwater basin using computer simulation methods (Aikin, Andrea R.)
- Geochemical aspects of artificial recharge by injection into the bedrock aquifers of the Denver groundwater basin (Ring, George T., et al.)
- Hydrodynamics of Denver Basin, an explanation of subnormal fluid pressures (Belitz, Kenneth)
- Hydrodynamics of Denver Basin; explanation of subnormal fluid pressures (Belitz, Kenneth)
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- Denver County:** Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)
- Hydrogeologic data from parts of the Denver Basin, Colorado (Major, Thomas J., et al.)
- Dolores County:** Regional hydrology of the Dolores River basin, eastern Paradox Basin, Colorado and Utah (Weir, J. E., Jr., et al.)
- Douglas County:** Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)
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- Eagle County:** Acoustic monitoring of landslides (Jurich, David M.)
- Analysis of a landslide along Interstate 70 near Vail, Colorado (Casals, Javier Fernandez)
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- Dowds Junction area, Eagle County, Colorado; landslide hazard studies, May 1985 to present (Anonymous)
- Engineering geology of the Battle Mountain landslide south of Minturn, Colorado (Shine, Brendan F.)
- Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Glenwood Springs (Geldon, Arthur L.)
- Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)
- El Paso County:** A reconnaissance water-quality appraisal of the Fountain Creek alluvial aquifer between Colorado Springs and Pueblo, Colorado, including trace elements and organic constituents (Cain, Doug)
- Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)
- Artificial-recharge tests in upper Black Squirrel Creek basin, Jimmy Camp Valley, and Fountain Valley, El Paso County, Colorado (Emmons, P. J.)
- Assessment of water resources at Fort Carson Military Reservation near Colorado Springs, Colorado (Leonard, Guy J.)
- Bedrock aquifers in the Denver Basin, Colorado; a quantitative water-resources appraisal (Robson, S. G.)
- Effects of irrigating with wastewater on ground-water quality at Fort Carson Military Reservation golf course near Colorado Springs, Colorado (Edelmann, Patrick)
- Geohydrology, water quality, and preliminary simulations of ground-water flow of the alluvial aquifer in the upper Black Squirrel Creek basin, El Paso County, Colorado (Buckles, David R.)
- Hydrogeologic data from parts of the Denver Basin, Colorado (Major, Thomas J., et al.)

- Mega-scallops in the Cave of the Winds, Manitou Springs, Colorado (Maslyn, Mark)
- Test of the Stroebel Spring, a supplementary study of the Fort Carson Expansion Project, Civic Action No. 9820, Track No. 202, EL Paso County, Colorado (Jenkins, E. D.)
- Elbert County:* Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)
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- Fremont County:* Geochemical interactions between uranium tailings fluids and subjacent bedrock, Canon City, Colorado; use of the computer model MINTEQ (Davis, Andrew Owen)
- Ground-water contamination near a uranium tailings disposal site in Colorado (Goode, Daniel J.)
- Ground-water flow and quality near Canon City, Colorado (Hearne, Glenn A.)
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- Garfield County:* A geological and legal analysis of groundwater resources in the West Divide Basin, Garfield County, Colorado (Merrill, William G.)
- Aquifer testing (Taylor, O. J.)
- Characterization of Glenwood Springs and Dotsero Springs waters (Eisenhauer, R. J.)
- Chemical effects and control of leachates from oil-shale spoil piles (Stollenwerk, Kenneth G.)
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- Fracture history of the northern Piceance Creek basin, northwestern Colorado (Verbeek, Earl R.)
- Ground-water potential of the Leadville Limestone on the White River uplift in Garfield and Rio Blanco counties, Colorado (Teller, R. W.)
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- Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Glenwood Springs (Geldon, Arthur L.)
- Hydrologic data from Roan Creek and Parachute Creek basins, northwestern Colorado (Adams, D. Briane, et al.)
- Hydrologic system of Piceance Basin (Taylor, O. James)
- Hydrologic-information needs for oil-shale development, northwestern Colorado (Taylor, O. J.)
- Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)
- Mathematical modeling of the ground-water flow system (Taylor, O. J.)
- Paleozoic and Mesozoic formations and their potential as ground-water reservoirs (MacLachlan, Marjorie E.)
- Simulation of mine drainage for preliminary development of oil shale and associated minerals, Piceance Basin, northwestern Colorado (Taylor, O. James)
- Spoil-pile geochemistry and hydrology (Stollenwerk, K. G.)
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- Unconsolidated deposits of the Piceance Basin (Welder, Frank)
- Water for oil-shale development (Miller, G. A.)
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- Grand County:* Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Glenwood Springs (Geldon, Arthur L.)
- Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)
- Regional hydrology of the Dolores River basin, eastern Paradox Basin, Colorado and Utah (Weir, J. E., Jr., et al.)
- Great Plains:* Adjustment preferences to groundwater depletion in the American High Plains (Kromm, David E.)
- Interstate groundwater management preference differences; the Ogallala region (Kromm, David E.)
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- Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)
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- High Plains Aquifer:* Digital simulation of ground-water flow in the High Plains Aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Luckey, Richard R., et al.)
- Divisions of potential fracture permeability, based on distribution of structures and lineaments, in sedimentary rocks of the Rocky Mountains-High Plains region, Western United States (Cooley, Maurice E.)
- Effects of future ground-water pumpage on the High Plains Aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Luckey, Richard R., et al.)
- Geohydrology of the High Plains Aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Gutentag, Edwin D., et al.)
- Machine-readable files developed for the High Plains Regional Aquifer-System Analysis in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Ferrigno, Carmelo F.)
- Mapping irrigated cropland from Landsat data for determination of water use from the High Plains Aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Thelin, Gail P.)
- Simulated effects of future pumpage on the High Plains Aquifer, west-central United States (Weeks, J. B.)
- Summary of the High Plains Regional Aquifer-System Analysis in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Weeks, John B., et al.)
- Hinsdale County:* Geochemical kinetics (Claassen, Hans C.)
- Huerfano County:* Selected climatological and hydrologic data, Raton Basin, Huerfano and Las Animas counties, Colorado, and Colfax County, New Mexico (Geldon, Arthur L.)
- Jackson County:* An evaluation of surface geophysics as applied to a hydrogeologic study in Routt and Jackson counties, Colorado (Cooper, Lon M.)
- An evaluation of surface geophysics in hydrogeologic study in Routt and Jackson counties, Colorado (Cooper, Lon Michael)
- Jefferson County:* Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)
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- Kiowa County:* Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)
- Water-level records for the northern High Plains of Colorado, 1970-86 (Reed, Raymond L.)
- Kit Carson County:* Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)
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- La Plata County:* Availability and chemical characteristics of ground water in central La Plata County, Colorado (Brogden, R. E.)
- General surface- and ground-water quality in a coal-resource area near Durango, southwestern Colorado (Butler, David L.)
- Hydrology of coal-lease areas near Durango, Colorado (Brooks, Tom)
- Lake County:* Water-resources appraisal of the upper Arkansas River basin from Leadville to Pueblo, Colorado (Crouch, Thomas M., et al.)
- Lake Minnequa:* Brief description as of April 1968 of the geology and hydrology of the Lake Minnequa area, Pueblo, Colorado, and suggested solutions for trouble caused by high water table (Scott, G. R.)
- Larimer County:* Generalized altitude and configuration of the water table in parts of Larimer, Logan, Sedgwick, and Weld counties, Colorado (Borman, R. G.)
- Ground water availability, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)
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- Shallow ground water in the Boulder-Fort Collins-Greeley area, Front Range urban corridor, Colorado, 1975-77 (Schneider, P. A., Jr.)
- Water quality and sources of potential pollution, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)
- Las Animas County*: Selected climatological and hydrologic data, Raton Basin, Huerfano and Las Animas counties, Colorado, and Colfax County, New Mexico (Geldon, Arthur L.)
- Lincoln County*: Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)
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- Logan County*: Generalized altitude and configuration of the water table in parts of Larimer, Logan, Sedgwick, and Weld counties, Colorado (Borman, R. G.)
- Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)
- Hydrologic description of the Tamarack Wildlife Area and vicinity, Logan County, Colorado, and simulated effects of possible water-management activities (Burns, Alan W.)
- Simulated effects of an artificial-recharge experiment near Proctor, Logan County, Colorado (Burns, Alan W.)
- Manitou Springs*: Hydrogeology of the mineral springs at Manitou Springs, Colorado (Maslyn, R. Mark)
- Mesa County*: Geohydrology and potential hydrologic effects of underground coal mining in the Rapid Creek basin, Mesa County, Colorado (Brooks, Tom)
- Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Glenwood Springs (Geldon, Arthur L.)
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- Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)
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- Simulation of mine drainage for preliminary development of oil shale and associated minerals, Piceance Basin, northwestern Colorado (Taylor, O. James)
- The impact of longwall mining on the hydrologic balance; premining data collection (Evans, Ginger S.)
- Mineral County*: Geochemical kinetics (Claassen, Hans C.)
- Relationship between precipitation and vadose-zone chemistry in a high-altitude watershed in Colorado (Claassen, Hans C., et al.)
- Moffat County*: Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Glenwood Springs (Geldon, Arthur L.)
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- Regional hydrology of the Dolores River basin, eastern Paradox Basin, Colorado and Utah (Weir, J. E., Jr., et al.)
- Morgan County*: Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)
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- North America*: Geologic field evidence suggesting membrane properties of shales (Berry Frederick, A. F.)
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- Can we save the Ogallala? (Sweazy, Robert M.)
- Determination and distribution of the hydraulic conductivity and specific yield of the Ogallala Aquifer in the Northern High Plains of Colorado (Bryn, Sean M.)
- Geology, altitude, and depth of the bedrock surface: altitude of the water table in 1980; and saturated thickness of the Ogallala Aquifer in 1980 in the southern High Plains of Colorado (Borman, R. G., et al.)
- Potential for artificial recharge of the northern High Plains of Colorado (Warner, James W., et al.)
- Potential well yields from the Ogallala Aquifer in the northern High Plains of Colorado (Lindner-Lunsford, Juli B.)
- Problems associated with determination of well efficiencies in four Ogallala Aquifer wells, northeastern Colorado (O'Brien, Patrick W.)
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- Variability in adjustment preferences to groundwater depletion in the American High Plains (Kromm, David E.)
- Otero County*: Assessment of long-term salinity changes in an irrigated stream-aquifer system (Konikow, Leonard F.)
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- Recalibration and predictive reliability of a solute-transport model of an irrigated stream-aquifer system (Person, Mark A.)
- Relations of specific conductance to streamflow and selected water-quality characteristics of the Arkansas River basin, Colorado (Cain, Doug)
- Role of solute-transport models in the analysis of groundwater salinity problems in agricultural areas (Konikow, L. F.)
- Paradox Basin*: Overview of the regional geology of the Paradox Basin study region (Woodward-Clyde Consultants)
- Park County*: Water-resources appraisal of the upper Arkansas River basin from Leadville to Pueblo, Colorado (Crouch, Thomas M., et al.)
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- Piceance Creek basin*: Application of a groundwater model for an oil shale mining operation in the Piceance Basin, Colorado (Kraeger-Rovey, Catherine)
- Fracture studies at C-a Mine, Piceance Creek basin, Colorado (Verbeek, Earl R.)
- Ground water age determinations, Piceance Creek basin, Colorado (Kimball, Briant A.)
- Preliminary computer model of ground water flow and solute transport for MIS retorting at tract C-b, Piceance Basin, Colorado (Shepherd, Russell G.)
- Simulated oil-shale mine dewatering using a confined multiaquifer model, Piceance Basin, Colorado, U.S.A. (Weeks, John B.)
- Pitkin County*: Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Glenwood Springs (Geldon, Arthur L.)
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- Rio Blanco County*: Aquifer testing (Taylor, O. J.)
- Chemical effects and control of leachates from oil-shale spoil piles (Stollenwerk, Kenneth G.)
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- Detailed lithologic, rock quality, and hydrologic data from four drill holes in the central Piceance Creek basin, Rio Blanco County, Colorado (Daub, G. J., et al.)
- Fracture history of the northern Piceance Creek basin, northwestern Colorado (Verbeck, Earl R.)
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- Hydrologic data from Roan Creek and Parachute Creek basins, northwestern Colorado (Adams, D. Briane, et al.)
- Hydrologic system of Piceance Basin (Taylor, O. James)
- Hydrologic-information needs for oil-shale development, northwestern Colorado (Taylor, O. J.)
- Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)
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- Predicted effects of underground mine flooding at Tract C-b in Piceance Basin, northwestern Colorado (Taylor, O. James)
- Preliminary assessment of the ground-water resources of the alluvial aquifer, White River valley, Rio Blanco County, Colorado (Van Liew, William P.)
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- Hydrogeology of the upper part of the Mesaverde Group, Williams Fork Mountains, Routt and Moffatt counties, Colorado (Stewart, Michael)
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- Soil-water hydrology and geochemistry of a coal spoil at a reclaimed surface mine in Routt County, Colorado (Williams, Robert S., Jr.)
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- Fluoride in the confined ground water of the San Luis Valley, Colorado (Glanzman, Richard K.)
- Hydrogeology and simulated effects of ground-water development on an unconfined aquifer in the Closed Basin Division, San Luis Valley, Colorado (Leonard, Guy J.)
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- Geochemical behavior of silica in the artesian ground water of the Closed Basin area, San Luis Valley, Colorado (Klein, John M.)
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- South Platte River basin*: Conjunctive use of ground water and surface water in the South Platte River basin; a case study of the Central Colorado Water Conservancy District (Cech, Thomas Victor)
- Hydrogeologic characteristics of the valley-fill aquifer in the Brush reach of the South Platte River valley, Colorado (Hurr, R. T.)
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- Hydrogeologic characteristics of the valley fill aquifer in the Brighton reach of the South Platte River valley, Colorado (Schneider, P. A., Jr.)
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- Land use controls to protect groundwater quality in the arid Southwest (Stephenson, Larry K.)
- Plan of study for the Regional Aquifer Systems Analysis of the upper Colorado River basin in Colorado, Utah, Wyoming, and Arizona (Taylor, O. James, et al.)
- Southwest alluvial-basin regional aquifer-systems study; study in parts of Colorado, New Mexico, and Texas (Wilkins, David W.)

- Summit County:** Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Glenwood Springs (Geldon, Arthur L.)
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- United States:** Chromium contamination of groundwater (Calder, L. M.)
- Geodetic evidence for subsidence due to groundwater withdrawal in many parts of the U.S. (Chi, S. C.)
  - Groundwater in the West (Smith, Zachary A.)
  - Hydrologic characteristics of soils in parts of Arkansas, Colorado, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, South Dakota, and Texas (Dugan, Jack T.)
  - Land applications of municipal waste water (Tomson, M. B., et al.)
  - Outlook for artificial recharge (Priestaf, Iris)
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- Washington County:** Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)
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  - Water quality and sources of potential pollution, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)
- Western U.S.:** A prototype computer interactive ground water monitoring methodology for surface water impoundments (Everett, Lorne G.)
- An assessment of the hydrologic information required for the U.S. Bureau of Land Management-U.S. Geological Survey coal-hydrology program in the West (Herbert, R. A.)
  - General hydrogeology of the aquifers of Mesozoic age, upper Colorado River basin; excluding the San Juan Basin; Colorado, Utah, Wyoming, and Arizona (Freethy, Geoffrey W., et al.)
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  - Hydrologic data for Paleozoic rocks in the upper Colorado River basin, Colorado, Utah, Wyoming, and Arizona (Geldon, A. L.)
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  - Selected hydrologic and physical properties of Mesozoic formations in the upper Colorado River basin in Arizona, Colorado, Utah, and Wyoming; excluding the San Juan Basin (Weigel, Jay F.)
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  - Water-bearing characteristics of geologic formations in northeastern New Mexico-southeastern Colorado (Kilmer, L. Clay)
- Westwater Canyon Aquifer:** Simulating underground mines in a regional model (Davis, Phillip R.)
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- guidebook** *see under* areal geology; petrology *see under* areal geology *under* Archuleta County; Boulder County; Conejos County; Custer County; Delta County; Dolores County; Eagle County; Garfield County; Grand County; Great Plains; Gunnison County; Hinsdale County; La Plata County; Lake County; Larimer County; Mesa County; Mineral County; Moffat County; Montezuma County; Pitkin County; Rio Blanco County; Routt County; Saguache County; San Juan County; San Miguel County; Western U.S. *see under* economic geology *under* Baca County *see under* landform description *under* geomorphology *see under* stratigraphy *under* Fremont County; Pueblo County
- Gunnison Conglomerate**
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- Anthracite Range:** Geology of the Anthracite Range, West Elk Mountains, Gunnison County, Colorado (Johnson, Lynn A.)
- Brush Creek area:** Geology of the Brush Creek area and a petrographic study of the Morrison Formation, Gunnison County, Colorado (Jackson, William Ernest)
- Cumberland Pass:** Geology and mineralization of the Cumberland Pass area, Gunnison County, Colorado (Rosenlund, Gene C.)
- Farris Creek area:** Geology of the Farris Creek area, Gunnison County, Colorado (Dukes, Bill Jady)
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- maps:** Geologic and structural maps and sections of the Marshall Pass mining district, Saguache, Gunnison, and Chaffee counties, Colorado (Olson, J. C.)
- Geologic map and coal stratigraphic framework of the Paonia area, Delta and Gunnison counties, Colorado (Dunrud, C. R.)
  - Geologic map and cross sections of the Carbonale 30' by 60' Quadrangle, west-central Colorado (Ellis, M. S.)

- Geologic map of the Buckhorn Lakes Quadrangle, Gunnison, Montrose, and Ouray counties, Colorado (Dickinson, R. G.)
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  - Geologic map of the Crested Butte Quadrangle, Gunnison County, Colorado (Gaskill, D. L., et al.)
  - Geologic map of the Fossil Ridge area, Gunnison County, Colorado (Zech, R. S.)
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- base metals*: An evaluation of an area of potential molybdenum mineralization, Chicago Park, Gunnison County, Colorado (Daly, Cathryn Hayes)
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  - Maroon Bells-Snowmass Wilderness and additions, Colorado (Freeman, Val L.)
  - Oh-Be-Joyful Wilderness Study Area, Colorado (Ludington, Steve)
  - Preliminary thermal-maturity map of the Cameo and Fairfield or equivalent coal zone in the Piceance Creek basin, Colorado (Nuccio, V. F.)
  - Stratigraphy of the Mesaverde Formation, Mt. Gunnison coal property, Gunnison County, Colorado (Wellborn, Jewel E. F.)
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  - fuel resources*: Seismic interpretation in the Piceance Basin, Northwest Colorado (Waechter, Noel B.)
  - Summary of vitrinite reflectance and Rock-Eval pyrolysis data, Eagle Basin, northwestern Colorado (Nuccio, Vito F., et al.)
  - gems*: Colorado's Blue Wrinkle lapis mine (Voynick, Steve)
  - gold ores*: A comparison of geochemical sampling and analytical techniques used for precious metal exploration in northeastern Gunnison County, Colorado (Clark, J. Robert, et al.)
  - Comparison of the trace element geochemistry of syngenetic and epigenetic mineralization in the Gunnison gold belt, Colorado (Drobeck, Peter A.)
  - Precambrian geology and gold mineralization in the vicinity of Ohio City, Gunnison County, Colorado (Horlacher, Craig F.)
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  - maps*: Geochemical characterization of the Mt. Harvard 15-minute quadrangle, Colorado, using NURE data (Ludlam, John R.)
  - Map showing geology and mineral resource potential of the Oh-Be-Joyful Wilderness Study Area, Gunnison County, Colorado (Ludington, Steve)
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  - Preliminary thermal-maturity map of the Cameo and Fairfield or equivalent coal zone in the Piceance Creek basin, Colorado (Nuccio, V. F.)
  - Results of site-specific studies in the Fossil Ridge Wilderness Study Area, Gunnison County, Colorado (Neubert, John T.)
  - metal ores*: Cannibal Plateau Roadless Area and Powderhorn Wilderness Study Area, Colorado (Sharp, William N.)
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  - Geology of ore deposits and associated rocks in Boulder-Leadville-Gunnison Belt, Colorado (Nelison, J. H.)
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  - Cannibal Plateau Roadless Area and Powderhorn Wilderness Study Area, Colorado (Sharp, William N.)
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  - Leadville 1' by 2' Quadrangle, Colorado; a pre-assessment (Wallace, Alan R., et al.)
  - Magnetic tape containing spectrographic and chemical analyses of stream sediments, rocks, and panned concentrates from the West Elk Wilderness and vicinity, Delta and Gunnison counties, Colorado (McDanal, S. K., et al.)
  - Map showing geology and mineral resource potential of the Oh-Be-Joyful Wilderness Study Area, Gunnison County, Colorado (Ludington, Steve)
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  - Mineral resource potential map of the Fossil Ridge Wilderness Study Area, Gunnison County, Colorado (DeWitt, Ed, et al.)
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  - molybdenum ores*: An evaluation of an area of potential molybdenum mineralization, Chicago Park, Gunnison County, Colorado (Daly, Cathryn Hayes)
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  - Geologic map of the Crested Butte Quadrangle, Gunnison County, Colorado (Gaskill, D. L., et al.)
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  - Trace metal geochemistry and hydrothermal alteration of three molybdenum-bearing stocks, Gunnison and Pitkin counties, Colorado (Perkins, R. A.)
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- Cretaceous Mesaverde Group, Piceance Basin, Colorado (Johnson, Ronald C., et al.)
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  - Geology and overview of coalbed methane resources and activity in the Piceance Creek basin, Colorado (Larsen, Veryl E.)
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- pegmatite*: Kindreds and districts of rare-mineral pegmatites in Colorado (Heinrich, E. William)
- silver ores*: A comparison of geochemical sampling and analytical techniques used for precious metal exploration in northeastern Gunnison County, Colorado (Clark, J. Robert, et al.)
- titanium ores*: Titanium resource in Colorado equals all other US deposits (Thompson, James V.)
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  - Geology and uranium deposits of the Cochetopa and Marshall Pass districts, Saguache and Gunnison counties, Colorado (Olson, Jerry C.)
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- Gunnison County—engineering geology**
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- trace elements*: Comparison of the trace element geochemistry of syngenetic and epigenetic mineralization in the Gunnison gold belt, Colorado (Drobeck, Peter A.)
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- radioactivity surveys*: Geochemical characterization of the Mt. Harvard 15-minute quadrangle, Colorado, using NURE data (Ludlam, John R.)
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- Gunnison County—hydrogeology**
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- intrusions*: Oxygen and hydrogen isotope variations in mid-Tertiary intrusions, Gunnison County, Colorado (Weidemann, Donna Elizabeth)
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*Cretaceous*: An assessment of gas resources in low-permeability sandstones of the Upper Cretaceous Mesaverde Group, Piceance Basin, Colorado (Johnson, Ronald C., et al.)

— Cross sections showing correlation of coal beds and coal zones in the Mesaverde Formation in the Carbondale 30' by 60' Quadrangle, west-central Colorado (Ellis, Margaret S., et al.)

— Geologic history and hydrocarbon potential of Late Cretaceous-age, low-permeability reservoirs, Piceance Basin, western Colorado (Johnson, Ronald C.)

— Stratigraphy of the Mesaverde Formation, Mt. Gunnison coal property, Gunnison County, Colorado (Wellborn, Jewel E. F.)

— Structure contour map of the top of the Rollins Sandstone Member of the Mesaverde Formation and Trout Creek Sandstone Member of the Iles Formation, Piceance Creek basin, Colorado (Johnson, R. C.)

*Devonian*: Stratigraphy of the Devonian Chaffee Formation of northeastern Gunnison County, Colorado (Thomas, William Andrew)

*Holocene*: Geology of archeological sites in Middle Cottonwood Creek valley and Taylor Park, Chaffee and Gunnison counties, Colorado (Madole, Richard F.)

*maps*: Structure contour map of the top of the Rollins Sandstone Member of the Mesaverde Formation and Trout Creek Sandstone Member of the Iles Formation, Piceance Creek basin, Colorado (Johnson, R. C.)

*Mesozoic*: Structural geology and stratigraphy of the Jack's Cabin cutoff area, Gunnison County, Colorado (Schlight, Harold N.)

*Mississippian*: Manitou, Harding, Fremont and Leadville formations of northeastern Gunnison County, Colorado (Eldridge, Charles A.)

*Ordovician*: Manitou, Harding, Fremont and Leadville formations of northeastern Gunnison County, Colorado (Eldridge, Charles A.)

*Paleozoic*: Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)

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— Stratigraphic analysis of the Gothic Formation (Desmoinesian), Pitkin and Gunnison counties, Colorado (Levorsen, Mark K.)

— Stratigraphy and sedimentology of the Pennsylvanian Gothic Formation in the Crested Butte area, Colorado (Leighton, Cheryl D.)

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*Proterozoic*: Time-stratigraphic equivalence of the Dubois Greenstone and felsic volcanic-sedimentary gneiss terrain, Gunnison Uplift, Gunnison and Saguache counties, Colorado (Shonk, Kenneth N.)

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— Seismic and borehole evidence for important pre-Laramide faulting along the axial arch in Northwest Colorado (Stone, Donald S.)

*tectonics*: Implications of a calcite mylonite for west directed Laramide structures in the Gunnison area, Colorado (Busch, Jay P.)

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— Structural and petrologic studies of a Proterozoic terrain; "Gold Brick District", Gunnison County, Colorado (Earley, Drummond, III)

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— Timing and nature of shearing deformation of Proterozoic rocks near Gunnison, Colorado (Hetherington, Eric D.)

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**Harding Sandstone**

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— Geology of the Steer Creek area northeast of Salida, Colorado (Thayer, James Bliss)

— Lower Paleozoic of Northwest Colorado; a summary (Ross, Reuben J., Jr.)

— Manitou, Harding, Fremont and Leadville formations of northeastern Gunnison County, Colorado (Eldridge, Charles A.)

— The enigmatic Middle Ordovician fossil *Archeognathus* and its relations to conodonts and vertebrates (Klapper, Gilbert)

**Harpole Mesa Formation**

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**Hartland Shale Member**

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— Oxygen-deficient biofacies of the Western Interior seaway; evidence from the Hartland Shale Member of the Greenhorn Formation (Sageman, B. B.)

— Pelagic/hemipelagic rhythmites of the Greenhorn Limestone (Upper Cretaceous) of northeastern New Mexico and southeastern Colorado (Hattin, Donald E.)

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*see under* geophysical surveys *under* Garfield County; Great Plains; Mineral County; Rocky Mountains; Southwestern U.S.; Western U.S.

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— Environmental influences upon mercury, radon and helium concentrations in soil gases at a site near Denver, Colorado (Klusman, Ronald W.)

*uranium ores*: Gaseous emanations associated with sandstone-type uranium deposits (Reimer, G. M.)

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  - Linking impacts in plant extinctions (Leahy, Guy D., et al.)
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  - Deposition and diagenesis of Middle Pennsylvanian (Desmoinesian) phylloid algal banks, Paradox Formation, Ismay Zone, Ismay Field and San Juan Canyon, Paradox Basin, Utah and Colorado (Brinton, Lise)
  - Discovery of the Silver Creek molybdenum deposit, Rico, Colorado (Cameron, D. E., et al.)
  - Early salt dissolution; Pennsylvanian of Paradox Basin, Colorado and Utah (Kendall, Alan C.)
  - Geochemical study of authigenic minerals in the Salt Wash Member of the Morrison Formation, Slick Rock District, San Miguel County, Colorado (Breit, George Nicholas)
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  - Laramide oblique-slip, high-angle faults, southern San Juan Mountains, Colorado (Morse, Earl L.)
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  - Relationship of authigenic minerals to the V-U and Cu mineralization of the Salt Wash Member of the Morrison Formation, San Miguel County, Colorado (Breit, G. N.)
  - Sedimentary petrology and paleontology of part of the Hermosa Group (Pennsylvanian) between Durango and Silverton, Colorado (McDonald, David Wilson)
  - Sedimentology and architecture of Gilbert-and-mouth-bar-type fan deltas, Paradox Basin, Colorado (Wood, Maria L.)
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  - Seismic exploration for Pennsylvanian algal mounds, Paradox Basin (Moriarty, Bruce)
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  - Evaluating vertical variability of hydraulic conductivity and specific yield in fluvial deposits (Gutentag, E. D., et al.)
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- guidebook*: Field trip guidebook; paleotectonics; San Juan Mountains; Dolores Formation; Paleosols and depositional systems; Jurassic depositional systems; San Juan Basin; Quaternary deposits and soils; Durango area (Brew, Douglas C.)
  - maps*: A geologic investigation of the early Proterozoic Irving Formation, southeastern Needle Mountains, Colorado (Gonzales, David A.)
  - Geologic map of the Courthouse Mountain Quadrangle, Gunnison, Hinsdale, and Ouray counties, Colorado (Dickinson, R. G.)
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  - Geologic map of the Piedra Wilderness Study Area, Archuleta and Hinsdale counties, Colorado (Condon, S. M., et al.)
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  - Geologic, alteration, and vein maps of the Redcloud Peak (Lake City Caldera) and Handies Peak Wilderness Study Areas, Hinsdale County, Colorado (Hon, Ken)
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  - Underground geologic maps of the Golden Wonder Mine, Lake City, Hinsdale County, Colorado (Billings, Patty)
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  - Mineral investigation of the Redcloud Peak (CO-030-208) and the Handies Peak (CO-030-241) Wilderness Study Areas, Hinsdale County, Colorado (Korzeb, Stanley L.)
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- metal ores*: Aeromagnetic and gravity models of the pluton below the Lake City Caldera, Colorado (Grauch, V. J. S.)
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- Gravity survey data and a Bouguer gravity anomaly map of the Lake City Caldera area, Hinsdale County, Colorado (Grauch, V. J. S.)
- La Garita Wilderness, Colorado (Steven, Thomas A.)
- Map showing areas of limonitic hydrothermal alteration in the Lake City Caldera area, western San Juan Mountains, Colorado (Lee, Keenan)
- Mineral investigation of the La Garita Wilderness Additions, Hinsdale and Saguache counties, Colorado (Scott, David C.)
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- underground installations*: Underground geologic maps of the Golden Wonder Mine, Lake City, Hinsdale County, Colorado (Billings, Patty)

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- impact statements*: Proposed wilderness designation of the Powderhorn Instant Study Area, Gunnison and Hinsdale counties, Colorado (U. S. Bureau of Land Management, Montrose District)

- land use*: Land use and land cover and associated maps for Durango, Colorado (U. S. Geological Survey)

- maps*: Land use and land cover and associated maps for Durango, Colorado (U. S. Geological Survey)

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- Application of techniques to identify coal-mine and power-generation effects on surface-water quality, San Juan River basin, New Mexico and Colorado (Goetz, C. L., et al.)
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*metasomatism*: An oxygen isotope study of hydrothermal alteration in the Lake City Caldera, San Juan Mountains, Colorado (Larson, Peter B.)

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*Proterozoic*: A geologic investigation of the early Proterozoic Irving Formation, southeastern Needle Mountains, Colorado (Gonzales, David A.)

- Revised interpretation of the age of allochthonous rocks of the Uncompahgre Formation, Needle Mountains, Colorado (Tewksbury, B. J.)

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- The geology of Summer Coon Volcano near Del Norte, Colorado (Noblett, Jeffrey B.)

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1977-81 Fish Creek study site; Resource and potential reclamation evaluation (U. S. Bureau of Reclamation)

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*see under* stratigraphy *under* Boulder County; Chaffee County; Grand County; Gunnison County; Larimer County; Montezuma County; Pueblo County; Rocky Mountains; San Juan County; Southwestern U.S.; Western U.S.

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— Boundary integral-equation-method (BIEM) modeling of regional aquifers using geostatistics (Weiss, Emanuel)

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— Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)

— Hamm Canyon (gas) (Lister, James C.)

— Paradox Basin; unravelling the mystery (Anonymous)

— Paradox Valley, Colorado; a collapsed salt anticline (Chenoweth, William L.)

— Sedimentology and architecture of Gilbert and mouth bar-type fan deltas, Paradox Basin, Colorado (Wood, Maria L.)

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— Tectonic control of Pennsylvanian fan delta deposition, southwestern Colorado (Millberry, Kimberlee W.)

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#### Horseshoe Mountain Group

Pleistocene sediments at the Cave of the Winds (Luiszer, Fred)

#### Horsetooth Member

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*maps*: Geologic map of the Beck Mountain, Crestone Peak, and Crestone quadrangles, Custer, Huerfano, and Saguache counties, Colorado (Lindsey, D. A., et al.)

— Geologic map of the Trinidad Quadrangle, south-central Colorado (Johnson, R. B.)

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— Reconnaissance geologic map of the Spanish Peaks Wilderness Study Area, Huerfano and Las Animas counties, Colorado (Budding, K. E.)

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*Rye Quadrangle*: Geology of the Rye Quadrangle, Pueblo and Huerfano counties, Colorado (McGuire, Emily)

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- land use*: Land use and land cover and associated maps for Trinidad, Colorado (U. S. Geological Survey)
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- glacial geology*: Identification of rock glaciers using enhanced Landsat MSS data (Berta, Susan M.)

**Huerfano County—geophysical surveys**

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- Petrology and geochemistry of the Huerto Formation, San Juan volcanic field, south central Colorado (Askren, Daniel R., et al.)

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**humates see under organic materials**

**hunic acids see under organic materials**

**Huntsman Shale**

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**hydrogen see deuterium**

**hydrogen—analysis**

- chemical analysis*: Sink float procedures for shale characterization (Vadovic, Charles J.)

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  - Algorithm for surface/ground-water allocation under appropriation doctrine (Illangasekare, T. H.)
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  - Characteristics of aquifers in the northern Uinta Basin area, Utah and Colorado (Wood, J. W.)
  - Cleanup strategy for Rocky Mountain Arsenal (Campbell, Donald L.)
  - Colorado ground-water quality (Hearne, Glenn A., et al.)
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  - Colorado; ground-water quality (Hearne, Glenn A., et al.)
  - Comments on Colorado's ground water problems (Colburn, George W.)
  - Conjunctive operation of a surface reservoir and of ground-water storage through a hydraulically connected stream (Morel-Seytoux, Hubert J.)
  - Conjunctive use of ground water and surface water for irrigated agriculture; risk aversion (Bredehoeft, John D.)
  - Conjunctive use project in Beebe Draw, Colorado (Mangelson, Kenneth A.)
  - Dakota Aquifer system in the state of Colorado (Pearl, R. H.)
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  - Digital simulation of ground-water flow in the High Plains Aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Luckey, Richard R., et al.)
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  - Geomorphic and lithologic controls of diffuse-source salinity, Grand Valley, western Colorado (Johnson, Richard K.)
  - Ground water age determinations, Piceance Creek basin, Colorado (Kimball, Briant A.)
  - Ground water recharge as affected by surface vegetation and management (Klute, A., et al.)
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  - Ground-water reconnaissance of selected sites in Rocky Mountain National Park and Shadow Mountain National Recreation Area, Colorado (Welder, F. A.)
  - Ground-water resources of the alluvial aquifers in northeastern Larimer County, Colorado (Hurr, R. Theodore)
  - Ground-water systems in Paleozoic rocks of the Upper Colorado River basin, Arizona, Colorado, Utah, and Wyoming (Geldon, Arthur L.)
  - Groundwater containment systems (Hager, Donald B.)
  - Groundwater quality regulation in Colorado (Looft, Thomas J.)
  - Hydraulic gradient control for groundwater contaminant removal; a three-stage planning procedure (Atwood, Dorothy Fisher)
  - Hydrodynamics of Denver Basin, an explanation of subnormal fluid pressures (Belitz, Kenneth)
  - Hydrodynamics of Denver Basin: explanation of subnormal fluid pressures (Belitz, Kenneth)
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- Modeling the reaction and movement of chromium in an alluvial aquifer near Telluride, Colorado (Grove, D. B., et al.)
- Origin of high P<sub>CO2(g)</sub> and low <sup>13</sup>C ground water in the Eastern Cordilleran (Mayo, A. L.)
- Paleohydrogeology of the Cretaceous Dakota Aquifer system in the Denver Basin; a computer approach (Tait, Donald)
- Plan of study for the Regional Aquifer Systems Analysis of the upper Colorado River basin in Colorado, Utah, Wyoming, and Arizona (Taylor, O. James, et al.)
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— Ground water/surface water conjunctive use project in Beebe Draw, Adams and Weld counties, Colorado (Mangelson, Kenneth A.)

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— The distribution of radiogenic heat producers in igneous and metamorphic rocks (Wollenberg, Harold A.)

— The petrology of middle Proterozoic granites of the West McCoy Gulch, Texas Creek and Cotopaxi area, Fremont County, Colorado (Sassarini, Nick A.)

— The petrology of Tertiary intrusions associated with epithermal veins in the Georgetown-Silver Plume District; Clear Creek County, Colorado (Connors, Katherine A.)

— The petrology of Tertiary intrusions associated with epithermal veins in the Georgetown-Silver Plume region, Clear Creek County, Colo. (Connors, Katherine A., et al.)

— Uranium, thorium, and trace elements in geologic occurrences as analogues of nuclear waste repository conditions (Wollenberg, H. A., et al.)

#### Ignacio Quartzite

Depositional environments of the Cambrian Ignacio Formation and Devonian pre-Elbert conglomerate, San Juan Mountains, southwestern Colorado (Wiggin, Roger Clay)

**igneous rocks** *see fluid inclusions; inclusions; intrusions; lava; magmas; metamorphic rocks; metasomatism; phase equilibria*

*see under geochemistry*

*see under petrology*

#### igneous rocks—acidic composition

*distribution*: A terrane of 1,350- to 1,400-m.y.-old silicic volcanic and plutonic rocks in the buried Proterozoic of the Mid-Continent and in the Wet Mountains, Colorado (Thomas, J. J., et al.)

#### igneous rocks—alkali syenites

*composition*: Aillard Stock, La Plata Mountains, Colorado; a porphyry copper-precious metals deposit in potassic alkaline rocks (Werle, James L., et al.)

#### igneous rocks—alkalic composition

*complexes*: Alkaline rock complexes in the Wet Mountains area, Custer and Fremont counties, Colorado (Armbrustmacher, Theodore J.)

— Major- and minor-element distribution in alkaline rock complexes of the Wet Mountains area, Custer and Fremont counties, Colorado (Armbrustmacher, Theodore J.)

*distribution*: Petrologic, paleomagnetic, and structural evidence of a Paleozoic rift system in Oklahoma, New Mexico, Colorado, and Utah; discussion and reply (McLemore, Virginia T., et al.)

*petrology*: Petrology of the alkalic hypabyssal and volcanic rocks at Cripple Creek, Colorado (Eriksson, Carl L.)

#### igneous rocks—alteration

*hydrothermal alteration*: Altered igneous rocks around Rocky Mountain manto deposits; the Gilman (Colorado) example (O'Neill, T. F., et al.)

#### igneous rocks—basalts

*chemical composition*: Geochemistry of the basaltic rocks, Fishers Peak Mesa, Colorado (Ryan, Timothy Harold)

- distribution*: Map showing gravel-bearing surficial deposits and basaltic rocks near Trinidad, Las Animas County, Colorado (Scott, G. R.)
- genesis*: A regional Rb/Sr isotopic and REE study of basalts from the Rio Grande Rift, N. Mex. and Colo. (Crowley, J. C.)
- Quaternary volcanism in northwestern Colorado; implications for the roles of asthenosphere and lithosphere in the genesis of continental basalts (Leat, P. T., et al.)
- Red Mountain Volcano; a source for local basalt flows north of Gunnison, Colorado (Rubel, N. Daniel)
- Strontium isotope and rare earth element analyses of Rio Grande Rift basalts; implications for magmagenesis in continental rifts (Crowley, Julia Coolidge)
- geochemistry*: Rb/Sr analyses of basalt fields in the Rio Grande Rift, New Mexico-Colorado (Crowley, J. C.)
- mineral composition*: Basalt from Colorado (Iddings, J. P.)

**Igneous rocks—carbonatites**

- alkalic composition*: Gases in alkalic rocks from McClure Mountain, Colorado (Heinrich, E. W., et al.)
- Petrology of alkaline rocks in the carbonatite complex at Iron Hill, Powderhorn District, Gunnison County, Colorado; new geochemical and isotopic data (Armbrustmacher, Theodore J.)
- composition*: Spectral reflectance of carbonatites and related alkalic igneous rocks; selected samples from four North American localities (Rowan, Lawrence C., et al.)
- dikes*: Carbonatite dikes of the Chupadera Mountains, Socorro County, New Mexico (Van Allen, Bruce R., et al.)
- geochemistry*: Mineralogy and geochemistry of carbonatites from the Gem Park Complex, Fremont and Custer counties, Colorado (Pappson, Ronald P.)
- Spectral characteristics of carbonatites; a potential exploration tool (Kingston, M. J.)
- mineral exploration*: Spectral reflectance of the carbonatite complexes at Mountain Pass, California and Iron Hill, Colorado (Rowan, Lawrence C., et al.)
- petrology*: Contrasts in the anatomy of neighboring alkalic carbonatitic complexes (Heinrich, E. W.)
- rare earths*: The carbonatite complex at Iron Hill, Powderhorn District, Gunnison County, Colorado (Armbrustmacher, Theodore J.)

**Igneous rocks—composition**

- chemical composition*: Geochemistry and petrotectonic setting of bimodal volcanic and volcanoclastic rocks, Cochetopa Canyon area, central Colorado (Bennett, Gregory S., et al.)
- granitic composition*: Evolution and crystallization of Proterozoic anorogenic plutons of the southwestern U.S. (Anderson, J. Lawford)
- mineral composition*: Geology and petrography of Crested Butte Laccolith, Gunnison County, Colorado (Bevier, Mary Lou)
- phenocrysts*: Epidote phenocrysts in dacitic dikes, Boulder County, Colorado (Evans, B. W.)

**Igneous rocks—diabase**

- textures*: Petrologic, paleomagnetic, and structural evidence of a Paleozoic rift system in

Oklahoma, New Mexico, Colorado, and Utah; discussion (Purucker, Michael)

**Igneous rocks—diorites**

- genesis*: Reverse zoning in the resurgent intrusions of the Grizzly Peak Cauldron, Sawatch Range, Colorado (Fridrich, Christopher J.)

**Igneous rocks—distribution**

- evolution*: Observations on the Precambrian evolution of northern New Mexico and adjacent regions (Silver, Leon T.)

**Igneous rocks—geochemistry**

- crystallization*: Geochemistry of the Proterozoic igneous and metaigneous rocks near Gunnison, Colorado (Blackburn, W. H.)
- intrusions*: Geochemical relationships of Laramide intrusives of the Empire region, Colorado (Larsen, Margaret K.)
- intrusive rocks*: Geologic setting and petrochemistry of the Late Cretaceous-early Tertiary intrusives in the northern Front Range mineral belt, Colorado (Gable, Dolores J.)
- isotopes*: An oxygen isotope study of hydrothermal alteration in the Lake City Caldera, San Juan Mountains, Colorado (Larson, Peter B.)
- Natural analogues; Alamosa River monzonite intrusive into tuffaceous and andesitic rocks (Brookins, Douglas G., et al.)
- Patterns of oxygen isotope depletion, multiple hydrothermal circulation systems, and the cooling history of the Stony Mountain intrusive complex, Colorado (Crowley, Julia C.)
- molybdenum*: The concentration and transport of molybdenum in magmatic systems, experimental evidence (Tingle, Tracy N.)
- oxygen*:  $^{18}\text{O}/^{16}\text{O}$  relationships in hydrothermally altered rocks of the 22.5 m.y. Lake City Caldera, San Juan Mts., Colo. (Larson, Peter B.)
- rare earths*: A modified crustal source for the Colorado mineral belt; implications for REE buffering in  $\text{CO}_2$ -rich fluids (Musselman, Thomas E.)
- Petrogenesis of the Spanish Peaks igneous complex, Colo.: major element, rare earth element, and strontium isotopic data (Arnold, B.)
- silicate rocks*: GRANNY, a data bank of chemical analyses of Laramide and younger high-silica rhyolites and granites from Colorado and north-central New Mexico (Steigerwald, C. H., et al.)
- surveys*: Reconnaissance geologic mapping in north-central Colorado using multispectral gamma-ray data (Moll, Stanton H.)
- trace elements*: Bibliographic and petrochemical data bases for molybdenite deposits (Steigerwald, Celia H.)
- Trace element mobility in tephra from three diagenetic environments (Summa, Lori L., et al.)
- Trace-element evidence for the evolution of the Eolus Batholith, Needle Mountains, southwestern Colorado (Collier, James D.)
- Igneous rocks—granites**
- calc-alkalic composition*: Mid-Proterozoic post-orogenic granites, and associated uranium mineralization of the Needle Mountains, southwestern Colorado (Collier, James D.)
- chemical composition*: Chemical variations and their significance in rocks of Silver Plume age (Gable, Dolores J.)

- composition*: Granite of Silver Plume type; a possible source of the uranium in deposits of the Tallahassee Creek and High Park areas, Fremont and Teller counties, Colorado (Hills, Francis Allan)
- genesis*: A lead, strontium, and sulfur isotope study of Laramide-Tertiary intrusions and mineralization in the Colorado mineral belt with emphasis on climax-type porphyry molybdenum systems plus a summary of other newly acquired isotopic and rare earth element data (Stein, Holly Jayne)
- Genetic traits of climax-type granites and molybdenum mineralization, Colorado mineral belt (Stein, Holly J.)
- Mineralogy and crystallization conditions of Proterozoic anorogenic peraluminous granites of the Colorado Front Range (Anderson, J. Lawford)
- Origin of Colorado mineral belt Laramide-Tertiary magmatism; lead and strontium isotope evidence (Stein, Holly J.)
- Petrogenesis of the Silver Plume, Log Cabin and Sherman granites, Colorado and Wyoming (Fountain, J. C., et al.)
- Precambrian geochronology of northern Utah (Hedge, Carl E.)
- Proterozoic anorogenic two-mica granites; Silver Plume and St. Vrain batholiths of Colorado (Anderson, J. Lawford)
- Proterozoic anorogenic two-mica granites; Silver Plume and St. Vrain batholiths of Colorado; discussion and reply (Puffer, John H.)
- Trace element mineralogy in the porphyry molybdenum environment (Gunow, Alexander James)
- geochemistry*: An oxygen-isotope study of water-rock interaction in the granite of Cataract Gulch, western San Juan Mountains, Colorado (Larson, Peter B.)
- mineral composition*: Granite-tectonics of Pikes Peak intrusive center of Pikes Peak composite batholith and road log up Pikes Peak toll road (Hutchinson, Robert M.)
- Recognition of tin-bearing granites by multivariate statistical analysis, Pikes Peak Batholith, Colorado (Erwin, Leslie Eugene)
- Relationship between structure and mineralogy of the Sherman Granite, southern part of the Laramie Range, Wyoming-Colorado (Harrison, Jack Edward)
- mineralization*: Tabulation of modal and chemical analyses for Silver Plume Quartz Monzonite (Silver Plume Granite), Berthoud Plutonic Suite, Front Range, Colorado (Gable, Dolores J.)
- pegmatite*: Antero revisited (Voynick, Steve)
- Electron microprobe analysis of rare-earth-element-bearing phases from the White Cloud Pegmatite, South Platte District, Jefferson County, Colorado (Wayne, David Matthew)
- Fertile granites in the Archean and Apebian fields of rare-element pegmatites; crustal environment, geochemistry and petrogenetic relationships (C#3/erny#2, P.)
- Geochemistry and evolution of the South Platte granite-pegmatite system, Jefferson County, Colorado (Simmons, W. B., et al.)
- Geology of the Ten Percenter pegmatite mine, Lake George District, Teller County, Colorado (Wobus, Reinhard A., et al.)
- Mechanics of pegmatite intrusion (Brisbin, W. C.)

- Pegmatites of Ohio City, Colorado and the origin of complex pegmatites (Doten, R. K.)
- Proterozoic plutons and pegmatites of the Pikes Peak region, Colorado (Wobus, Reinhard A.)
- Trip 12, Granite pegmatites of the Black Hills, South Dakota and Front Range, Colorado (C#3/erny#2., P., et al.)
- petrology*: A redescription of the Cripple Creek Granite, Cripple Creek, Colorado (Steffen, Robert W.)
- Petrology and geochemistry of the Silver Plume-age plutons of the southern and central Wet Mountains, Colorado (Bender, Russell Berryman, Jr.)
- Pikes Peak Granite rampart range site, CO (Steppe, Michael C.)
- The granites and derived gneisses of the Pikes Peak folio of the geologic atlas of the United States (Mathews, E. B.)
- The petrology of foliated plutons at Garell Peak and Oak Creek, northern Wet Mountains, Colorado (McCabe, Marc)
- physical properties*: A gravity survey of the Moffat, Eisenhower and Johnson tunnels in the Front Range of Colorado (Upp, Charles S.)
- two-mica granite*: The petrology of middle Proterozoic granites of the West McCoy Gulch, Texas Creek and Cotopaxi area, Fremont County, Colorado (Sassarini, Nick A.)
- Igneous rocks—lamprophyres**
- genesis*: Petrogenesis of an orbicular lamprophyre dike, Fremont County, Colorado (Alexander, D. H.)
- kersantite*: Contemporaneous bimodal mafic-felsic magmatism at Red Mountain, Clear Creek County, and Climax, Colorado (Shannon, J. R., et al.)
- minette*: Silicic magmas derived by fractional crystallization from Miocene minette, Elkhead Mountains, Colorado (Leat, P. T., et al.)
- Igneous rocks—monzonites**
- composition*: Stable isotopic composition of fluid inclusions in a porphyry-style hydrothermal system near Silverton, San Juan Mountains, Colorado (Ringrose, C. R., et al.)
- quartz monzonite*: Age, origin and significance of the San Isabel Batholith, Wet Mountains, Colorado (Shuster, Robert D.)
- Petrology of the San Isabel Batholith, southern Wet Mountains, Colorado (Griffin, Thomas)
- trace elements*: Petrogenesis of the A.O. porphyry copper complex in Jackson and Grand Counties, northwestern Colorado (Karimpour, M. H.)
- Igneous rocks—occurrence**
- Tertiary*: Tertiary igneous rocks of South Park, Colorado (Hoagland, Alan D.)
- Igneous rocks—peridotites**
- garnet lherzolite*: Zoned minerals in peridotite nodules; clues to mantle dynamics (Smith, D., et al.)
- garnet peridotite*: Relationship between geochemistry and color of garnet xenocrysts from Colorado-Wyoming kimberlites (Padgett, J. P., et al.)
- geochemistry*: Mantle garnet-spinel transition zone demonstrated by xenoliths from Colorado-Wyoming kimberlites (Kirkley, M. B., et al.)
- P-T conditions*: Petrology and geochemistry of mantle eclogite xenoliths from Colorado-Wyoming kimberlites (Ater, P. C., et al.)
- Igneous rocks—petrology**
- absolute age*: Granite-tectonics of Pikes Peak composite batholith (Hutchinson, R. M.)
- U-Pb zircon geochronology of early Proterozoic plutonism in N. Colorado and SE Wyoming (Premo, Wayne R.)
- complexes*: Proterozoic geology of the Middle Mountain area, Needle Mountains, Colorado (Gonzales, David A.)
- evolution*: Early Proterozoic supracrustal associations in the Southwest; an update (Condie, Kent C.)
- Geologic and petrologic evolution of the Lake City Caldera, San Juan Mountains, Colorado (Hon, Kenneth)
- genesis*: Tertiary igneous petrology of the Mt. Richthofen-Iron Mt. area, north-central Colorado (Corbett, Marshall K.)
- interpretation*: Igneous geology of the Elkhead Mountains, Colorado (Christensen, Andrew Lee)
- intrusive rocks*: Laramide-Tertiary intrusive rocks of Colorado (Young, E. J.)
- Reverse zoning in the resurgent intrusions of the Grizzly Peak cauldron, Sawatch Range, Colorado (Fridrich, Christopher J.)
- petrofabrics*: The petrology and structure of Proterozoic rocks northeast of Salida, Colorado (Plummer, David A.)
- properties*: Tertiary igneous rocks of South Park, Colorado (Harris, David V.)
- terranes*: Proterozoic granite rhyolite terranes of the southern Midcontinent, USA (Bickford, M. E.)
- xenoliths*: The mafic enclaves of the Dinkey Creek Granodiorite and the Carpenter Ridge Tuff; a mineralogical, textural, and geochemical study of their origins with implications for the generation of silicic batholiths (Dorais, Michael John)
- Igneous rocks—plutonic rocks**
- alteration*: Infinite variations on a fenite theme (Heinrich, E. William)
- geochemistry*: Analytical data on the crystalline rocks of the Strawberry Lake area, Grand County, Colorado (Young, Edward J.)
- magnetic properties*: Paleomagnetism of Cambro-Ordovician intrusives from Colorado (Lynnes, C. G., et al.)
- phase equilibria*: Phase equilibria and spatial extent of chemical equilibration of magmatite rocks from Colorado, U.S.A., and Venezuela (Urbani, Franco)
- Igneous rocks—pyroclastics**
- absolute age*: High-precision  $^{40}\text{Ar}/^{39}\text{Ar}$  ages of sanidine, biotite, hornblende, and plagioclase from the Fish Canyon Tuff, San Juan volcanic field, south-central Colorado (Kunk, Michael J., et al.)
- alteration*: The hydration and alteration of the perlite, pitchstone, and upper pyroclastic unit at Ruby Mountain, Nathrop, Colorado (Nickel, Brian K.)
- ash flows*: Oligocene ash-flow eruptions of the San Juan volcanic field, Colorado (Lipman, Peter W.)
- ash-flow tuff*: "Dynamic" or non-modal assimilation within the Platoro Caldera complex; strontium-isotope and trace-element results (Murphy, M. T.)
- Determination of the depth of origin of large volume silicic magmas; two-feldspar + Fe-Ti oxide method (Stormer, J. C., Jr.)
- Epithermal mineralization related to caldera development, Pride of the West Mine, San Juan Co., Colorado (Hardwick, James F.)
- Evidence for magma mixing in a zoned magma body; phenocryst heterogeneity in pumice from an ash-flow sheet (Vogel, Thomas A., et al.)
- Geochemical correlation of ash-flow tuffs from the Platoro volcanic complex, Southeast Colorado (Jackman, Toni Kay)
- I, An  $^{18}\text{O}/^{16}\text{O}$  investigation of the Lake City Caldera, San Juan Mountains, Colorado; II,  $^{18}\text{O}/^{16}\text{O}$  relationships in Tertiary ash-flow tuffs from complex caldera structures in central Nevada and San Juan Mountains, Colorado (Larson, Peter Brennan)
- Magmatic conditions and development of chemical zonation in the Carpenter Ridge Tuff, central San Juan volcanic field, Colorado (Whitney, James A., et al.)
- Magmatic conditions and magma mixing in the Carpenter Ridge Tuff; a zoned ash-flow in the San Juan volcanic field, Colorado (Whitney, James A.)
- Magmatic conditions of the Snowshoe Mountain Tuff, central San Juan volcanic field, Colorado (Matty, David J., et al.)
- Magmatic paragenesis of the Fish Canyon ash-flow tuff, central Jose Mountains, Colorado (O'Leary, William J.)
- Primary sulfide inclusions within the Fish Canyon ash-flow tuff and their implications for the paragenesis of calc-alkaline silicic magmas and related ore deposits (Whitney, James A.)
- genesis*: A pyroclastic surge deposit and its relation to the hydrothermal center at Hahns Peak, Colorado (Casaceli, Robert J.)
- ignimbrite*: A statistical study of phenocryst orientation fabrics in a dacite ignimbrite (Varga, Robert J.)
- magnetic properties*: Rapid alteration of primary magnetizations in Tertiary and Quaternary tephra from the Western United States (Summa, Lori L.)
- tuff*:  $^{18}\text{O}/^{16}\text{O}$  ratios in ash-flow tuffs and lavas erupted from the central Nevada caldera complex and the central San Juan caldera complex, Colorado (Larson, P. B.)
- Comment on "... magmatic conditions of the Fish Canyon Tuff, central San Juan volcanic field, Colorado" by Whitney & Stormer (1985) (Grunder, A. L.)
- Etching characteristics of fission tracks in minerals, and fission track dating and calibration of zircon (Shin, Seong-cheon)
- Experimentally determined conditions in the Fish Canyon Tuff, Colorado, magma chamber (Johnson, Marie C.)
- High-resolution  $^{40}\text{Ar}/^{39}\text{Ar}$  chronology of Oligocene volcanic rocks, San Juan Mountains, Colorado (Lanphere, Marvin A.)
- K-Ar geochronology of the Bonanza Caldera, NE San Juan Mountains, Colorado; the oldest known San Juan Caldera (Varga, Robert J.)

## igneous rocks—rhyodacites

- Location of eruptive vents by analysis of fluidal flow textures in the Bonanza Tuff, NE San Juan Mountains, Colorado (Varga, Robert J.)
- Magmatic paragenesis of the Fish Canyon ash-flow tuff, central San Juan Mountains, Colorado (O'Leary, William J.)
- Mineralogy, petrology, and magmatic conditions from the Fish Canyon Tuff, central San Juan volcanic field, Colorado (Whitney, James A.)
- Oligocene volcanic rocks as a uranium source for sandstone-type uranium deposits in central Colorado (Dickinson, Kendall A.)
- Proterozoic subaqueous ash flows from central Colorado; a tuff problem (Rossen, Christine, et al.)
- Reply to a comment on "...magmatic conditions of the Fish Canyon Tuff ..." (Stormer, John C., Jr., et al.)
- The Grizzly Peak Cauldron, Colorado; structure and petrology of a deeply dissected resurgent ash-flow caldera (Fridrich, Christopher John)
- The Mammoth Mountain and Wason Park tuffs; magmatic evolution in the central San Juan volcanic field, southwestern Colorado (Webber, Karen Louise)
- volcanic ash:* Goyazite in kaolinitic altered volcanic ash beds of Cretaceous age near Denver, Colorado (Triplehorn, Don M.)
- welded tuff:* Compositional layers in the zoned magma chamber of the Grizzly Peak Tuff (Fridrich, Christopher J.)

## igneous rocks—rhyodacites

- epidote:* Properties of truly magmatic epidote (Evans, Bernard W.)
- quartz latite:* The significance of the Fisher Quartz Latite to the history of the Creede Caldera, southwestern Colorado (Ritch, Kurt D.)

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- genesis:* Interpretation of rock and vapor phase relations in the Ruby Mountain volcanic complex, Chaffee County, Colorado (Schooler, Richard A.)
- mineral composition:* Bimodal rhyolite-kersantite suites of the Climax and Red Mountain porphyry molybdenum systems, CO (Bookstrom, A. A., et al.)
- rhyolite porphyry:* The geology and geochemistry of Cenozoic topaz rhyolites from the Western United States (Christiansen, Eric H., et al.)

## igneous rocks—syenites

- absolute age:* U-Pb dating of domains of a single zircon grain (Schaerer, U.)
- composition:* Allard Stock, La Plata Mountains, Colorado; an alkaline rock-hosted porphyry copper - precious metal deposit (Werle, James L., et al.)
- geochemistry:* Geochemistry of the Burro Mountains syenites and adjacent Proterozoic granite and gneiss and the relationship to a Cambrian-Ordovician alkalic magmatic event in New Mexico and southern Colorado (McLemore, Virginia T.)

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- kimberlite:* A Colorado-Wyoming border diatreme and a possible potential kimberlite indicator plant (Collins, Donna B.)

- A diamond-graphite eclogite from the Sloan 2 kimberlite, Colorado, U.S.A. (McCandless, T. E.)
- A study in progress; multispectral analysis of kimberlite pipes in the Colorado-Wyoming state-line district using the extended spectral capabilities of the Thematic Mapper Simulator (Marks, Janet E.)
- A teledetective study of kimberlite regions in N. America (Colorado-Wyoming), E. Africa (Mwadui), and Siberia (Mir) (Woodzick, Thomas L.)
- A teledetective study of kimberlite regions in N. America, E. Africa, and Siberia (Woodzick, Thomas L.)
- A teledetective study of kimberlite regions in North America (Colorado-Wyoming), East Africa (Mwadui), and Siberia (Mir) (Woodzick, T. L.)
- Coexisting garnet and spinel in upper mantle xenoliths from Colorado-Wyoming kimberlites (Kirkley, M. B., et al.)
- Discovery of the George Creek Colorado kimberlite dikes (Carlson, J. A.)
- Evaluation of geophysical techniques for diatreme delineation in the Colorado-Wyoming kimberlite province (Carlson, J. A., et al.)
- Exploration for kimberlite in the Green Mountain-Magnolia area, Boulder County, Colorado (Padgett, Joel P.)
- Geophysical and remote-sensing characteristics of the Colorado-Wyoming kimberlite occurrences (Woodzick, Tom)
- Geophysical and remote-sensing characteristics of the Colorado-Wyoming kimberlite occurrences (Woodzick, Thomas L.)
- Granulite facies and related xenoliths from Colorado-Wyoming kimberlite (Bradley, S. D.)
- Kimberlite exploration, Red Feather area, and petrology of the Chicken Park diatreme, northern Colorado (Rogers, Jack A., Jr.)
- Kimberlite-transported nodules from Colorado-Wyoming; a record of enrichment of shallow portions of an infertile lithosphere (Eggler, David H., et al.)
- Kimberlite-transported nodules from Colorado-Wyoming; enrichment of shallow lithosphere by metasomatism (Eggler, David H., et al.)
- Lithosphere of the continental United States; xenoliths in kimberlites and other alkaline magmas (Eggler, D. H., et al.)
- Mineral inclusions in diamonds from kimberlites in Colorado and Wyoming (Meyer, Henry O. A.)
- Mineralogical and textural-genetic classification of kimberlites in northern Colorado and southern Wyoming, U.S.A. (McCallum, M. E., et al.)
- Multispectral remote sensing techniques applied to exploration for kimberlite diatremes, Laramie Range, Wyoming-Colorado (Marks, Janet E.)
- Oxide minerals in Chicken Park Kimberlite, northern Colorado (McCallum, M. E.)
- Petrology and geochemistry of eclogite xenoliths from Colorado-Wyoming kimberlites (Ater, Patricia C.)
- Petrology and geochemistry of mantle eclogite xenoliths from Colorado-Wyoming

kimberlites; recycled ocean crust? (Ater, P. C., et al.)

- The geology, diamond testing procedures, and economic potential of the Colorado-Wyoming kimberlite province; a review (Hausel, W. D., et al.)
- Use of reflectance spectra and digital processing to identify kimberlite diatremes in the Colorado-Wyoming district (Marks, Janet E.)
- petrology:* Cooling rate estimates from mineral zonation; resolving power and applications (Wilson, C. R.)
- History of the Colorado-Wyoming state line diatremes (Collins, Donley S.)

## igneous rocks—volcanic rocks

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- complexes:* The petrology and geochemistry of the Handkerchief Mesa mixed magma complex, San Juan Mountains, Colorado (Thompson, Ren A.)
- composition:* Evolving parallel tectonic styles in adjacent Proterozoic crustal provinces of the southwestern United States (Condie, Kent C.)
- Oligocene volcanic rocks in the La Veta Pass area, northern Sangre De Cristo Mountains, south-central Colorado (Kearney, Barbara Cowles)
- distribution:* Geology of the Mt. Aetna volcanic center, Chaffee and Gunnison counties, Colorado (Toulmin, Priestley, III)
- Volcanics of the State Bridge area, Eagle County, Colorado (Rozilo, Paul John)
- evolution:* The evolution of magmatic systems during lithospheric extension; geologic and geochemical studies of volcanic rocks from the Rio Grande Rift region (Perry, Frank Vinton)
- geochemistry:* Rare-earth-element compositions of Cenozoic volcanic rocks in the Southern Rocky Mountains and adjacent areas (Lipman, Peter W.)
- Strontium-isotope and trace-element geochemistry of the Platoro caldera complex, Colorado (Murphy, Mark Thomas)
- lithostratigraphy:* Chronology of igneous events in the Proterozoic of central Colorado (Bickford, M. E., et al.)
- mafic composition:* Compositionally-diverse Miocene-Recent rift-related magmatism in NW Colorado; partial melting, and mixing of mafic magmas from three different asthenospheric and lithospheric mantle sources (Leat, P. T., et al.)
- metal ores:* Geologic characteristics of the Scotia-Vanderbilt Vein, Silverton, Colorado; implications for epithermal precious metal exploration in volcanic settings (Standen, Allan R.)
- petrology:* Evolution of the early Oligocene Bonanza Caldera, Northeast San Juan volcanic field, Colorado (Varga, Robert J.)
- phenocrysts:* Fugacities of sulfurous gases in pyrrhotite-bearing silicic magmas (Whitney, James A.)
- physical properties:* Summary of natural remanent magnetization, magnetic susceptibility, and density measurements from the Lake City Caldera area, San Juan Mountains, Colorado (Grauch, V. J. S.)

**ignimbrite** *see under* pyroclastics *under* igneous rocks

### Iles Formation

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— Book Cliffs coal field, western Colorado (Young, Robert G.)

— Coal bed methane desorption data (Tremain, Carol M.)

— Description and origin of the lower part of the Mesaverde Group in Rifle Gap, Garfield County, Colorado (Madden, Dawn J.)

— Facies analysis of the lower cycles of the Mesaverde Group (Upper Cretaceous) in northwestern Colorado (Kiteley, Louise W.)

— Facies relationships in Campanian wave-dominated coastal deposits in Sand Wash Basin (Siepmann, Bret R.)

— Geologic and engineering implications of production history from five Mesaverde wells in central Piceance Creek basin, Northwest Colorado (Chancellor, R. E.)

— Geologic map and coal sections of the Sawmill Mountain Quadrangle, Rio Blanco County, Colorado (Reheis, Marith Cady C.)

— Geologic map and coal sections of the Thornburgh Quadrangle, Moffat and Rio Blanco counties, Colorado (Reheis, Marith Cady C.)

— Geology and overview of coalbed methane resources and activity in the Piceance Creek basin, Colorado (Larsen, Veryl E.)

— Laboratory drying procedures and the permeability of tight sandstone core (Soeder, Daniel J.)

— Late Cretaceous Mesaverde Group outcrops at Rifle Gap, Piceance Creek basin, northwestern Colorado (Lorenz, J. C.)

— Sedimentological aspects of stratigraphic correlations in the Upper Cretaceous Ericson Sandstone, Greater Green River basin, Wyoming, Colorado, and Utah (Law, B. E., et al.)

— Stratigraphic distribution suggesting environmental significance of pollen in Late Cretaceous upper Iles and lower Williams Fork formations, Rifle Gap, Garfield County, Colorado (Madden-McGuire, Dawn J.)

— Stratigraphic distribution suggesting environmental significance of pollen in Late Cretaceous upper Iles and lower Williams Fork formations, Rifle Gap, Garfield County, Colorado (Madden-McGuire, Dawn J.)

— Stratigraphy and depositional environments of a portion of upper Campanian Mesaverde Group, central Grand Hogback, Northwest Colorado (Madden, Dawn J.)

— Stratigraphy of Grand Hogback Coalfield, upper Campanian Mesaverde Group, Rifle Gap to New Castle, Garfield County, Colorado (Madden, Dawn J.)

— Stratigraphy, depositional environments, and paleogeography of coal-bearing strata in the Upper Cretaceous Mesaverde Group, central Grand Hogback, Garfield County, Colorado (Madden, Dawn J.)

— Structure contour map of the top of the Rollins Sandstone Member of the Mesaverde Formation and Trout Creek Sandstone Member of the Iles Formation, Piceance Creek basin, Colorado (Johnson, R. C.)

— The Carter Sandstone Member of the Pierre Shale; a Cretaceous shoreline (Mieras, Barbara L.)

— The coal bed methane potential of the Sand Wash Basin, Green River coal region, Colorado (Boreck, Donna L., et al.)

— The effects of depositional environment on petrophysical properties of Mesaverde reservoirs, northwestern Colorado (Lorenz, J. C., et al.)

**Impact statements** *see under* environmental geology

*see under* environmental geology *under* Adams County; Arapahoe County; Archuleta County; Delta County; Dolores County; Eagle County; El Paso County; Elbert County; Garfield County; Grand County; Gunnison County; Hinsdale County; Jackson County; La Plata County; Larimer County; Mesa County; Moffat County; Montezuma County; Montrose County; Morgan County; Pitkin County; Rio Blanco County; Routt County; San Juan County; San Miguel County; Summit County; Weld County; Western U.S.

**Incertae sedis** *see* problematic fossils

**Inclusions** *see* fluid inclusions *see under* petrology

**Inclusions—mineral inclusions**

*composition:* Mineral inclusions in diamonds from the Sloan diatremes, Colorado-Wyoming state line kimberlite district, North America (Otter, M. L.)

*diamond:* Mineral inclusions in diamonds from kimberlites in Colorado and Wyoming (Meyer, Henry O. A.)

— Mineral inclusions in diamonds from the Sloan kimberlites, Colorado (Meyer, Henry O. A.)

*emplacement:* The petrology of Tertiary intrusions associated with epithermal veins in the Georgetown-Silver Plume District; Clear Creek County, Colorado (Connors, Katherine A.)

*kersantite:* Contemporaneous bimodal mafic-felsic magmatism at Red Mountain, Clear Creek County, and Climax, Colorado (Shannon, J. R., et al.)

*pyrrhotite:* Mineralogy, petrology, and magmatic conditions from the Fish Canyon Tuff, central San Juan volcanic field, Colorado (Whitney, James A.)

— Primary sulfide inclusions within the Fish Canyon ash-flow tuff and their implications for the paragenesis of calc-alkaline silicic magmas and related ore deposits (Whitney, James A.)

*quartz:* The quartz family minerals; Part 2 (Jones, Bob)

*zircon:* U–Th–Pb systematics of zircon inclusions in rock-forming minerals; a study of armoring against isotopic loss using the Sherman Granite of Colorado-Wyoming, USA (Aleinikoff, John N.)

**Inclusions—xenoliths**

*composition:* Kimberlite-transported nodules from Colorado-Wyoming; enrichment of shallow lithosphere by metasomatism (Eggler, David H., et al.)

*eclogite:* Petrology and geochemistry of eclogite xenoliths from Colorado-Wyoming kimberlites (Ater, Patricia C.)

— Petrology and geochemistry of mantle eclogite xenoliths from Colorado-Wyoming

kimberlites; recycled ocean crust? (Ater, P. C., et al.)

— Trace element, isotopic and seismic velocity characteristics of eclogites and other inclusions derived from the lower crust of southern Australia and the Colorado Plateau (Arculus, R. J., et al.)

*garnet lherzolite:* Zoned minerals in peridotite nodules; clues to mantle dynamics (Smith, D., et al.)

*granites:* Granite-tectonics of Pikes Peak composite batholith (Hutchinson, R. M.)

*granulites:* Lower crustal xenoliths from Colorado-Wyoming state line kimberlites (Bradley, S. D.)

*kimberlite:* Coexisting garnet and spinel in upper mantle xenoliths from Colorado-Wyoming kimberlites (Kirkley, M. B., et al.)

— Garnet + spinel xenoliths from Colorado-Wyoming kimberlites reflect Precambrian tectonic events (Kirkley, M.)

— Granulite facies and related xenoliths from Colorado-Wyoming kimberlite (Bradley, Scott D.)

— Granulite facies and related xenoliths from Colorado-Wyoming kimberlite (Bradley, S. D.)

— Kimberlite-transported nodules from Colorado-Wyoming; a record of enrichment of shallow portions of an infertile lithosphere (Eggler, David H., et al.)

— Lithosphere of the continental United States; xenoliths in kimberlites and other alkaline magmas (Eggler, D. H., et al.)

*mineral composition:* Coexisting garnet and spinel in upper mantle xenoliths from Colorado-Wyoming kimberlites (Kirkley, M. B., et al.)

*P-T conditions:* Eclogite-facies ultramafic xenoliths from Colorado Plateau kimberlites; comparison with eclogites in crustal environments, and evaluation of the subduction hypothesis (Helmstaedt, Herwart)

— Petrology of flecked gneisses in the northern Wet Mountains, Fremont County, Colorado (Trumbull, Robert Bruce)

*peridotites:* Mantle garnet-spinel transition zone demonstrated by xenoliths from Colorado-Wyoming kimberlites (Kirkley, M. B., et al.)

— Peridotite xenoliths in Colorado-Wyoming kimberlites (Kirkley, Melissa B.)

— Petrology and geochemistry of mantle eclogite xenoliths from Colorado-Wyoming kimberlites (Ater, P. C., et al.)

*rhyolites:* Bimodal rhyolite-kersantite suites of the Climax and Red Mountain porphyry molybdenum systems, CO (Bookstrom, A. A., et al.)

**Industrial minerals** *see* ceramic materials; mineral deposits, genesis

*see under* economic geology *under* Conejos County; Costilla County; Garfield County; Hinsdale County; Mesa County; Rio Blanco County *see under* economic geology

**Inert gases** *see* noble gases

### Ingleside Formation

Depositional environments and origin of bounding surfaces in the Ingleside Formation, Livermore area, Colorado (Sipe, Dwight Randy)

## Insecta—occurrence

- Depositional environments of the upper Fountain and Ingleside formations between Lyons and Loveland, Colorado (Schatz, Barry Allen)
- Facies relationships of the Ingleside Formation in northern Colorado and southeastern Wyoming (Rhoads, Holly)
- Precambrian structure, metamorphic mineral zoning, and igneous rocks in the foothills east of Estes Park, Colorado (Hutchinson, Robert M.)
- The Pierce Field structure (Sonnenberg, Stephen A.)

## Insecta see under paleontology

### Insecta—occurrence

- Eocene*: Fossils from the Green River Formation, Douglas Pass area, Colorado (Dayvault, Richard)
- Oligocene*: Florissant Fossil Beds National Monument (Anonymous)
- The Florissant Fossil Beds National Monument, Teller County, Colorado (Hutchinson, Robert M.)

## Insectivora see under Mammalia

### Insects—biostratigraphy

- Holocene*: Paleoenvironmental interpretations of Holocene insect fossil assemblages from four high-altitude sites in the Front Range, Colorado, U.S.A. (Elias, Scott A.)

### Insects—paleoecology

- Holocene*: Holocene tree limit positions and paleoenvironments of the Colorado Front Range, based on insect fossil assemblages from five high altitude sites (Elias, Scott A.)
- Paleoenvironmental interpretations of the late Holocene, Rocky Mountain national Park, Colorado, USA (Elias, S. A., et al.)
- Pleistocene*: Late Pleistocene paleoenvironmental studies from the Rocky Mountain region; a comparison of pollen and insect fossil records (Elias, Scott A.)
- New pollen and beetle analyses at the Mary Jane site, Colorado; evidence for late glacial tundra conditions (Short, Susan K.)

## Instruments see under hydrology; seismology; well-logging

- see under acoustical logging under well-logging
- see under electrical logging under well-logging
- see under electromagnetic logging under well-logging
- see under field studies under rock mechanics
- see under gravity methods under geophysical methods
- see under magnetic field under Earth
- see under remote sensing under mineral exploration

## Intrusions see igneous rocks; metamorphism; metasomatism

### see under petrology

### Intrusions—age

- paleomagnetism*: Paleomagnetic data bearing on Laramide and younger deformation of the northern Mosquito Range, central Colorado (Oppenheimer, William L.)
- Paleomagnetism and tectonic setting of the Red Mountain intrusive complex (Henderson molybdenum deposit); Clear Creek County, Colorado (Graaskamp, Garret)

### Intrusions—batholiths

*chemical composition*: Chemical variations and their significance in rocks of Silver Plume age (Gable, Dolores J.)

*composition*: Tabulation of modal and chemical analyses for Silver Plume Quartz Monzonite (Silver Plume Granite), Berthoud Plutonic Suite, Front Range, Colorado (Gable, Dolores J.)

*emplacement*: Granite-tectonics of Pikes Peak intrusive center of Pikes Peak composite batholith and road log up Pikes Peak toll road (Hutchinson, Robert M.)

— Mineralogy and crystallization conditions of Proterozoic anorogenic peraluminous granites of the Colorado Front Range (Anderson, J. Lawford)

— Proterozoic anorogenic two-mica granites; Silver Plume and St. Vrain batholiths of Colorado (Anderson, J. Lawford)

— Proterozoic anorogenic two-mica granites; Silver Plume and St. Vrain batholiths of Colorado; discussion and reply (Puffer, John H.)

— The geology, microstructures, and small-scale structures in the vicinity of Upper Cataract Lake, Gore Range, Colorado (Sauls, Brian D.)

— Transect of northern part of Pikes Peak Batholith (Hutchinson, Robert M.)

*evolution*: Trace-element evidence for the evolution of the Eolus Batholith, Needle Mountains, southwestern Colorado (Collier, James D.)

*genesis*: Age, origin and significance of the San Isabel Batholith, Wet Mountains, Colorado (Shuster, Robert D.)

— Granite-tectonics of Pikes Peak composite batholith (Hutchinson, R. M.)

— Petrogenesis of the Silver Plume, Log Cabin and Sherman granites, Colorado and Wyoming (Fountain, J. C., et al.)

*granites*: Granite-tectonics of Pikes Peak composite batholith, Colorado (Hutchinson, Robert M.)

— Petrology of the San Isabel Batholith, southern Wet Mountains, Colorado (Griffin, Thomas)

*petrology*: Petrology and structure of the southwest portion of the Precambrian Rawah Batholith, northcentral Colorado (Griswold, Mark L.)

— Petrology and U-Th potential of the eastern portion of the Precambrian Rawah Batholith, Larimer County, Colorado (Burch, Alvin L.)

— Proterozoic geology of the Middle Mountain area, Needle Mountains, Colorado (Gonzales, David A.)

### Intrusions—composition

*alkalic composition*: Mineral deposits associated with alkaline intrusive complexes; examples from Wyoming, Colorado, Montana, and California (Armbrustmacher, Theodore J.)

*interpretation*: Petrology and Pb-Sr isotope geochemistry of rocks related to the Lake City Caldera, western San Juan Mountains, California (Hon, Ken, et al.)

*zoning*: Reverse zoning in the resurgent intrusions of the Grizzly Peak Cauldron, Sawatch Range, Colorado (Fridrich, Christopher J.)

### Intrusions—contact metamorphism

*processes*: Infinite variations on a fenite theme (Heinrich, E. William)

### Intrusions—diatremes

*composition*: Kimberlite exploration, Red Feather area, and petrology of the Chicken Park diatreme, northern Colorado (Rogers, Jack A., Jr.)

— Mineral inclusions in diamonds from the Sloan diatremes, Colorado-Wyoming state line kimberlite district, North America (Otter, M. L.)

*detection*: Evaluation of geophysical techniques for diatreme delineation in the Colorado-Wyoming kimberlite province (Carlson, J. A., et al.)

— Exploration for kimberlite and geophysical delineation of diatremes, W. State Line District, Colo./Wyo. (Carlson, Jon Andrew)

— Multispectral remote sensing techniques applied to exploration for kimberlite diatremes, Laramie Range, Wyoming-Colorado (Marks, Janet E.)

*distribution*: Use of reflectance spectra and digital processing to identify kimberlite diatremes in the Colorado-Wyoming district (Marks, Janet E.)

*igneous rocks*: A Colorado-Wyoming border diatreme and a possible potential kimberlite indicator plant (Collins, Donna B.)

— Cooling rate estimates from mineral zonation; resolving power and applications (Wilson, C. R.)

— Evaluation of geophysical techniques for diatreme delineation in the Colorado-Wyoming kimberlite province (Carlson, J. A., et al.)

— Zoned minerals in peridotite nodules; clues to mantle dynamics (Smith, D., et al.)

*inclusions*: Trace element, isotopic and seismic velocity characteristics of eclogites and other inclusions derived from the lower crust of southern Australia and the Colorado Plateau (Arculus, R. J., et al.)

*kimberlite*: Mineralogical and textural-genetic classification of kimberlites in northern Colorado and southern Wyoming, U.S.A. (McCallum, M. E., et al.)

— Preliminary results of resistivity investigations of Colorado-Wyoming kimberlite diatremes (Memmi, J. M., et al.)

— Remote sensing techniques applied to kimberlite exploration in Southeast Wyoming and north-central Colorado (Marks, Janet E.)

*pipes*: Mantle with oceanic affinities beneath the Colorado Plateau; REE evidence (Roden, M. F., et al.)

### Intrusions—dikes

*alkalic composition*: Gases in alkalic rocks from McClure Mountain, Colorado (Heinrich, E. W., et al.)

*aureoles*: Paleotemperatures based on vitrinite reflectance of shales and limestones in igneous dike aureoles in the Upper Cretaceous Pierre Shale, Walsenburg, Colorado (Bostick, Neely H.)

*carbonatites*: Carbonatite dikes of the Chupadera Mountains, Socorro County, New Mexico (Van Allen, Bruce R., et al.)

*contact metamorphism*: The effect of thermal metamorphism on quartz shape: Fourier-series analysis (Murray, David H., Jr.)

*dike swarms*: Alteration zones related to igneous activity, Spanish Peaks area, Las Animas and Huerfano counties, Colorado (Hutchinson, Robert M.)

— Dyke emplacement at Spanish Peaks, Colorado (Smith, R. P.)

— Petrologic evidence of a Paleozoic rift system in Oklahoma and Colorado (Larson, Edwin E., et al.)

— Petrologic, paleomagnetic, and structural evidence of a Paleozoic rift system in Oklahoma, New Mexico, Colorado, and Utah (Larson, E. E., et al.)

*distribution*: Kings Canyon lithium pegmatites, Crystal Mountain District, Larimer County, Colorado (Jacobson, Mark I.)

— Mapping dikes from thematic mapper imagery; Raton Basin (Merin, Ira S.)

*emplacement*: Changing stresses during emplacement of the radial dike swarm at Spanish Peaks, Colorado (Muller, Otto H.)

— Contrasts in the anatomy of neighboring alkalic carbonatitic complexes (Heinrich, E. W.)

— Field relations between dikes and joints; emplacement processes and paleostress analysis (Delaney, Paul T., et al.)

— Interpretation of rock and vapor phase relations in the Ruby Mountain volcanic complex, Chaffee County, Colorado (Schooler, Richard A.)

— Paleomagnetism of Cambro-Ordovician intrusives from Colorado (Lynnes, C. G., et al.)

— Reinterpretation of the geology of the Henderson porphyry molybdenum deposit, Colorado (Carten, Richard B., et al.)

— Tertiary intrusive activity and mineralization in the Empire mining district, Grand, Gilpin and Clear Creek counties, Colorado (Myint, Khin Maung)

*genesis*: Petrogenesis of an orbicular lamprophyre dike, Fremont County, Colorado (Alexander, D. H.)

— The Mount Antero and California intrusions, Chaffee County, Colorado; evidence for early evolution of pegmatitic fluids (Shannon, James R.)

*kimberlite*: History of the Colorado-Wyoming state line diatremes (Collins, Donley S.)

*lineation*: Geology of dikes in part of the Spanish Peaks dike system, south-central Colorado (Smith, Richard P.)

*mineral composition*: Discovery of the George Creek Colorado kimberlite dikes (Carlson, J. A.)

*occurrence*: Data from ground magnetic survey of the Ralston dike, Jefferson County, Colo. (Hasbrouck, W. P., et al.)

*paleomagnetism*: Paleomagnetism of a Late Cambrian or Early Ordovician dike from Lodore Canyon, northwestern Colorado (Hudson, Mark R.)

*petrography*: Structure and petrography of Spanish Peaks dikes, south central Colorado (Smith, Richard P.)

*petrology*: Chemical and mineralogical variations in the radial dikes of Difficulty Creek intrusive center, San Juan Mountains, Colorado (Foss, Ted Harry)

— Igneous dikes of the eastern Uinta Mountains, Utah and Colorado (Ritzma, Howard R.)

— The petrology of Tertiary intrusions associated with epithermal veins in the Georgetown-Silver Plume District; Clear Creek County, Colorado (Connors, Katherine A.)

— The petrology of Tertiary intrusions associated with epithermal veins in the Georgetown-Silver Plume region, Clear Creek County, Colo. (Connors, Katherine A., et al.)

*ring dikes*: A quantitative contamination model; application to the Virginia Dale ring-dike complex, Colorado-Wyoming (Frappa, Richard H.)

#### **Intrusions—emplacement**

*age*: Paleomagnetic evidence regarding the eruptive and resurgent history of the Lake City Caldera, San Juan Mountains, Colorado (Reynolds, R. L., et al.)

*controls*: Mechanics of pegmatite intrusion (Brisbin, W. C.)

*rifting*: Petrologic, paleomagnetic, and structural evidence of a Paleozoic rift system in Oklahoma, New Mexico, Colorado, and Utah; discussion (Purucker, Michael)

*zoning*: Emplacement of the reversely zoned central intrusions of the Grizzly Park Cauldron, Sawatch Range, Colorado (Fridrich, Christopher J.)

#### **Intrusions—genesis**

*complexes*: Alkaline rock complexes in the Wet Mountains area, Custer and Fremont counties, Colorado (Armbrustmacher, Theodore J.)

*indicators*: Origin of Colorado mineral belt Laramide-Tertiary magmatism; lead and strontium isotope evidence (Stein, Holly J.)

— Zircons: a petrogenic indicator in the San Isabel Batholith, Wet Mountains, Colorado (King, Harvey Dennis)

#### **Intrusions—geochemistry**

*aureoles*: Contact zones and hydrothermal systems as analogues to repository conditions (Wollenberg, H. A.)

*isotopes*: Oxygen and hydrogen isotope variations in mid-Tertiary intrusions, Gunnison County, Colorado (Weidemann, Donna Elizabeth)

— Stable isotopic composition of fluid inclusions in a porphyry-style hydrothermal system near Silverton, San Juan Mountains, Colorado (Ringrose, C. R., et al.)

#### **Intrusions—laccoliths**

*composition*: Geology and petrography of Crested Butte Laccolith, Gunnison County, Colorado (Bevier, Mary Lou)

*emplacement*: Seismic investigation of the Big Pie Structure, a probable laccolithic intrusion, Routt County, Colorado (Hickenlooper, John W.)

#### **Intrusions—occurrence**

*pegmatite*: Trip 12, Granite pegmatites of the Black Hills, South Dakota and Front Range, Colorado (C#3/erny#2., P., et al.)

#### **Intrusions—petrography**

*breccia*: Petrography and trace metal chemistry of intrusion breccias, eastern Breckenridge mining district, Summit County, Colorado (Warlow, Joseph Charles)

#### **Intrusions—petrology**

*genesis*: Geology, geochemistry, and genesis of the Engineer Pass intrusive complex, San Juan Mountains, CO (Maher, Brian J.)

*petrography*: Petrography of certain Tertiary igneous intrusives of north-central Gunnison County, Colorado (Kramsky, Melvin Bernard)

— The geology of Upper Spring Creek and a petrographic analysis of the igneous intrusives of the area (Conyers, William Patrick)

*siliceous composition*: Mechanical properties of silicic intrusions based on patterns of deformation around the Creede Caldera (Gephart, J. W.)

#### **Intrusions—pipes**

*breccia pipes*: A fluid inclusion and sulfur isotopic study of precious and base metal mineralization spatially associated with the Patch and Gold Cup breccia pipes, Central City, Colorado (Spry, Paul G.)

— Apatite fission-track age for the Bull Domingo boulder pipe, Custer County, Colorado (Sharp, W. N.)

— Geological, fluid inclusion and sulfur isotopic studies of Au-Ag-Pb-Zn-Cu breccia pipe deposits, Central City, Colorado (Spry, Paul G.)

— Geology, geochemistry, and genesis of the Engineer Pass breccia pipe and intrusive complex, western San Juan Mountains, Colorado (Maher, Brian J.)

— Great pockets: the National Belle Mine (Smith, Arthur E., Jr.)

#### **Intrusions—plutons**

*absolute age*: U-Pb zircon geochronology of early Proterozoic plutonism in N. Colorado and SE Wyoming (Premo, Wayne R.)

*composition*: U-Pb zircon chronology of early and middle Proterozoic igneous events in the Gunnison, Salida, and Wet Mountains areas, Colorado (Bickford, M. E., et al.)

*contact metamorphism*: Redistribution of U and Th in shallow plutonic environments (Gosnold, William D., Jr.)

*crystallization*: Evolution and crystallization of Proterozoic anorogenic plutons of the south-western U.S. (Anderson, J. Lawford)

*distribution*: Aeromagnetic and gravity models of the pluton below the Lake City Caldera, Colorado (Grauch, V. J. S.)

— Rock units of the Precambrian basement in Colorado (Tewo, Ogden)

*emplacement*: Age constraints on early Proterozoic deformation in the northern Front Range, Colorado (Barovich, Karin Marie)

— Proterozoic geology of the Needle Mtns., Colorado (Tewksbury, B. J.)

— Proterozoic plutons and pegmatites of the Pikes Peak region, Colorado (Wobus, Reinhard A.)

*geochemistry*: Chemical characteristics and U-Pb zircon ages of Proterozoic rocks in the Wet Mountains region, Colo., USA (Cullers, Robert L.)

— Geochemistry and evolution of the South Platte granite-pegmatite system, Jefferson County, Colorado (Simmons, W. B., et al.)

— Geochemistry of the Proterozoic igneous and metaigneous rocks near Gunnison, Colorado (Blackburn, W. H.)

*granites*: Proterozoic granite rhyolite terranes of the southern Midcontinent, USA (Bickford, M. E.)



*observations:* Aeromagnetic and gravity models of the Lake City Caldera, Colorado (Grauch, V. J. S.)

*petrology:* Geology and uranium mineralization of the Florida Mountain area, Needle Mountains, southwestern Colorado (Collier, James D.)

— Petrology and geochemistry of the Silver Plume-age plutons of the southern and central Wet Mountains, Colorado (Bender, Russell Berryman, Jr.)

— The petrology of foliated plutons at Garell Peak and Oak Creek, northern Wet Mountains, Colorado (McCabe, Marc)

*textures:* Geology of the Mount Aetna cauldron complex, Sawatch Range, Colorado (Shannon, James R.)

**Intrusions—ring complexes**

*geochemistry:* I, An  $^{18}\text{O}/^{16}\text{O}$  investigation of the Lake City Caldera, San Juan Mountains, Colorado; II,  $^{18}\text{O}/^{16}\text{O}$  relationships in Tertiary ash-flow tuffs from complex caldera structures in central Nevada and San Juan Mountains, Colorado (Larson, Peter Brennan)

*petrology:* Hydrothermal fluid flow patterns associated with resurgent doming of the 23 m.y.-old Lake City Caldera, San Juan Mountains, Colorado (Larson, P. B.)

**Intrusions—sills**

*emplacement:* Geology of the Granby and Strawberry Lake 7 1/2' quadrangles, Grand County, Colorado (Schroeder, David Alan)

— Silicic magmas derived by fractional crystallization from Miocene minette, Elkhead Mountains, Colorado (Leat, P. T., et al.)

*petrology:* A petrographic and chemical study of coal dikes intruding lamprophyre sills in the Purgatoire River Valley of Colorado (Podwysocki, M. H.)

**Intrusions—stocks**

*absolute age:* Isotopic geochemistry and chronology of porphyry-style mineralisation near Ophir, San Juan Mountains, Colorado (Jackson, S. E., et al.)

— Rb-Sr whole-rock age of the Eldora-Bryan Stock, Front Range, Colorado (Brookins, D. G.)

*chemical composition:* A lead, strontium, and sulfur isotope study of Laramide-Tertiary intrusions and mineralization in the Colorado mineral belt with emphasis on climax-type porphyry molybdenum systems plus a summary of other newly acquired isotopic and rare earth element data (Stein, Holly Jayne)

*composition:* Reverse zoning in the resurgent intrusions of the Grizzly Peak cauldron, Sawatch Range, Colorado (Fridrich, Christopher J.)

*contact metamorphism:* Radwaste storage in crystalline rocks; a natural analog (Brookins, Douglas G., et al.)

*cooling:* Patterns of oxygen isotope depletion, multiple hydrothermal circulation systems, and the cooling history of the Stony Mountain intrusive complex, Colorado (Crowley, Julia C.)

*emplacement:* Allard Stock, La Plata Mountains, Colorado: an enigmatic porphyry copper-precious metals deposit (Werle, James L.)

— Henderson porphyry molybdenum deposit; cyclic alteration-mineralization and geochemi-

cal evolution of topaz- and magnetite-bearing assemblages (Seedorff, Charles Eric)

— Tilting of Urad-Henderson and Climax porphyry molybdenum systems, central Colorado, as related to northern Rio Grande Rift tectonics (Geraghty, Ennis P., et al.)

*engineering properties:* The Eldora-Bryan Mountain Stock as a natural analog to buried wastes; geochemistry and geochronology (Abashian, Mark S.)

*evolution:* Allard Stock, La Plata Mountains, Colorado; an alkaline rock-hosted porphyry copper - precious metal deposit (Werle, James L., et al.)

— Systematic stress evolution indicated by vein patterns related to stock crystallization, Henderson Mine, CO (Geraghty, Ennis P.)

*geochemistry:* A strontium isotope study of Laramide intrusions and associated mineralisation near Central City, Colorado (Dickin, A. P., et al.)

— Comparison of field-based studies of the Henderson porphyry molybdenum deposit, Colorado, with experimental and theoretical models of porphyry systems (Carten, R. B., et al.)

— Geologic setting and petrochemistry of the Late Cretaceous-early Tertiary intrusives in the northern Front Range mineral belt, Colorado (Gable, Dolores J.)

— Natural analogues; Alamosa River monzonite intrusive into tuffaceous and andesitic rocks (Brookins, Douglas G., et al.)

— Ore petrology and geochemistry of Tertiary gold telluride deposits of the Colorado mineral belt (Saunders, James A.)

— Trace element mineralogy in the porphyry molybdenum environment (Gunow, Alexander James)

— Trace metal geochemistry and hydrothermal alteration of three molybdenum-bearing stocks, Gunnison and Pitkin counties, Colorado (Perkins, R. A.)

*granites:* Oxygen isotope compositions of selected Laramide-Tertiary granitoid stocks in the Colorado mineral belt and their bearing on the origin of climax-type granite-molybdenum systems (Hannah, Judith L.)

*hydrothermal conditions:* Relationship of stock textures and compositions to hydrothermal systems, Henderson Mine, CO (Walker, Bruce M., et al.)

*major-element analyses:* Allard Stock, La Plata Mountains, Colorado; a porphyry copper-precious metals deposit in potassic alkaline rocks (Werle, James L., et al.)

*mineralization:* Controls on molybdenite deposition at Henderson Mine, Empire, Colorado (Carten, R. B., et al.)

— Cyclic development of hydrothermal mineral assemblages related to multiple intrusions at the Henderson porphyry molybdenum deposit, Colorado (Seedorff, Eric)

*petrology:* The Mt. Bellview, Colorado igneous-hydrothermal-breccia complex; a calc-alkaline molybdenite occurrence (Lynch, Willy C., et al.)

*properties:* Suitability of crystalline rocks for radwaste storage; I, Investigation of two plutons, Colorado (Brookins, D. G., et al.)

*zoning:* Hydrothermal alteration and oil show at the Summer Coon intrusive center, Saguache County, Colorado (Loken, Trygve)

**Invertebrata** *see* Arthropoda; Echinodermata; foraminifera; ichnofossils; Insecta; Mollusca; problematic fossils; Radiolaria; Trilobita

**invertebrates** *see* brachiopods; bryozoans; conodonts; corals; echinoderms; foraminifers; mollusks; ostracods; radiolarians

**invertebrates—biostratigraphy**

*Cretaceous:* Biostratigraphic units and tectonism in the mid-Cretaceous foreland of Wyoming, Colorado, and adjoining areas (Merewether, E. A.)

**invertebrates—ecology**

*fluvial environment:* Appraisal of water quality in Piceance Creek using benthic invertebrates (Covay, Kenneth J.)

— Benthic invertebrates in selected streams of the Piceance Creek basin, northwestern Colorado, water years 1977-81 (Covay, Kenneth J., et al.)

— Data compilation of benthic invertebrates from tributary streams of the Yampa and North Platte River basins, northwestern Colorado (Britton, L. J.)

— Reconnaissance of benthic invertebrates from tributary streams of the Yampa and North Platte River basins, northwestern Colorado (Britton, Linda J.)

**iridium—abundance**

*claystone:* Geologic framework of nonmarine Cretaceous-Tertiary boundary sites, Raton Basin, New Mexico and Colorado (Pillmore, C. L., et al.)

**iridium—geochemistry**

*clay:* Trace element patterns at a non-marine Cretaceous-Tertiary boundary (Gilmore, J. S., et al.)

*claystone:* Characteristic magnetization of Cretaceous/Tertiary boundary claystone in Raton Basin is reversed (Shoemaker, E. M., et al.)

— Disruption of the terrestrial plant ecosystem at the Cretaceous-Tertiary boundary, Western Interior (Tschudy, R. H., et al.)

— Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado (Pillmore, Charles L.)

*coal:* Iridium abundance anomalies at the palynological Cretaceous/Tertiary boundary in coal beds of the Raton Formation, Raton Basin, New Mexico and Colorado (Pillmore, C. L., et al.)

*sandstone:* The Ojo Alamo Sandstone and the Cretaceous-Tertiary boundary, San Juan Basin, New Mexico and Colorado (Fassett, James E.)

*sedimentary rocks:* Iridium abundance maxima in the upper Cenomanian extinction interval (Orth, C. J., et al.)

— Iridium anomaly at the Cretaceous-Tertiary boundary in the Raton Basin (Orth, Charles J., et al.)

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**Irk Formation**

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**Iron—geochemistry**

*oil shale*: Sulfur compound, organic-carbon, carbonate-carbon, iron, and mineral composition data on samples from the Green River Formation, Wyoming, Colorado, and Utah (Tuttle, Michele L.)

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*streams*: Identifying in-stream variability; sampling iron in an acidic stream (Bencala, Kenneth E.)

*surface water*: Iron photoreduction and oxidation in an acidic mountain stream (McKnight, D. M., et al.)

— Reactive iron transport in an acidic mountain stream in Summit County, Colorado; a hydrologic perspective (McKnight, Diane M.)

*water*: Diel variations in iron chemistry in an acidic stream in the Colorado Rocky Mountains, U.S.A. (McKnight, Diane M.)

**Iron Dike**

Paleomagnetic assessment of basement rotation along the eastern flank of the Front Range near Boulder, Colorado (Davis, John Wesley)

— Precambrian geology of the northern Front Range, Colorado (Braddock, William A.)

**Iron ores** *see under* economic geology; mineral deposits, genesis

**Iron ores—genesis**

*igneous processes*: Composition and activity of sulfurous species in quenched magmatic gases associate with pyrrhotite-bearing silicic systems (Whitney, James A.)

**Irving Formation**

A geologic investigation of the early Proterozoic Irving Formation, southeastern Needle Mountains, Colorado (Gonzales, David A.)

— Correlations and revisions of Precambrian stratigraphy, Needle Mountains, southwest Colorado, and Tusas Mountains, north-central New Mexico (Burns, L. K.)

— Polyphase deformation in allochthonous rocks of the Precambrian Uncompahgre Formation, Needle Mountains, southwestern Colorado (Tewksbury, Barbara J.)

— Proterozoic geology of the Middle Mountain area, Needle Mountains, Colorado (Gonzales, David A.)

— Proterozoic geology of the Needle Mountains; a summary (Tewksbury, Barbara J.)

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*see under* structural geology *under* Hinsdale County; Mineral County; Rio Grande County; Rocky Mountains; Saguache County

*see under* tectonophysics *under* Great Plains; Southwestern U.S.

*see under* tectonophysics

**Isotope dating** *see* absolute age**Isotopes** *see* absolute age; geochronology

*see under* geochemistry

**Isotopes—analysis**

*uranium ores*: Integration of 35 geological, geochemical, and geophysical data sets for the Montrose 1° × 2° Quadrangle, Colorado (Bolivar, Stephen L., et al.)

**Isotopes—argon**

*Ar-40/Ar-39*: Argon diffusion in partially outgassed alkali feldspars; insights from <sup>40</sup>Ar/<sup>39</sup>Ar analysis (Zeitler, Peter K.)

**Isotopes—barite deposits**

*ratios*: Use of epigenetic barite to document the origin and movement of brines on the Colorado Plateau, Colorado and Utah (Breit, George N.)

**Isotopes—calcium**

*Ca-42/Ca-40*: Application of the potassium-calcium geochronometer to problems in geochronology and petrogenesis (Marshall, Brian David)

**Isotopes—carbon**

*C-13/C-12*: Character and origin of natural gases from Wattenberg area, Denver Basin, Colorado (Rice, Dudley D.)

— Comparison of natural gases produced from Upper Cretaceous Fruitland Formation coal beds and adjacent reservoirs, San Juan Basin, New Mexico and Colorado (Rice, Dudley D.)

— Depletion of <sup>13</sup>C in Cretaceous marine organic matter; source, diagenetic, or environmental signal? (Dean, Walter E., et al.)

— Distinction between in-situ biogenic gas and migrated thermogenic gas in ground water, Denver Basin, Colorado (Rice, Dudley D.)

— Drought indicated in carbon-13/carbon-12 ratios of Southwestern tree rings (Leavitt, Steven W.)

— Geochemical correlation of Paleozoic oils, northern Denver Basin; implications for exploration (Clayton, J. L., et al.)

— Geochemical evidence for Paleozoic oil in Lower Cretaceous O Sandstone, northern Denver Basin (Clayton, J. L.)

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— Humic substances in groundwater (Thurman, E. M.)

— Identification and significance of coal-bed gas, San Juan Basin, northwestern New Mexico and southwestern Colorado (Rice, Dudley D., et al.)

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— Organic geochemistry of Green River Formation oil shales, Piceance Creek basin, Colorado (Meddaugh, W. S., et al.)

— Origin of solid bitumens, with emphasis on biological marker results (Curiale, Joseph A.)

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— Stable carbon isotopic analysis of sedimentary organic matter by stepped combustion (Gilmour, I.)

— Stratigraphic significance of <sup>13</sup>C/<sup>12</sup>C ratios in Mid-Cretaceous rocks on the Western Interior, U.S.A. (Pratt, Lisa M.)

— Temperature effects on kerogen and on molecular and isotopic composition of organic matter in Pierre Shale near an igneous dike (Clayton, J. L.)

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**Isotopes—cesium**

*Cs-137*: A time resolution methodology for assessing the quality of lake sediment cores that are dated by <sup>137</sup>Cs (Miller, Kevin M.)

**Isotopes—copper ores**

*ratios*: Chemical and thermal evolution of diagenetic fluids and the genesis of uranium and copper ore in and adjacent to the Paradox Basin with emphasis on the Lisbon Valley and Temple Mountain areas, Utah and Colorado (Morrison, Stan Jay)

**Isotopes—faults**

*fault zones*: Uranium-series nuclides in the Golden Fault, Colorado, U.S.A., dating latest fault displacement and measuring recent uptake of radionuclides by fault-zone materials (Szabo, B. J.)

**Isotopes—fluid inclusions**

*ratios*: Stable isotopic composition of fluid inclusions in a porphyry-style hydrothermal system near Silverton, San Juan Mountains, Colorado (Ringrose, C. R., et al.)

**Isotopes—gold ores**

*ratios*: The origin and significance of the stratabound, carbonate-hosted gold deposits at Tennessee Pass, Colorado (Beatty, David W., et al.)

*stable isotopes*: Gold in the Central City mining district, Colorado (Wallace, Alan R.)

**Isotopes—ground water**

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*stable isotopes*: Ground-water flow and quality near Canon City, Colorado (Hearne, Glenn A.)

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*D/H*: A re-interpretation of  $\delta D_{H_2O}$  values of inclusion fluids in quartz from shallow ore bodies (Foley, Nora K., et al.)

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**isotopes—igneous rocks**

*carbonatites*: Petrology of alkaline rocks in the carbonatite complex at Iron Hill, Powderhorn District, Gunnison County, Colorado; new geochemical and isotopic data (Armbrustmacher, Theodore J.)

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— Stable isotope geochemistry of the Creede, Colorado, hydrothermal system (Rye, Robert O., et al.)

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— Stable isotope and fluid inclusion investigations of epithermal vein and porphyry molybdenum mineralization in the Rico mining district, Colorado (Larson, Peter B.)

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**isotopes—noble gases**

*abundance*: Non-atmospheric noble gases from  $\text{CO}_2$  well gases (Caffee, M. W., et al.)

**isotopes—osmium**

*Os-187/Os-186*: Osmium-187/osmium-186 in manganese nodules and the Cretaceous-Tertiary boundary (Luck, J. M.)

**isotopes—oxygen**

*ground water*: Ground water age determinations, Piceance Creek basin, Colorado (Kimball, Briant A.)

*O-18/O-16*:  $^{18}\text{O}/^{16}\text{O}$  ratios in ash-flow tuffs and lavas erupted from the central Nevada caldera complex and the central San Juan caldera complex, Colorado (Larson, P. B.)

—  $^{18}\text{O}/^{16}\text{O}$  relationships in hydrothermally altered rocks of the 22.5 m.y. Lake City Caldera, San Juan Mts., Colo. (Larson, Peter B.)

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- isotopes—petroleum**  
*ratios:* Origin and source-rock potential of the Sharon Springs Member of the Pierre Shale, Colorado and Kansas (Gautier, Donald L., et al.)
- isotopes—plutonium**  
*Pu-240/Pu-239:* Remote plutonium contamination and total inventories from Rocky Flats; discussion (Merrill, G. L., Jr., et al.)
- isotopes—pollution**  
*radioactive isotopes:* Ecological considerations of the behavior of plutonium in the environment (Hanson, Wayne C.)
- Plutonium-239 contamination in the Denver area; reply (Poet, S. E.)
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- isotopes—radium**  
*Ra-226:* Releases of radium and uranium into Ralston Creek and Reservoir, Colorado, from uranium mining (Yang, I. C.)
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*Rn-222:* Field measurements of in situ  $^{222}\text{Rn}$  concentrations in soil based on the prompt decay of the  $^{214}\text{Bi}$  counting rate (Stieff, L. R., et al.)
- isotopes—ratios**  
*fluid inclusions:* Geology and significance of the auriferous manto deposits at Tennessee Pass, Colorado (Beaty, David W., et al.)
- stable isotopes:* Isotopic research, climate, and the genesis of mineral deposits (Doe, B. R.)
- isotopes—salt**  
*ratios:* The origin of water in salt (Knauth, L. Paul)
- isotopes—sedimentary rocks**  
*carbonate rocks:* Diagenesis of late Proterozoic carbonates; the Beck Spring Dolomite of eastern California (Zempolich, William G., et al.)
- fractionation:* A preliminary interpretation of carbon and oxygen isotopic data from surface rocks, Southern Ute Indian Reservation, southwestern Colorado (Henry, Mitchell E.)
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- Isotopic and sedimentological study of the lower Niobrara Formation, Lyons, Colorado (Pratt, Lisa M.)
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- Paleofluids in the copper and uranium bearing sandstones, central Colorado Plateau; fluid inclusion and isotopic evidence in calcite (Meunier, J. D.)
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- isotopes—soils**  
*radioactive isotopes:* Colorado; the legacy of uranium mining (Hazle, Albert J.)
- isotopes—strontium**  
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- Age, origin and significance of the San Isabel Batholith, Wet Mountains, Colorado (Shuster, Robert D.)
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*S-34/S-32:* A fluid inclusion and sulfur isotopic study of precious and base metal mineralization spatially associated with the Patch and Gold Cup breccia pipes, Central City, Colorado (Spry, Paul G.)
- Correlation between the  $\delta^{34}\text{S}$  of pyritic and organic sulfur in coal and oil shale (Price, Fred T.)
- Cretaceous shales from the Western Interior of North America; sulfur/carbon ratios and sulfur-isotope composition (Gautier, Donald L.)
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- Stratigraphic variation of sulfur isotopes in Colorado Corehole number 1 (Smith, John Ward)
- Sulfur isotopic variations in low-sulfur coals from the Rocky Mountain region (Hackley, Keith C.)
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## J

## J Sandstone

- Burial history reconstruction of the Lower Cretaceous J Sandstone in the Wattenberg Field, Colorado, "hot spot" (Higley, D. K.)
- Core porosity, permeability, and vitrinite reflectance data from the Lower Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)
- Core porosity, permeability, and vitrinite reflectance data from the Lower Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)
- Evolution of formation fluids in the "J" Sandstone, Denver Basin, Colorado (Ottman, J. D.)
- Exploration intensity map of the Cretaceous J Sandstone, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, D. K., et al.)
- Investigation of stratigraphic and paleostructural controls on hydrocarbon migration and entrapment in Cretaceous D and J sandstones of the Denver Basin (Tainter, Patrick A.)
- Isoreflectance map of the J Sandstone in the Denver Basin of Colorado (Higley, D. K., et al.)
- Median-permeability contour maps of the J Sandstone, Dakota Group, in the Denver Basin,

- Colorado, Nebraska, and Wyoming (Higley, D. K.)
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- Grizzly Peak Cauldron*: Geology and ore deposits of the Grizzly Peak Cauldron Complex, Sawatch Range, Colorado (Cruson, Michael G.)
- maps*: Geologic map of the Mount Richthofen Quadrangle and the western part of the Fall River Pass Quadrangle, Grand and Jackson counties, Colorado (O'Neill, J. Michael)
- Geology and petroleum potential, Colorado Park Basin province, north-central Colorado (Maughan, Edwin K.)
- Preliminary geologic map of the southwest third of Kings Canyon Quadrangle, North Park, Jackson County, Colorado (Kinney, D. M.)
- Mount Zirkel Wilderness*: Geological appraisal (Snyder, George L.)
- North Park*: Geology of the Sheep Mountain-Delaney Butte area, North Park, Colorado (Welsh, J. E.)
- Rabbit Ears Pass*: Geology of Rabbit Ears Pass area, Jackson and Grand counties, Colorado (Scott, R. W.)
- regional*: Road log; Steamboat Springs to Colorado-Wyoming line (Petta, Timothy J.)

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- coal*: Chemical analyses of coal and coal-associated rock samples from the Coalmont Formation, McCallum and Coalmont areas, North Park, Jackson County, Colorado (Hatch, Joseph R., et al.)
- copper ores*: Application of trace elements and isotopes for discriminating between porphyry molybdenum, copper, and tin systems and the implications for predicting the grade (Karimpour, M. H.)
- Petrogenesis of the A.O. porphyry copper complex in Jackson and Grand Counties, northwestern Colorado (Karimpour, M. H.)
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- Stratigraphy of upper Morrison and lower Dakota Group of Front Range, Colorado; new

- play in central Denver Basin? (Wyatt, Danny J.)
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— The distribution and chemistry of rare-earth minerals in the South Platte pegmatite district, Colorado, and their genetic implications (Brewster, Renee Harrison)

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— Bottom-sediment chemistry and water quality of the South Platte River in the Denver metropolitan area, Colorado (Steele, Timothy D.)

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— The correlation of the Jurassic Bluff and Junction Creek sandstones in southeastern Utah and southwestern Colorado (Cadigan, R. A.)

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— Geology of the Lost-Lake Duling Pass area, Sangre de Cristo Mountains, Colorado (Okumura, Terrence A.)

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— Biogeographic influences on Early Cretaceous paleocommunities, Western Interior (Scott, R. W.)

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— Significance of the rate of deposition of uppermost Upper Cretaceous rocks of the San Juan Basin, New Mexico and Colorado (Fassett, James E.)

— Stratigraphic palynology of Cretaceous-Paleocene boundary rocks, San Juan Basin, Colorado and New Mexico (Newman, K. R.)

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**La Jara Canyon Tuff**

Cyclical ash-flow tuff volcanism, Platoro-Summitville caldera complex, Southeast San Juan volcanic field, south-central Colorado (Dungan, M. A.)

— Oligocene volcanic rocks in the La Veta Pass area, northern Sangre De Cristo Mountains, south-central Colorado (Kearney, Barbara Cowles)

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*Engineer Mountain Quadrangle*: Geology of the eastern half of the Engineer Mountain Quadrangle, San Juan and La Plata counties, Colorado (Williams, Wilbur S.)

*guidebook*: Field trip guidebook: paleotectonics; San Juan Mountains; Dolores Formation; Paleosols and depositional systems; Jurassic depositional systems; San Juan Basin:

Quaternary deposits and soils; Durango area (Brew, Douglas C.)

— First day, road log from Durango, Colorado around northwest rim of San Juan Basin via Cedar Hill, Aztec and La Plata, New Mexico and Soda Springs, Marvel, and Breen, Colorado (Fassett, James E.)

— Second day, road log from Durango, Colorado around northeast rim of San Juan Basin via Bayfield, Chimney Rock, Arboles, Allison, and Ignacio, Colorado and back to Durango (Fassett, James E.)

*Ignacio Quadrangle*: Geology of a southwest portion of the Ignacio Quadrangle, La Plata County, Colorado (Voris, Richard Hensler)

*maps*: A geologic investigation of the early Proterozoic Irving Formation, southeastern Needle Mountains, Colorado (Gonzales, David A.)

— Geologic and geochemical maps of the West Needle Wilderness Study Area, San Juan and La Plata counties, Colorado (Van Loenen, R. E.)

— Geologic map of the Aztec 1' by 2' Quadrangle, northwestern New Mexico and southern Colorado (Manley, Kim, et al.)

— Geologic map of the Durango Quadrangle, southwestern Colorado (Steven, T. A., et al.)

— Geologic reconnaissance map of the Rules Hill and Ludwig Mountain quadrangles, La Plata County, Colorado (Hail, W. J., Jr., et al.)

— Preliminary geologic map of the Hermosa Peak Quadrangle, Dolores, San Juan, La Plata, and Montezuma counties, Colorado (Pratt, W. P.)

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— Distribution of coal beds in the Fruitland Formation, Southern Ute Indian Reservation, Archuleta and La Plata counties, southwestern Colorado (Sandberg, Dorothy T.)

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*fuel resources*: Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

— Weminuche Wilderness, Colorado (Steven, Thomas A.)

*gold ores*: Bessie G; a high-grade epithermal gold telluride deposit, La Plata County, Colorado, U.S.A. (Saunders, James A.)

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- Mineral resource potential map of the West Needle Wilderness Study Area, San Juan and La Plata counties, Colorado (Van Loenen, R. E.)
- metal ores:* Geology and uranium mineralization of the Florida Mountain area, Needle Mountains, southwestern Colorado (Collier, James D.)
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  - Long Hollow (gas) (Mickel, Edward G.)
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- La Plata County—environmental geology**
- impact statements:* Proposed resource management plan and environmental impact statement for the San Juan/San Miguel planning area (U. S. Bureau of Land Management, Montrose District)
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- land use:* Land use and land cover and associated maps for Durango, Colorado (U. S. Geological Survey)
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- La Plata County—geochemistry**
- trace elements:* A geologic investigation of the early Proterozoic Irving Formation, southeastern Needle Mountains, Colorado (Gonzales, David A.)
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- La Plata County—hydrogeology**
- ground water:* Availability and chemical characteristics of ground water in central La Plata County, Colorado (Brogden, R. E.)
- Estimates of vertical hydraulic conductivity and regional ground-water flow rates in rocks of Jurassic and Cretaceous age, San Juan Basin, New Mexico and Colorado (Frenzel, Peter F.)
  - Plan of study for the regional aquifer-system analysis of the San Juan structural basin, New Mexico, Colorado, Arizona, and Utah (Welder, G. E.)
  - Using a geographic information system to assist in numerical analysis and to prepare cartographic products for the San Juan Basin Regional Aquifer-System Analysis, New Mexico and Colorado (Kernodle, J. M.)
- hydrology:* Adequacy of NASQAN data to describe areal and temporal variability of water quality of the San Juan River drainage basin upstream from Shiprock, New Mexico (Goetz, C. L.)
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  - General surface- and ground-water quality in a coal-resource area near Durango, southwestern Colorado (Butler, David L.)
  - Hydrology of coal-lease areas near Durango, Colorado (Brooks, Tom)
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- La Plata County—sedimentary petrology**
- sediments:* Quaternary alluvial deposits and soil formation, lower Animas River area, Colorado and New Mexico (Gillam, Mary L.)
- La Plata County—soils**
- maps:* Soil survey of La Plata County area, Colorado (Pannell, James P.)
- Paleosols:* Calcareous Paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)
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- Geometry and depositional environment of Fruitland Formation coal beds, San Juan Basin, New Mexico and Colorado; anatomy of a giant coal-bed methane deposit (Fassett, James E.)
  - Isopach map of interval between top of the Pictured Cliffs Sandstone and the Huerfano Bentonite Bed of the Lewis Shale, La Plata County, Colorado, and Rio Arriba and San Juan counties, New Mexico (Sandberg, D. T.)
  - Measured sections and environmental reconstructions of uppermost Jurassic to lowermost Upper Cretaceous rocks on the northern side of the San Juan Basin, southwestern Colorado (Aubrey, W. M.)
  - North-south stratigraphic cross sections of Upper Cretaceous rocks, northern San Juan Basin, southwestern Colorado (Molenaar, C. M.)
  - Stratigraphy and palynology of the upper Lewis Shale, Pictured Cliffs Sandstone and lower Fruitland Formation (Upper Cretaceous) near Durango, Colorado (Manfrino, Carrie)
  - Stratigraphy, environments of deposition and petrography of selected coals of the Upper Cretaceous Menefee Fm. near Durango, Colorado (Pawlewicz, Mark J.)
  - The ages of the continental, Upper Cretaceous, Fruitland Formation and Kirtland Shale based on a projection of ammonite zones from the Lewis Shale, San Juan Basin, New Mexico and Colorado (Fassett, James E.)
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- Paleocene:* Lithofacies relationships and depositional environment of the Tertiary Ojo Alamo Sandstone and related strata, San Juan

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- Paleozoic*: Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)
- Pennsylvanian*: Sedimentary petrology and paleontology of part of the Hermosa Group (Pennsylvanian) between Durango and Silverton, Colorado (McDonald, David Wilson)
- Proterozoic*: A geologic investigation of the early Proterozoic Irving Formation, southeastern Needle Mountains, Colorado (Gonzales, David A.)
- Revised interpretation of the age of allochthonous rocks of the Uncompahgre Formation, Needle Mountains, Colorado (Tewksbury, B. J.)
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*guidebook*: Field guide and road log: Pennsylvanian and Permian depositional systems and cycles in the Eagle Basin, northwestern Colorado (Schenk, Christopher J., et al.)

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— Geologic map of the Holy Cross Quadrangle, Eagle, Lake, Pitkin, and Summit counties, Colorado (Tweto, Ogden)

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*bibliography*: Leadville 1' by 2' Quadrangle, Colorado; a pre-assessment (Wallace, Alan R., et al.)

*gems*: Leadville; a rockhound's bonanza (Voynick, Steve)

*gold ores*: Cripple Creek, Cresson, Camp Bird (Poss, John R.)

— Leadville Silver and Gold begins drilling (Pettem, Silvia)

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*tunnels*: Correlation of tunnel support loads with geology (Brown, Lynn A.)

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*ecology*: Metal-tolerant algae in St. Kevin Gulch, Colorado (McKnight, Diane M.)

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*Paleogene*: Isotopic age determinations, unaltered and hydrothermally altered igneous rocks, north-central Colorado mineral belt (Bookstrom, Arthur A., et al.)

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— Aeromagnetic map of the Holy Cross Wilderness Area, Eagle, Lake, and Pitkin counties, Colorado (Campbell, D. L.)

*maps*: Aeromagnetic map of Mt. Massive and vicinity, Colorado (Godson, R. H., et al.)

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— Searching old mine dumps (Meyer, John P.)

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*Mississippian*: Paleomagnetism and rock magnetism of the Mississippian Leadville (carbonate) Formation and implications for the age of sub-regional dolomitization (Horton, Robert A., Jr.)

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— Tilting of Urad-Henderson and Climax porphyry molybdenum systems, central Colorado, as related to northern Rio Grande Rift tectonics (Geraghty, Ennis P., et al.)

**Lake Fork Formation**

The geology of Summer Coon Volcano near Del Norte, Colorado (Noblett, Jeffrey B.)

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— Seismic profile; North Park Basin (Lange, J. K.)

— What now in Colorado's North Park Basin? (McCaslin, John C.)

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— Geologic characterization of low permeability gas reservoirs in selected wells, greater Green River basin, Wyoming, Colorado, and Utah (Law, Ben E., et al.)

— Geologic map and coal sections of the Pine Ridge Quadrangle, Moffat County, Colorado (Prost, G. L.)

— Latest Cretaceous occurrence of nodosaurid ankylosaurs (Dinosauria, Ornithischia) in western North America and the gradual extinction of the dinosaurs (Carpenter, Kenneth)

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*abandoned mines*: Colorado Geological Survey's role and responsibility; abandoned mine subsidence hazards (Turney, Julia E.)

*underground mining*: History and evolution of mining and mining methods (Hart, Stephen S.)

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*remote sensing*: Wildland classification with multivariate analysis and remote sensing techniques (Radloff, David Lee)

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*abandoned mines*: Colorado Geological Survey's role and responsibility; abandoned mine subsidence hazards (Turney, Julia E.)

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### lanthanum—geochemistry

*granites*: Granite of Silver Plume type; a possible source of the uranium in deposits of the Tallahassee Creek and High Park areas, Fremont and Teller counties, Colorado (Hills, Francis Allan)

### Laramie Aquifer

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— A guide to dinosaur tracksites of the Colorado Plateau and American Southwest (Lockley, Martin)

— Assessment of hazards from abandoned mine shafts along the Colorado Front Range (Clift, Anne Eckert)

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— Coal geology and coal, oil, and gas resources of the Erie and Frederick quadrangles, Boulder and Weld counties, Colorado (Spencer, Frank D.)

— Dinosaurs near Denver (Lockley, Martin G.)

— Formation mechanisms of a Quaternary graben near Golden, Colorado (Krusi, Alan P.)

— Gaseous emanations associated with sandstone-type uranium deposits (Reimer, G. M.)

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— Gravity anomalies and lithospheric flexure beneath the Denver Basin; evidence for a buoyant subsurface load (Angevine, Charles L.)

— Late Cretaceous nonmarine vertebrates of the Denver Basin (Carpenter, Kenneth)

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— Surficial geology and Quaternary history of the Central Plains Experimental Range, Colorado (Davidson, James M.)

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— Uranium distribution and sandstone depositional environments-Oligocene and Upper Cretaceous sediments, Cheyenne Basin, Colorado (Nibbelink, Kenneth A.)

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*Crystal Mountain District*: Field trip guide to the granitic pegmatites of the Crystal Mountain District, Larimer County, Colorado (Jacobson, Mark I.)

— Road log for field trip to Crystal Mountain District, Larimer County, Colorado (Nesse, William D.)

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*maps*: Geologic map and sections of the Horsetooth Reservoir Quadrangle, Larimer County, Colorado (Braddock, W. A., et al.)

— Geologic map and sections of the Laport Quadrangle, Larimer County, Colorado (Braddock, W. A., et al.)

— Geologic map of the Buckhorn Mountain Quadrangle, Larimer County, Colorado (Braddock, W. A., et al.)

— Geologic map of the Cherokee Park Quadrangle, Larimer County, Colorado, and Albany County, Wyoming (Eggler, D. H.)

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— Reconnaissance geologic mapping in north-central Colorado using multispectral gamma-ray data (Moll, Stanton H.)

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— Diamond exploration geochemistry in the North American Cordillera (Dummett, H. T., et al.)

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*fuel resources*: Codell Sandstone, new exploration play, Denver Basin (Weimer, Robert J.)

*gems*: Colorado amethyst (Michalski, Thomas C.)

— Pegmatites of the Crystal Mountain District, Larimer County, Colorado (Jacobson, Mark I.)

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*maps*: Energy and mineral resource (excluding sand and gravel), Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)

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*metal ores*: Comanche-Big South, Neota-Flat Top, and Never Summer Wilderness Study Areas, Colorado (Pearson, Robert C.)

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— Energy and mineral resource (excluding sand and gravel), Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)

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*dams*: Hydrology, geomorphology, and dam-break modeling of the July 15, 1982, Lawn Lake Dam and Cascade Lake Dam failures, Larimer County, Colorado (Jarrett, Robert D.)

*earthquakes*: Earth science information needs of planners and policymakers in Larimer County, Colorado (Alexander, Robert H.)

*geologic hazards*: Earth science information needs of planners and policymakers in Larimer County, Colorado (Alexander, Robert H.)

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*maps*: Hydrology, geomorphology, and dam-break modeling of the July 15, 1982, Lawn Lake Dam and Cascade Lake Dam failures, Larimer County, Colorado (Jarrett, Robert D.)

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*radioactivity*: Reconnaissance geologic mapping in north-central Colorado using multi-spectral gamma-ray data (Moll, Stanton H.)

#### Larimer County—geochronology

*Proterozoic*: Age constraints on early Proterozoic deformation in the northern Front Range, Colorado (Barovich, Karin Marie)

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— Variability of bed load measurement (Pitlick, John)

*maps*: Generalized altitude and configuration of the water table in parts of Larimer, Logan, Sedgwick, and Weld counties, Colorado (Borman, R. G.)

— Shallow ground water in the Boulder-Fort Collins-Greeley area, Front Range urban corridor, Colorado, 1975-77 (Schneider, P. A., Jr.)

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#### Larimer County—petrology

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— Kimberlite exploration, Red Feather area, and petrology of the Chicken Park diatreme, northern Colorado (Rogers, Jack A., Jr.)

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— Field trip guide, Codell Sandstone, northern Front Range (Sonnenberg, Stephen A.)

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*Holocene*: Pollen in packrat (*Neotoma*) mid-dens; pollen transport and the relationship of pollen to vegetation (Davis, Owen K.)

*maps*: Geologic, biostratigraphic, and structure map of the Pierre Shale between Loveland and Round Butte, Colorado (Scott, G. R.)

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*faults*: Laramide fault blocks and forced folds of the Livermore-Bellvue area, Colorado (Matthews, Vincent, III)

*structural analysis*: Age constraints on early Proterozoic deformation in the northern Front Range, Colorado (Barovich, Karin Marie)

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— Discovery of Upper Cretaceous "Parkman Sandstone" production, Denver Basin, Colorado (Guion, Douglas J., et al.)

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— Historic trail maps of the Raton and Springer 30' by 60' quadrangles, New Mexico and Colorado (Scott, G. R.)

— Reconnaissance geologic map of the Spanish Peaks Wilderness Study Area, Huerfano and

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*Sangre de Cristo Mountains*: Geology of the Lost-Lake Duling Pass area, Sangre de Cristo Mountains, Colorado (Okumura, Terrence A.)

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— First annual report; evaluation of coking-coal deposits in Colorado (Jones, David C.)

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*maps*: Map showing gravel-bearing surficial deposits and basaltic rocks near Trinidad, Las Animas County, Colorado (Scott, G. R.)

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*metal ores*: Spanish Peaks Wilderness Study Area, Colorado (Budding, Karin E.)

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— Plays for oil and gas in the Raton Basin, south-central Colorado and northeastern New Mexico (Merewether, E. A.)

— Seismic exploration in Raton Basin (Applegate, James K.)

*petroleum*: Plays for oil and gas in the Raton Basin, south-central Colorado and northeastern New Mexico (Merewether, E. A.)

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*maps*: Geology, altitude, and depth of the bedrock surface; altitude of the water table in 1980; and saturated thickness of the Ogallala Aquifer in 1980 in the southern High Plains of Colorado (Borman, R. G., et al.)

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*Reptilia*: Late Jurassic dinosaur trackways from S.E. Colorado (Prince, Nancy K.)

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*intrusions*: Alteration zones related to igneous activity, Spanish Peaks area, Las Animas and Huerfano counties, Colorado (Hutchinson, Robert M.)

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— Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado (Pillmore, Charles L.)

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— Raton Basin magnetostratigraphy near Cretaceous-Tertiary boundary (Wolberg, Donald L., et al.)

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#### lava—composition

*chemical composition*: Geology and uranium geochemistry of the western margin of the Thirtynine Mile volcanic field, Park, Chaffee and Fremont counties, Colorado (Smith, Larry B.)

*mineral composition*: The significance of the Fisher Quartz Latite to the history of the Creede Caldera, southwestern Colorado (Ritch, Kurt D.)

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*interpretation*: Location of eruptive vents by analysis of fluidal flow textures in the Bonanza Tuff, NE San Juan Mountains, Colorado (Varga, Robert J.)

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*rare earths*: Rare-earth-element compositions of Cenozoic volcanic rocks in the Southern Rocky Mountains and adjacent areas (Lipman, Peter W.)

*trace elements*: "Dynamic" or non-modal assimilation within the Platoro Caldera complex; strontium-isotope and trace-element results (Murphy, M. T.)

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*lava flows*: Types of mineralization related to fluorine-rich silicic lava flows and domes (Burt, Donald M.)

#### lava—properties

*engineering properties*: Relationship between alteration and strength in South Table Mountain Lavas and Pikes Peak Granite, Jefferson County, Colorado (Borges, Cesar O.)

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— Rapid alteration of primary magnetizations in Tertiary and Quaternary tephra from the Western United States (Summa, Lori L.)

#### lead—geochemistry

*claystone*: Goyazite in kaolinitic altered tuff beds of Cretaceous age near Denver, Colorado (Triplehorn, Don M.)

*metal ores*: Trace element distribution around precious/base metal veins, Idaho Springs Dist., CO (Budge, Suzanne)

*oxides*: Adsorption of Cu, Pb, and Zn onto birnessite (Catts, John G.)

*rocks*: Maps showing anomaly patterns for silver, molybdenum, lead, and zinc in altered rocks and soils, Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

*sediments*: Bottom-sediment chemistry and water quality of the South Platte River in the Denver metropolitan area, Colorado (Steele, Timothy D.)

*soils*: Relative mobility of lead and copper in soils; an example from the Bonanza District, Saguache County, Colorado (Cepeda, Joseph C.)

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*Pb-206/Pb-204*: Petrology and Pb-Sr isotope geochemistry of rocks related to the Lake City Caldera, western San Juan Mountains, California (Hon, Ken, et al.)

— The age and origin of the Schwartzwalder uranium deposit, Front Range, Colorado (Wallace, A. R., et al.)

*Pb-210*: Excess unsupported <sup>210</sup>Pb in lake sediment from Rocky Mountain lakes; a groundwater effect (Norton, Stephen A., et al.)

*ratios*: A lead, strontium, and sulfur isotope study of Laramide-Tertiary intrusions and mineralization in the Colorado mineral belt with emphasis on climax-type porphyry molybdenum systems plus a summary of other newly acquired isotopic and rare earth element data (Stein, Holly Jayne)

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— Genetic traits of climax-type granites and molybdenum mineralization, Colorado mineral belt (Stein, Holly J.)

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— Geothermal systems and epithermal ores; lessons from Creede, Colorado (Bethke, Philip M.)

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— U-Pb isochron age and Pb isotope systematics of the Golden Fleece vein; implications for the relationship of mineralization to the Lake City Caldera, western San Juan Mountains, Colorado (Hon, Ken, et al.)

*lead ores* see under economic geology  
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*lead-zinc deposits* see under economic geology  
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*geochemical methods*: Application of fluid inclusion and rock-gas analysis in mineral exploration (Kesler, Stephen E., et al.)

— Characteristics that distinguish types of epithermal deposits (Hayba, D. O., et al.)

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— Algal limestones within the Mintum Formation, Meeker to Dotsero area, western Colorado (Irtem, Oguz)

— Altered igneous rocks around Rocky Mountain manto deposits; the Gilman (Colorado) example (O'Neill, T. F., et al.)

— An interpretation of the subsurface structural style of the Beaver Creek Anticline, Moffat and Routt counties, Colorado (Morel, John A., et al.)

— Carbonate-rich alteration assemblages in porphyry around manto-type orebodies in central Colorado, and their exploration significance (Beatty, David W.)

— Central Colorado karst-controlled lead, zinc, and silver deposits, (Leadville, Gilman, Aspen, and others); a late Paleozoic Mississippi Valley type district (De Voto, Richard H.)

— Central Colorado karst-controlled lead-zinc-silver deposits (Leadville, Gilman, Aspen, and others); a late Paleozoic mississippi valley-type district (De Voto, R. H.)

— Central Colorado karst-controlled lead-zinc-silver deposits (Leadville, Gilman, Aspen, and others); a late Paleozoic mississippi valley-type district (De Voto, R. H.)

— Characterization of Glenwood Springs and Dotsero Springs waters (Eisenhauer, R. J.)

— Dolomites and Early Mississippian bioherms, Leadville Formation, Molas Lake, Colorado (Young, Leonard M.)

— Dolomitization and diagenesis of the Leadville Limestone (Mississippian), central Colorado (Horton, Robert A., Jr.)

— Epidote from the Calumet iron mine in the Turret District, Salida, Colorado (Minch, Randy S.)

— Epithermal mineralization related to caldera development, Pride of the West Mine, San Juan Co., Colorado (Hardwick, James F.)

— Epithermal vein and carbonate replacement mineralization in Cunningham Gulch, Silverton, Colorado (Hardwick, James F.)

— Evidence for multiple episodes and styles of brecciation, Smuggler Mine, Aspen, Colorado (Stegen, Ralph J., et al.)

— Field Trip No. 6: Sedimentology, dolomitization, mineralization and karstification of the Leadville Limestone (Mississippian)



- pian), central Colorado (De Voto, Richard H.)
- Genetic model for the Gilman District (Colo.), based on fluid inclusion, stable isotope, geologic, and fission-track time/temperature studies (Beaty, David W., et al.)
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  - Geology and geochemistry of the Pitch uranium mine area, Saguache County, Colorado (Nash, J. Thomas)
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  - Ground-water potential of the Leadville Limestone on the White River uplift in Garfield and Rio Blanco counties, Colorado (Teller, R. W.)
  - Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Greenwood Springs (Geldon, Arthur L.)
  - Hydrogeology of the mineral springs at Manitou Springs, Colorado (Maslyn, R. Mark)
  - Implications of a calcite mylonite for west directed Laramide structures in the Gunnison area, Colorado (Busch, Jay P.)
  - Late Mississippian paleokarst and related mineral deposits, Leadville Formation, central Colorado (De Voto, Richard H.)
  - Late Paleozoic dolomitization of Leadville Limestone (central Colorado) and implications for genesis of Pb-Zn-Ag deposits (Horton, R. A., Jr., et al.)
  - Manitou, Harding, Fremont and Leadville formations of northeastern Gunnison County, Colorado (Eldridge, Charles A.)
  - McElmo Dome Leadville carbon dioxide field, Colorado (Gerling, C. R.)
  - Mississippian Williams Canyon Limestone Member of the Leadville Limestone, south-central Colorado (Hill, Virginia S.)
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  - Paleokarst and other dissolution features of the Devonian Dyer and Mississippian Leadville formations, central Colorado (Hall, John F., Jr.)
  - Paleomagnetism and rock magnetism of the Mississippian Leadville (carbonate) Formation and implications for the age of sub-regional dolomitization (Horton, Robert A., Jr.)
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  - Stratigraphy and sedimentology of Devonian and Mississippian strata flanking the Homestake shear zone, northeastern Sawatch Uplift, Eagle County, Colorado (Smith, Patricia Gould)
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- First day, road log from Durango, Colorado around northwest rim of San Juan Basin via Cedar Hill, Aztec and La Plata, New Mexico and Soda Springs, Marvel, and Breen, Colorado (Fassett, James E.)
- General surface- and ground-water quality in a coal-resource area near Durango, southwestern Colorado (Butler, David L.)
- Geologic evaluation of critical production parameters for coalbed methane resources (Ayers, Walter B., Jr.)
- Geometry and depositional environment of Fruitland Formation coal beds, San Juan Basin, New Mexico and Colorado; anatomy of a giant coal-bed methane deposit (Fassett, James E.)
- Identification and significance of coal-bed gas, San Juan Basin, northwestern New Mexico and southwestern Colorado (Rice, Dudley D., et al.)
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- Mosasaur remains from the Lewis Shale (Upper Cretaceous), southwestern Colorado (Kues, Barry S.)
- San Juan Sag; Cretaceous rocks in a volcanic-covered basin, south central Colorado (Gries, Robbie Rice)
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- Upper Cretaceous and Tertiary cross sections, Moffat County, Colorado (Irwin, C. Dennis)

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  - hydrothermal conditions*: Scientific drilling to study the roots of active hydrothermal systems related to young magmatic intrusions (Muffer, L. J. Patrick)
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  - magma chambers*: Comment on "...magmatic conditions of the Fish Canyon Tuff, central San Juan volcanic field, Colorado" by Whitney & Stormer (1985) (Grunder, A. L.)
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- hybridization*: Limited magma mixing in a basalt-rhyolite complex Handkerchief Mesa; San Juan Mountains, Colorado (Thompson, Ren S.)
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- Paleocene*: New Adapisoricidae, Pentacodontidae, and Hyopsodontidae (Mammalia, Insectivora and Condylarthra) from the late Paleocene of Wyoming and Colorado (Gingerich, Philip D.)
- Mammalia—Mastodontoidea**
- Pleistocene*: *Stegomastodon* from Pleistocene of Colorado (Lindsey, K. Don, et al.)
- Mammalia—Pantodonta**
- Eocene*: Paleopathology of early Cenozoic Coryphodon (Mammalia; Pantodonta) (Lucas, Spencer G.)
- Paleogene*: *Barylambda churchilli*, a new species of Pantolambidae (Mammalia, Pantodonta) from the late Paleocene of western North America (Gingerich, Philip D.)
- Mammalia—Primates**
- Eocene*: Part I; Eocene stratigraphy of the Washakie Basin, Wyoming and Colorado; Part III; a new species of anaptomorphid (Morris, W. J.)
- Mammalia—Proboscidea**
- taphonomy*: Proboscidean die-offs and die-outs; age profiles in fossil collections (Haynes, Gary)
- Mammalia—Rodentia**
- Eocene*: The rodents *Pseudotomus* and *Quadratomus* and the content of the tribe Manitshini (Paramyinae, Ischyromyidae) (Korth, William W.)
- Miocene*: On *Mesogaulus paniensis* (Rodentia) from Hemingfordian (middle Miocene) deposits in northeastern Colorado (Galbreath, Edwin C.)

*Oligocene*: A new species of the Oligocene comyid rodent *Centimanomys* (Martin, Larry D.)

— Patterns of evolution in *Ischomys* and *Titanotheriomys* (Rodentia; Ischyromyidae) from Oligocene deposits of western North America (Heaton, Timothy Howard)

*Pleistocene*: Middle Pleistocene arvicoline rodents and environmental change at 2900-meters elevation, Porcupine Cave, South Park, Colorado (Barnosky, Anthony D.)

#### Mammalia—Ruminantia

*Pleistocene*: An associated partial skeleton of *Symbos cavifrons* (Artiodactyla: Bovidae) from Montezuma County, Colorado (McDonald, Jerry N., et al.)

#### Mammalia—Taeniodonta

*Eocene*: Apparent evolutionary stasis in the Eocene taeniodont (Mammalia) *Stylinodon mirus* (Schoch, Robert M.)

#### mammals—biogeography

*Paleogene*: The distribution and paleobiogeography of the Tillodontia (Mammalia, Eutheria) (Schoch, Robert M.)

*Quaternary*: Quaternary geochronology and distribution of *Mammuthus* on the Colorado Plateau (Agenbroad, Larry D.)

#### mammals—biostratigraphy

*Cretaceous*: Biostratigraphic correlation of K-T rocks from northwestern Colorado to San Juan Basin, Colorado and New Mexico (Newman, Karl R.)

— Paleocene and latest Cretaceous mammal ages, biozones, magnetozones, rates of sedimentation, and evolution (Sloan, Robert E.)

*Holocene*: The Frazier Site, Colorado (Worthington, H. M.)

*Miocene*: Miocene mammals from the central Colorado Rocky Mountains (Kron, Donald Gordon)

*Paleocene*: Early Paleocene vertebrates of the Denver Basin, Colorado (Middleton, Michael D.)

*Pleistocene*: Middle Pleistocene (late Irvingtonian; Nebraskan) climatic changes in south-central Colorado (Rogers, Karel L., et al.)

*Tertiary*: A prospectus of the North American mammal ages (Woodburne, Michael O.)

#### mammals—paleoecology

*Holocene*: Archaeology of the Jurgens Site (Scott, Douglas D.)

*Pleistocene*: Review of the Dent mammoth site (Cassells, E. Steve)

*Quaternary*: Comparison of plant macrofossils in woodrat (*Neotoma* sp.) and porcupine (*Erethizon dorsatum*) middens from the western United States (Betancourt, Julio L., et al.)

#### mammals—rodents

*Oligocene*: The Oligocene rodent *Ischyromys* in relation to the Paleosols of the Brule Formation (Howe, John Alfred)

*Tertiary*: Paleocene and Eocene rodents of North America (Black, Craig C.)

#### Mammoth Mountain Tuff

Central San Juan Caldera cluster, Colorado; new stratigraphic and structural interpretations and implications for mineralization (Lipman, Peter W., et al.)

— Mineralogy, petrology, and magmatic conditions from the Fish Canyon Tuff, central San Juan volcanic field, Colorado (Whitney, James A.)

— Oligocene central San Juan caldera cluster, Colorado (Lipman, Peter W.)

— Structure of the Bachelor Caldera, Creede, CO (Sawyer, D. A.)

— The Mammoth Mountain and Wason Park tuffs; magmatic evolution in the central San Juan volcanic field, southwestern Colorado (Webber, Karen Louise)

— The Mammoth Mt. Tuff and other shallow zoned rhyolitic ash-flow tuffs, central San Juan volcanic field (Krause, Karen W., et al.)

man, fossil *see* fossil man

#### Mancos Shale

"Mancos B" interval of Upper Cretaceous Mancos Shale, Douglas Creek Arch, Northwest Colorado; a "shelf-sand" complex (Cole, Rex D.)

— An automated manometric method for quantitative determination of calcite and dolomite (Evangelou, V. P., et al.)

— An integrated geophysical investigation and comparison of compressional and shear wave seismic reflection data from the San Juan volcanic area, SW. Colo. (Durrenberger, Sally A.)

— Chemical and mineralogical differences of marine and non-marine shales of the Dakota Sandstone and adjacent units, southwestern Colorado (Winsten, Miriam S.)

— Chipeta (oil) (Armstrong, Karen, et al.)

— Comparison of natural gases produced from Upper Cretaceous Fruitland Formation coal beds and adjacent reservoirs, San Juan Basin, New Mexico and Colorado (Rice, Dudley D.)

— Cross sections showing stratigraphic framework of Upper Cretaceous Dakota Sandstone, Mancos Shale, Mesaverde Group, and Mesaverde Formation, and lower Tertiary Wasatch Formation, west-central Piceance Basin, Garfield County, Colorado (Ellis, M. S.)

— Depositional environment of the Kremmling Sandstone Member, Pierre Shale, Middle Park, Colorado (Wiedenieier, Todd H.)

— Depositional environments of the Dakota Sandstone and adjacent units in the San Juan Basin utilizing discriminant analysis of trace elements in shales (Walters, Lester J., Jr., et al.)

— Depositional history and sedimentology of Upper Cretaceous Mancos Shale and lower Mesaverde Group, northwestern Colorado; migrating shelf-bar and wave-dominated shoreline deposits (Boyles, Joseph Michael)

— Depositional model for a muddy shelf-sand complex and their relationship to reservoir development; "Mancos B" interval of Late Cretaceous Mancos Shale, Northwest Colorado and Northeast Utah (Cole, R. D.)

— Depositional systems of the Upper Cretaceous Mancos and Mesaverde groups, Axial Basin region, northwestern Colorado (Tondou, R. Joe.)

— Description and origin of the lower part of the Mesaverde Group in Rifle Gap, Garfield County, Colorado (Madden, Dawn J.)

— Dissolution and desorption rates of calcium and magnesium from Mancos Shale (Evangelou, V. P., et al.)

— Dissolved mineral salts derived from Mancos Shale (Evangelou, V. P., et al.)

— Early-time tight gas production forecasting technique improves reserves and reservoir description (Neal, D. B.)

— Facies analysis of the lower cycles of the Mesaverde Group (Upper Cretaceous) in northwestern Colorado (Kiteley, Louise W.)

— First day, road log from Durango, Colorado around northwest rim of San Juan Basin via Cedar Hill, Aztec and La Plata, New Mexico and Soda Springs, Marvel, and Breen, Colorado (Fassett, James E.)

— Foraminifera of the Storm King Mountain Shale Member, Mancos Shale, western Colorado (Von Holdt, Laura Lynn)

— General surface- and ground-water quality in a coal-resource area near Durango, southwestern Colorado (Butler, David L.)

— Geologic and engineering parameters used in stimulating tight gas-bearing sandstones by modified hydraulic fracturing techniques: North Douglas Creek Arch Field, Colorado (Holland, M., et al.)

— Geologic evidence of Quaternary faulting near Carbondale, Colorado, with possible associations to the 1984 Carbondale earthquake swarm (Stover, Bruce K.)

— Geologic overview, coal deposits, and potential methane recovery from coalbeds of the Uinta Basin, Utah and Colorado (Adams, M. A.)

— Geology and petrography of Crested Butte Laccolith, Gunnison County, Colorado (Bevier, Mary Lou)

— Geology of the Wilson Creek Field, Rio Blanco County, Colorado (Stone, Donald S.)

— Geomorphic and lithologic controls of diffuse-source salinity, Grand Valley, western Colorado (Johnson, Richard K.)

— Hotchkiss stop (Junge, W. R.)

— Hydrogeochemical characterization of the Durango, Colorado, tailings and raffinate pond areas (Kearl, Peter)

— Identification and importance of coal bed gas, San Juan Basin, southwestern Colorado and northwestern New Mexico (Rice, Dudley D., et al.)

— Identification and significance of coal-bed gas, San Juan Basin, northwestern New Mexico and southwestern Colorado (Rice, Dudley D., et al.)

— Landslide stability achieved with horizontal drains (Spitzer, Roy H., et al.)

— Late Cretaceous Mesaverde Group outcrops at Rifle Gap, Piceance Creek basin, northwestern Colorado (Lorenz, J. C.)

— Long Hollow (gas) (Mickel, Edward G.)

— Mancos River (oil) (Emmendorfer, Alan P.)

— Measured sections and environmental reconstructions of uppermost Jurassic to lowermost Upper Cretaceous rocks on the northern side of the San Juan Basin, southwestern Colorado (Aubrey, W. M.)

— Mineral resources of the Eagle Mountain Wilderness Study Area, Pitkin County, Colorado (Soulliere, Sandra J., et al.)

— Mixed layer clay in the Mancos Shale (Hall, Robert B.)

- Natural gamma-ray spectrometry, lithofacies, and depositional environments of selected Upper Cretaceous marine mudrocks, Western United States, including Tropic Shale and Tununk Member of Mancos Shale (Zelt, Frederick Bruce)
- Nodules and pseudomorphs of fossil origin (Raines, Tony B.)
- Oil-bearing sediments beneath San Juan Volcanics; Colorado's newest frontier (Gries, Robbie R.)
- Porosity, permeability, and pore structure of the tight Mesaverde Sandstone, Piceance Basin, Colorado (Soeder, D. J.)
- Preliminary study of coccoliths and discoasters from Mancos Shale of eastern Utah and western Colorado (Cohen, Carel Lodewijk David)
- Preserved ammonitellas of Scaphites (*Ammonoidea*, *Ancyloceratina*) (Landman, Neil H.)
- Red Mountain Volcano: a source for local basalt flows north of Gunnison, Colorado (Rubel, N. Daniel)
- Remains of ancient life in Cretaceous rocks of the Dinosaur Triangle (Young, Robert G.)
- Role of sediment in non-point source salt loading within the Upper Colorado River basin (Shen, H. W., et al.)
- San Juan Sag: Cretaceous rocks in a volcanic-covered basin, south central Colorado (Gries, Robbie Rice)
- Second day road log, Dewey Bridge to Grand Junction via Cisco, Utah (Young, Robert G.)
- Second day, road log from Durango, Colorado around northeast rim of San Juan Basin via Bayfield, Chimney Rock, Arboles, Allison, and Ignacio, Colorado and back to Durango (Fassett, James E.)
- Sediment and solute yield from Mancos Shale hillslopes, Colorado and Utah (Laronne, J.)
- Sedimentological aspects of stratigraphic correlations in the Upper Cretaceous Ericson Sandstone, Greater Green River basin, Wyoming, Colorado, and Utah (Law, B. E., et al.)
- Seismic interpretation in the Piceance Basin, Northwest Colorado (Waechter, Noel B.)
- Seismic lines in the San Luis Valley, south central Colorado (Gries, Robbie Rice)
- Shallow marine depositional environments in the Upper Cretaceous of northern Colorado (Kiteley, Louise W.)
- Soluble mineral content in surficial alluvium and associated Mancos Shale (Laronne, Jonathan B.)
- Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)
- Stratigraphy of the Mesaverde Formation, Mt. Gunnison coal property, Gunnison County, Colorado (Wellborn, Jewel E. F.)
- Structural development and oil occurrence on northeast flank of Uinta Mountains near Irish Canyon, northwestern Colorado (Roehler, Henry W.)
- Structural geology and stratigraphy of the Jack's Cabin cutoff area, Gunnison County, Colorado (Schlicht, Harold N.)
- Submarine debris-flow, slump-block, and turbidite deposits in Mancos Shale (Cretaceous) of northwestern Colorado (Lorenz, John C.)

- Tarrantoceras Stephenson and related ammonoid genera from Cenomanian (Upper Cretaceous) rocks in Texas and the Western Interior of the United States (Cobban, William A.)
- The Black Canyon of the Gunnison, Colorado (Hansen, Wallace R.)
- The Frontier Formation and associated rocks of northeastern Utah and northwestern Colorado (Molenaar, Cornelius M.)
- The Ignacio Blanco gas field, northern San Juan Basin, Colorado (Harr, Clarence L.)
- Thermal maturity and hydrocarbon source-rock potential of the Eagle Basin, northwestern Colorado (Nuccio, Vito F.)
- Third day road log; Vernal to Grand Junction via Dinosaur National Monument, Rangely, Douglas Pass, and Dinosaur and Riggs Hills (Goodknight, Craig S., et al.)
- Types and usages of drilling fluids utilized to install monitoring wells associated with metals and radionuclide ground water studies (Ericson, Wayne A., et al.)

#### manganese—geochemistry

- kimberlite*: Oxide minerals in Chicken Park Kimberlite, northern Colorado (McCallum, M. E.)
- soils*: Adsorption of mercury by soils of the Piceance Creek basin, Colorado (Klusman, Ronald W.)
- Development of a DTPA soil test for zinc, iron, manganese, and copper (Lindsay, W. L.)
- Electron titration as a technique to study iron and manganese redox transformations in soils (Sadiq, Muhammad)

#### Manitou Formation

- Geology of the Steer Creek area northeast of Salida, Colorado (Thayer, James Bliss)
- Lower Paleozoic of Northwest Colorado; a summary (Ross, Reuben J., Jr.)
- Manitou, Harding, Fremont and Leadville formations of northeastern Gunnison County, Colorado (Eldridge, Charles A.)
- Middle Pleistocene arvicoline rodents and environmental change at 2900-meters elevation, Porcupine Cave, South Park, Colorado (Barnosky, Anthony D.)
- Pleistocene sediments at the Cave of the Winds (Luiszer, Fred)
- The Garden of the Gods and basal Phanerozoic nonconformity in and near Colorado Springs, Colorado (Noblett, Jeffrey B., et al.)

#### Manning Canyon Formation

- Biostratigraphic aspects of fossil plants near the Mississippian-Pennsylvanian boundary in North America (Jennings, James R.)

**mantle** *see under* geochemistry; seismology; tectonophysics

*see under* geochemistry *under* Southwestern U.S. *see under* tectonophysics *under* Basin and Range Province; Colorado Plateau; Southwestern U.S.

#### mantle—geochemistry

- xenon*: Xenon from CO<sub>2</sub> well gases (Caffee, Mark W., et al.)

#### mantle—processes

- subduction*: Eclogite-facies ultramafic xenoliths from Colorado Plateau kimberlites: comparison with eclogites in crustal environ-

ments, and evaluation of the subduction hypothesis (Helmstaedt, Herwart)

**maps** *see under* areal geology *under* Adams County; Alamosa County; Arapahoe County; Archuleta County; Boulder County; Chaffee County; Clear Creek County; Conejos County; Custer County; Delta County; Dolores County; Eagle County; El Paso County; Fremont County; Garfield County; Gilpin County; Grand County; Gunnison County; Hinsdale County; Huerfano County; Jackson County; Jefferson County; La Plata County; Lake County; Larimer County; Las Animas County; Logan County; Mesa County; Mineral County; Moffat County; Montezuma County; Montrose County; Morgan County; Ouray County; Park County; Phillips County; Pitkin County; Pueblo County; Rio Blanco County; Rio Grande County; Routt County; Saguache County; San Juan County; San Miguel County; Sedgwick County; Summit County; Teller County; Washington County; Weld County; Yuma County

*see under* economic geology *under* Adams County; Alamosa County; Arapahoe County; Archuleta County; Boulder County; Chaffee County; Clear Creek County; Conejos County; Custer County; Delta County; Douglas County; Eagle County; El Paso County; Elbert County; Fremont County; Garfield County; Grand County; Gunnison County; Hinsdale County; Huerfano County; Jackson County; Jefferson County; La Plata County; Lake County; Larimer County; Las Animas County; Lincoln County; Logan County; Mesa County; Mineral County; Moffat County; Montrose County; Morgan County; Ouray County; Park County; Pitkin County; Pueblo County; Rio Blanco County; Rio Grande County; Routt County; Saguache County; San Juan County; San Miguel County; Summit County; Teller County; Washington County; Weld County

*see under* engineering geology *under* Jefferson County; Larimer County; Mesa County; Moffat County; Ouray County; Rio Blanco County

*see under* environmental geology *under* Alamosa County; Archuleta County; Conejos County; Costilla County; Custer County; Delta County; Eagle County; El Paso County; Fremont County; Garfield County; Grand County; Hinsdale County; Huerfano County; Jefferson County; La Plata County; Lake County; Larimer County; Las Animas County; Mesa County; Mineral County; Montrose County; Park County; Pitkin County; Pueblo County; Rio Blanco County; Rio Grande County; Saguache County; San Juan County; San Miguel County; Summit County; Weld County; Western U.S.

*see under* geochemistry *under* Alamosa County; Archuleta County; Chaffee County; Clear Creek County; Costilla County; Custer County; Eagle County; El Paso County; Fremont County; Grand County; Gunnison County; Hinsdale County; Huerfano County; Jefferson County; Lake County; Las Animas County; Mesa County; Moffat County; Montrose County; Ouray County; Park County; Pitkin County; Pueblo County; Saguache County; San Juan County; San Miguel County; Summit County; Teller County; Weld County

*see under* geomorphology *under* data processing *see under* geophysical surveys *under* Archuleta County; Chaffee County; Clear Creek County; Conejos County; Douglas County; Eagle County; El Paso County; Fremont County; Grand County; Great Plains; Gunnison County; Hinsdale County; Jackson County; Jefferson County; Lake County;

Lincoln County; Mesa County; Mineral County; Moffat County; Park County; Pitkin County; Rio Grande County; Routt County; Saguache County; Summit County; Teller County

*see under hydrogeology under Adams County; Alamosa County; Arapahoe County; Archuleta County; Baca County; Bent County; Boulder County; Cheyenne County; Conejos County; Costilla County; Crowley County; Delta County; Douglas County; El Paso County; Elbert County; Fremont County; Garfield County; Great Plains; Gunnison County; Jefferson County; Kiowa County; Kit Carson County; La Plata County; Larimer County; Las Animas County; Lincoln County; Logan County; Mesa County; Montezuma County; Otero County; Phillips County; Prowers County; Pueblo County; Rio Blanco County; Rio Grande County; Saguache County; Sedgwick County; Southwestern U.S.; Washington County; Weld County; Western U.S.; Yuma County*

*see under petrology under Chaffee County; Grand County; Gunnison County; Routt County; Saguache County*

*see under soils under Denver County; Douglas County; Garfield County; Grand County; Huerfano County; Jefferson County; La Plata County; Mesa County; Otero County; Park County; Saguache County; United States; Washington County*

*see under stratigraphy under Archuleta County; Delta County; El Paso County; Garfield County; Gunnison County; La Plata County; Larimer County; Mesa County; Pitkin County; Pueblo County; Rio Blanco County; Saguache County; San Juan County; Weld County*

*see under structural geology under Great Plains; Jackson County; La Plata County; Rocky Mountains; Western U.S.*

#### maps—cartography

*automatic cartography:* Delineating producing trends within plays by the use of computer-generated drill intensity maps, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)

— DEM editing using a polygon scan-conversion process (Anonymous)

— Evaluation of Landsat-4 thematic mapper data as applied to geologic exploration; summary of results (Dykstra, Jon D., et al.)

— Mapping dikes from thematic mapper imagery; Raton Basin (Merin, Ira S.)

— Microcomputer data analysis and mapping applied to exploration in Cretaceous sands of Denver Basin (Schulman, Melvyn M.)

— Use of computer-generated maps of oil and gas development and exploration intensity for delineating producing trends, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)

*geochemical maps:* Regional geochemical mapping and its application to environmental studies (Howarth, Richard J.)

*magnetic survey maps:* Mapping paleostructures from time-related aeromagnetic lineaments and photolineaments (Peterson, Rex M.)

*mineralogic maps:* A test of a mineralogic mapping technique in the Italian Mountain area, Colorado (Truebe, Henry A.)

*remote sensing:* Interactive digital image analysis of Landsat MSS images for mapping hydrothermal limonite (Lee, Keenan)

*soils maps:* General soil maps of the United States (Gennadiyev, A. N.)

#### Marlas River Shale

Tarrantoceras Stephenson and related ammonoid genera from Cenomanian (Upper Cretaceous) rocks in Texas and the Western Interior of the United States (Cobban, William A.)

#### Marmaton Group

Pennsylvanian (Desmoinesian) stratigraphy and petroleum potential, Southeast Colorado (Daniels, Robert P.)

— Tectonic and sedimentation model for Morrow Sandstone deposition, Sorrento Field area, Denver Basin, Colorado (Sonnenberg, Stephen A.)

#### Maroon Formation

A paleomagnetic investigation of the Permian-Carboniferous Maroon and Upper Permian-Lower Triassic State Bridge formations in north-central Colorado (Christensen, F. Deon)

— Characteristic remanent magnetization of boulders and cobbles in red beds of Pennsylvanian and Permian age in Colorado (Larson, E. E.)

— Evolution of sedimentary basins; Uinta and Piceance basins (Johnson, Samuel Y., et al.)

— Field guide and road log; Pennsylvanian and Permian depositional systems and cycles in the Eagle Basin, northwestern Colorado (Schenk, Christopher J., et al.)

— Fluvial transitions and paleogeography in upper part of Maroon Formation (Pennsylvanian and Permian), northwestern Colorado (Johnson, Samuel Y.)

— Geologic results of the TMS survey over Mt. Emmons, Colorado (Rickman, D. L.)

— Late Paleozoic stratigraphy and syndepositional tectonism, Northwest Colorado (De Voto, Richard H., et al.)

— Magnetic stratigraphy, past and future (Opdyke, Neil D.)

— Magnetostratigraphy of the Red Sandstone Creek Section, Vail, CO (Miller, J.)

— Magnetostratigraphy of the Red Sandstone Creek section; Vail, Colorado (Miller, John D.)

— Paleotectonic, stratigraphic, and diagenetic history of the Weber Sandstone in the Rangely area (Koelmel, Mark)

— Pennsylvanian and Permian depositional systems and cycles in the Eagle Basin, Northwest Colorado (Johnson, Samuel Y., et al.)

— Pennsylvanian-Permian Block faulting in subsurface of Piceance Basin, Colorado (Waechter, Noel B.)

— Pennsylvanian-Permian paleostructure and stratigraphy as interpreted from seismic data in the Piceance Basin, Northwest Colorado (Waechter, Noel B.)

— Pre-Quaternary desert loess; significance of an example from the Maroon Formation (Pennsylvanian and Permian) in Eagle Basin, Northwest Colorado (Johnson, Samuel Y.)

— Rangely Field; colian system-boundary trap in the Permo-Pennsylvanian Weber Sandstone of Northwest Colorado (Fryberger, Steven G.)

— Sediment dispersal analysis of the Maroon Formation in the Crested Butte Quadrangle, Colorado (Elkin, Robert Rich)

— Sedimentary rocks of the Eagle Basin (Mallory, William W.)

— Sedimentology and paleogeographic significance of six fluvial sandstone bodies in the Maroon Formation, Eagle Basin, Northwest Colorado (Johnson, Samuel Y.)

— Sedimentology and paleogeography of eolian deposits in the Maroon Formation (Pennsylvanian and Permian), Eagle Basin, Northwest Colorado (Johnson, Samuel Y.)

— Seismic interpretation in the Piceance Basin, Northwest Colorado (Waechter, Noel B.)

— Significance of loessite in the Maroon Formation (Middle Pennsylvanian to Lower Permian), Eagle Basin, Northwest Colorado (Johnson, Samuel Y.)

— Stratigraphic analysis of the Gothic Formation (Desmoinesian), Pitkin and Gunnison counties, Colorado (Levorsen, Mark K.)

— Stratigraphic and sedimentologic studies of late Paleozoic strata in the Eagle Basin and northern Aspen Sub-basin, Northwest Colorado (Johnson, Samuel Y.)

— Structural geology and stratigraphy of the Jack's Cabin cutoff area, Gunnison County, Colorado (Schlight, Harold N.)

— Structural reinterpretation of Ruedi and Woody Creek quadrangles, Pitkin and Eagle counties, Colorado; a central Colorado overthrust belt (Zoerner, Frederick P.)

— Tectonic history of the Front Range, Colorado (Bilodeau, William L.)

— The Fryngpan Member of the Maroon Formation; a Lower Permian(?) basin-margin dune field in northwestern Colorado (Johnson, Samuel Y.)

— Thermal maturity and hydrocarbon source-rock potential of the Eagle Basin, northwestern Colorado (Nuccio, Vito F.)

#### Masonic Park Tuff

Cyclic ash-flow tuff volcanism, Platoro-Summitville caldera complex, Southeast San Juan volcanic field, south-central Colorado (Dungan, M. A.)

— High-resolution  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology, central San Juan caldera complex, Colorado (Lanphere, Marvin A.)

— Magnetostratigraphy of the Treasure Mountain Tuff, Platoro-Summitville caldera complex, San Juan volcanic field, Colorado (Brown, Laurie L.)

— Mineralogy, petrology, and magmatic conditions from the Fish Canyon Tuff, central San Juan volcanic field, Colorado (Whitney, James A.)

**mass movements** *see under* geomorphology

**mass spectroscopy** *see under* spectroscopy  
*see under methods under* chemical analysis

**Mastodontoida** *see under* Mammalia

**mathematical geology** *see* data processing

#### Mazatzal Group

Basement-cover relationships in Southwest Colorado; implications for early to middle Proterozoic crustal evolution of the Southwest USA (Harris, C. W., et al.)

— Regional implications of Proterozoic deformation and lithostratigraphy in the Needle Mtns., Colorado (Gibson, R. G., et al.)

#### McCaslin Formation

Favorability of Precambrian quartz-pebble conglomerates in the United States as uranium hosts (Anderson, J. R., et al.)

**McClure Mountain Complex**

- Major- and minor-element distribution in alkaline rock complexes of the Wet Mountains area, Custer and Fremont counties, Colorado (Ambrustmacher, Theodore J.)
- Paleomagnetism of the Cambro-Ordovician McClure Mountain alkalic complex, Colorado (Lynnes, C. S.)

**McCracken Sandstone Member**

- Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)
- Paradox Basin activity to remain lively (Rountree, Russ)

**McDermott Member**

- Biostratigraphic correlation of K-T rocks from northwestern Colorado to San Juan Basin, Colorado and New Mexico (Newman, Karl R.)
- Biostratigraphy of Fruitland, Kirtland, and Animas formations (Cretaceous and Paleocene), northern San Juan Basin, Colorado (Newman, Karl R.)
- First day, road log from Durango, Colorado around northwest rim of San Juan Basin via Cedar Hill, Aztec and La Plata, New Mexico and Soda Springs, Marvel, and Breen, Colorado (Fassett, James E.)
- Joint patterns on the northwest side of the San Juan Basin, (Southern Ute Indian Reservation), Southwest Colorado (Condon, Steven M.)
- Second day, road log from Durango, Colorado around northeast rim of San Juan Basin via Bayfield, Chimney Rock, Arboles, Allison, and Ignacio, Colorado and back to Durango (Fassett, James E.)
- Stratigraphic palynology of Cretaceous-Paleocene boundary rocks, San Juan Basin, Colorado and New Mexico (Newman, K. R.)

**McGuire Pegmatite**

- Niobian rutile and ilmenite from the McGuire Pegmatite, Colorado and their breakdown products (Cerny, Petr, et al.)

**meanders** *see under* fluvial features *under* geomorphology

**Medicine Peak Quartzite**

- Tectonic implications from U-Pb dating of detrital zircons from the early Proterozoic terrane of the Central Rocky Mountains (Aleinikoff, John N., et al.)

**meetings** *see* symposia

**Menefee Formation**

- A preliminary interpretation of carbon and oxygen isotopic data from surface rocks, Southern Ute Indian Reservation, southwestern Colorado (Henry, Mitchell E.)
- Chemical analyses of coal samples from Jan Juan River region (Khalsa, Nirbha S.)
- Coal deposits in Cretaceous and Tertiary fluvial systems of the Rocky Mountain region (Flores, Romeo M.)
- Comparative analysis of coal accumulation in Cretaceous alluvial deposits, southern United States Rocky Mountain basins (Flores, Romeo M.)
- History of gas produced from coal seams in the San Juan Basin (Dugan, Thomas A.)
- History of gas produced from coal seams; San Juan Basin (Dugan, Thomas A.)
- Occurrence and distribution of fluorescent macerals in coals from three coal basins of the United States (Cardott, Brian J.)

- Seam profiling of three coals from the Upper Cretaceous Menefee Formation near Durango, Colorado (Pawlewicz, Mark J.)
- Seam profiling of three coals from Upper Cretaceous Menefee Formation near Durango, Colorado (Pawlewicz, Mark J.)
- Stratigraphic framework of Upper Cretaceous (Campanian) coal in western Colorado (Newman, Karl R.)
- Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)
- Stratigraphy, environments of deposition and petrography of selected coals of the Upper Cretaceous Menefee Fm. near Durango, Colorado (Pawlewicz, Mark J.)
- Stress-dependent permeability and porosity of coal (McKee, Chester R., et al.)
- The non-transferability of a Cretaceous coal model in the San Juan Basin of New Mexico and Colorado (Fassett, James E.)
- Upper Cretaceous geology, coal, and the potential for methane recovery from coalbeds in San Juan Basin; Colorado and New Mexico (Choate, R., et al.)

**mercury—geochemistry**

- crust*: Seasonal and short-term variations in gas emission from the Earth (Klusman, R. W.)
- lake sediments*: Aldrin, dieldrin, and mercury profiles in Recent lake sediments at the Rocky Mountain Arsenal, Colorado (Bergersen, E. P.)
- soils*: Adsorption of mercury by soils of the Piceance Creek basin, Colorado (Klusman, Ronald W.)
- Environmental influences upon mercury, radon and helium concentrations in soil gases at a site near Denver, Colorado (Klusman, Ronald W.)

**Mesa County—areal geology**

- guidebook*: First day road log from Grand Junction to Price via Interstate 70 across the San Rafael Swell past the Cleveland-Lloyd Dinosaur Quarry (Goodknight, Craig S., et al.)
- Supplemental road log Douglas Pass to FAA radar station (Dayvault, Richard D.)
- Third day road log; Vernal to Grand Junction via Dinosaur National Monument, Rangely, Douglas Pass, and Dinosaur and Riggs Hills (Goodknight, Craig S., et al.)
- maps*: Geologic map and cross sections of parts of the Grand Junction and Delta 30' × 60' quadrangles, west-central Colorado (Ellis, Margaret S.)
- Geologic map and cross sections of the Carbondale 30' by 60' Quadrangle, west-central Colorado (Ellis, M. S.)
- Geologic map of the Hawxhurst Creek Quadrangle, Garfield and Mesa counties, Colorado (Donnell, J. R., et al.)
- Geologic map of the Housetop Mountain Quadrangle, Garfield and Mesa counties, Colorado (Donnell, J. R., et al.)
- Geologic map of the Westwater 30' by 60' Quadrangle, Grand and Uintah counties, Utah and Garfield and Mesa counties, Colorado (Gualtieri, J. L.)
- Geologic map showing coal beds in the Dakota Sandstone, Harley Dome Quadrangle and parts of the Bitter Creek Well, Westwater 4 SE, and Westwater 4 SW quadrangles, Colorado and Utah (Ellis, M. S.)

- Preliminary geologic map of the Collbran Quadrangle, Mesa County, Colorado (Donnell, J. R., et al.)
- Preliminary geologic map of the Mesa Quadrangle, Mesa County, Colorado (Donnell, J. R., et al.)
- Preliminary geologic map of the Molina Quadrangle, Mesa County, Colorado (Donnell, J. R., et al.)
- Preliminary geologic map of the Winter Flats Quadrangle, Garfield and Mesa counties, Colorado (Johnson, R. C.)
- regional*: New interpretations of Northwest Colorado geology (Stone, Donald S.)
- Unaweep District*: Geology and mineral deposits of the Unaweep mining district, Mesa County, Colorado (Perkins, Michael)

**Mesa County—economic geology**

- coal*: Chemical analyses of the coal from the Mesaverde Formation, Grand Mesa coal field, Delta and Mesa counties, Colorado (Affolter, Ronald H., et al.)
- Cross sections showing correlation of coal beds and coal zones in the Mesaverde Formation in the Carbondale 30' by 60' Quadrangle, west-central Colorado (Ellis, Margaret S., et al.)
- First annual report: evaluation of coking-coal deposits in Colorado (Jones, David C.)
- Geologic characterization of a field laboratory for coalbed methane exploration and development (Wiman, Stephen K., et al.)
- Geologic map and cross sections of parts of the Grand Junction and Delta 30' × 60' quadrangles, west-central Colorado (Ellis, Margaret S.)
- Geologic map showing coal beds in the Dakota Sandstone, Harley Dome Quadrangle and parts of the Bitter Creek Well, Westwater 4 SE, and Westwater 4 SW quadrangles, Colorado and Utah (Ellis, M. S.)
- Preliminary thermal-maturity map of the Cameo and Fairfield or equivalent coal zone in the Piceance Creek basin, Colorado (Nuccio, V. F.)
- energy sources*: Red Mountain Unit, Piceance Basin, Colorado; field laboratory for research and development in coal bed methane production (Wiman, Stephen K.)
- fuel resources*: Field trip; Colorado oil shale (Voynick, Steve)
- Seismic interpretation in the Piceance Basin, Northwest Colorado (Waechter, Noel B.)
- gems*: Colorado amethyst (Michalski, Thomas C.)
- gold ores*: Mineral resources of the Black Ridge Canyons Wilderness Study Area, Mesa County, Colorado, and Grand County, Utah, and Westwater Canyon Wilderness Study Area, Grand County, Utah (Dickerson, Robert P., et al.)
- industrial minerals*: Simulation of mine drainage for preliminary development of oil shale and associated minerals, Piceance Basin, northwestern Colorado (Taylor, O. James)
- maps*: Geology, structure, and uranium deposits of the Moab Quadrangle, Colorado and Utah (Williams, P. L.)
- Mineral investigation of a part of the Dominguez Canyon Wilderness Study Area (CO-070-150), Delta, Mesa, and Montrose counties, Colorado (Schreiner, Russell A.)



- Mineral investigation of the Dolores River Canyon Wilderness Study Area (CO-030-290) and a part of the Sewemup Mesa Wilderness Study Area (CO-070-176), Mesa, Montrose, and San Miguel counties, Colorado (Martin, Clay M.)
- Mineral resources of the Black Ridge Canyons (CO-070-113)/Black Ridge Canyons West (CO-070-113A/UT-060-116/117), and Westwater Canyon (UT-060-118) Wilderness Study Areas, Mesa County, Colorado, and Grand County, Utah (Chatman, Mark L.)
- Mineral resources of the Black Ridge Canyons Wilderness Study Area, Mesa County, Colorado, and Grand County, Utah, and Westwater Canyon Wilderness Study Area, Grand County, Utah (Dickerson, Robert P., et al.)
- Preliminary thermal-maturity map of the Cameo and Fairfield or equivalent coal zone in the Piceance Creek basin, Colorado (Nuccio, V. F.)
- metal ores:* Geology and mineral resource potential of the Black Ridge Canyon Wilderness Study Area, Mesa County, Colorado (GEM Phase 2) (Toth, M. I., et al.)
- mineral resources:* Analytical results and sample locality maps of stream-sediment and heavy-mineral-concentrate samples from Westwater Canyon (UT-060-118) and Black Ridge Canyons West (CO-070-113A, UT-060-116/117) Wilderness Study Areas, Grand County, Utah and Mesa County, Colorado (Bullock, John H., Jr., et al.)
- Geology and mineral resource potential of the Black Ridge Canyon Wilderness Study Area, Mesa County, Colorado (GEM Phase 2) (Toth, M. I., et al.)
- Geology and mineral resource potential of the Dominguez Canyon Wilderness Study Area, Delta, Mesa, and Montrose counties, Colorado (GEM phase 2) (Toth, M. I., et al.)
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- Mineral investigation of the Dolores River Canyon Wilderness Study Area (CO-030-290) and a part of the Sewemup Mesa Wilderness Study Area (CO-070-176), Mesa, Montrose, and San Miguel counties, Colorado (Martin, Clay M.)
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- Remote sensing study in support of mineral resource appraisal of the Black Ridge Canyons and Black Ridge Canyons West Wilderness Study Areas, Mesa County, Colorado, and Grand County, Utah, and the Westwater Canyon Wilderness Study Area, Grand County, Utah (Lee, Keenan)
- Remote sensing study in support of mineral resource appraisal of the Dominguez Canyon Wilderness Study Area, Montrose, Mesa, and Delta counties, Colorado (Lee, Keenan)
- Remote sensing study in support of mineral resource appraisal of the Sewemup Wilderness Study Area, Mesa and Montrose counties, Colorado (Lee, Keenan)
- natural gas:* A geologic assessment of natural gas from coal seams in the Piceance Basin, Colorado; topical report (September 1985 - September 1986) (McFall, K. S., et al.)
- An assessment of gas resources in low-permeability sandstones of the Upper Cretaceous Mesaverde Group, Piceance Basin, Colorado (Johnson, Ronald C., et al.)
- Deep Coal Seam Project; advances made in coalbed gas recovery from deep Cretaceous coal reservoirs, Piceance Basin (Schwoebel, J. J., et al.)
- Determination of widths of meander-belt sandstone reservoirs from vertical downhole data, Mesaverde Group, Piceance Creek basin, Colorado (Lorenz, John C., et al.)
- Fracture studies in Cretaceous and Paleocene strata in and around the Piceance Basin, Colorado; preliminary results and their bearing on a fracture-controlled natural-gas reservoir at the MWX site (Verbeek, Earl R.)
- Geologic parameters controlling natural gas production from a single deeply buried coal reservoir in the Piceance Basin, Mesa County, Colorado (Decker, David A.)
- Geology and overview of coalbed methane resources and activity in the Piceance Creek basin, Colorado (Larsen, Veryl E.)
- Origin and production implications of abnormal coal reservoir pressure (Decker, A. D.)
- Petrography, mineralogy, and reservoir characteristics of the Upper Cretaceous Mesaverde Group in the east-central Piceance Basin, Colorado (Pitman, Janet K., et al.)
- Southern Piceance Basin model; Cozzette, Corcoran and Rollins sandstones (Brown, Charles A., et al.)
- oil shale:* 1982 report on the prototype oil shale leasing program (Anonymous)
- Simulation of mine drainage for preliminary development of oil shale and associated minerals, Piceance Basin, northwestern Colorado (Taylor, O. James)
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*water resources:* Hydrologic data from Roan Creek and Parachute Creek basins, northwestern Colorado (Adams, D. Briane, et al.)

**Mesa County—engineering geology**

- maps:* Vega Reservoir access road and vicinity; assessment of landslide hazards and related problems (Soule, James M.)
- petroleum engineering:* An assessment of tight sand development potential in the South Rulison area, Garfield County, Colorado (Duda, J. R.)
- reservoirs:* Sediment discharge in the Colorado River near De Beque, Colorado (Butler, David L.)
- slope stability:* Vega Reservoir access road and vicinity; assessment of landslide hazards and related problems (Soule, James M.)
- waste disposal:* Composition, density and fabric effects on bulky waste capillary retention characteristics (Veyera, George E.)
- Paradox Basin, Utah; hydrology (Wilson, William E.)
- waterways:* Sediment discharge in the Colorado River near De Beque, Colorado (Butler, David L.)

**Mesa County—environmental geology**

- ecology:* Geochemical variability of soils and biogeochemical variability of plants in the Piceance Basin, Colorado (Tuttle, M. L., et al.)
- geologic hazards:* Regional hydrology of the Dolores River basin, eastern Paradox Basin, Colorado and Utah (Weir, J. E., Jr., et al.)
- impact statements:* Book Cliffs resource management plan (U. S. Bureau of Land Management, Vernal District)
- Colorado River basin salinity control project, Grand Valley Unit, stage two development; draft environmental impact statement (U. S. Bureau of Reclamation)
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- Geohydrology and potential hydrologic effects of underground coal mining in the Rapid Creek basin, Mesa County, Colorado (Brooks, Tom)
- Proposed resource management plan and environmental impact statement for the San Juan/San Miguel planning area (U. S. Bureau of Land Management, Montrose District)
- San Juan-San Miguel Planning Area (U. S. Bureau of Land Management, Uncompahgre Resource Area)
- land use:* Anthropogenic effects on cloudiness in Colorado and Wyoming (Jarrett, R. D.)
- Hydrologic and biotic effects of grazing versus nongrazing near Grand Junction, Colorado (Lusby, G. C.)
- Land use and land cover and associated maps for Grand Junction, Colorado; Utah (U. S. Geological Survey)
- Land use and land cover and associated maps for Moab, Utah; Colorado (U. S. Geological Survey)
- maps:* Land use and land cover and associated maps for Grand Junction, Colorado; Utah (U. S. Geological Survey)

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- reclamation*: Remedial actions at the former Climax Uranium Company uranium mill site, Grand Junction, Mesa County, Colorado (U. S. Department of Energy)
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- Mesa County—geochemistry**
- maps*: Analytical results and sample locality maps of stream-sediment and heavy-mineral-concentrate samples from Westwater Canyon (UT-060-118) and Black Ridge Canyons West (CO-070-113A, UT-060-116/117) Wilderness Study Areas, Grand County, Utah and Mesa County, Colorado (Bullock, John H., Jr., et al.)
- trace elements*: Chemical analyses of the coal from the Mesaverde Formation, Grand Mesa coal field, Delta and Mesa counties, Colorado (Affolter, Ronald H., et al.)
- Geochemical variability of soils and biogeochemical variability of plants in the Piceance Basin, Colorado (Tuttle, M. L., et al.)
- Mesa County—geochronology**
- Paleozoic*: Petrologic, paleomagnetic, and structural evidence of a Paleozoic rift system in Oklahoma, New Mexico, Colorado, and Utah (Larson, E. E., et al.)
- Mesa County—geophysical surveys**
- gravity surveys*: Principal facts for gravity stations in the La Sal Mountains area, Grand and San Juan counties, Utah, and Mesa and Montrose counties, Colo. (Joesting, H. R.)
- Principal facts for gravity stations in the Uruvan area, Mesa, Montrose, and San Miguel counties, Colo. (Joesting, H. R.)
- Principal facts for new and reprocessed gravity data in and around the Westwater Canyon and Black Ridge Canyons areas, Utah and Colorado (Morin, Robert L.)
- magnetic surveys*: Aeromagnetic map of the Black Ridge Canyon area, western Colorado (U. S. Geological Survey)
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- seismic surveys*: Pennsylvanian-Permian Block faulting in subsurface of Piceance Basin, Colorado (Waechter, Noel B.)
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- Seismic and borehole evidence for important pre-Laramide faulting along the axial arch in Northwest Colorado (Stone, Donald S.)
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- Mesa County—hydrogeology**
- ground water*: Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Glenwood Springs (Geldon, Arthur L.)
- Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)
- Reconnaissance of ground-water resources in the lower Gunnison River basin, southwestern Colorado (Brooks, Tom)
- The impact of longwall mining on the hydrologic balance; premining data collection (Evans, Ginger S.)
- hydrology*: Trend analysis of salt load and evaluation of the frequency of water-quality measurements for the Gunnison, the Colorado, and Dolores rivers in Colorado and Utah (Kircher, James E., et al.)
- maps*: Discharge and water quality of springs in Roan and Parachute Creek basins, northwestern Colorado, 1981-83 (Butler, David L.)
- springs*: Discharge and water quality of springs in Roan and Parachute Creek basins, northwestern Colorado, 1981-83 (Butler, David L.)
- Geohydrology and potential hydrologic effects of underground coal mining in the Rapid Creek basin, Mesa County, Colorado (Brooks, Tom)
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- Simulation of mine drainage for preliminary development of oil shale and associated minerals, Piceance Basin, northwestern Colorado (Taylor, O. James)
- Mesa County—mineralogy**
- miscellaneous minerals*: Classic Colorado minerals; a portfolio (Muntyan, Barbara L.)
- Mesa County—paleontology**
- ichnofossils*: Dinosaur tracksites of western Colorado and eastern Utah (Lockley, Martin G.)
- Mammalia*: Jurassic mammals of North America (Clemens, W. A.)
- Reptilia*: A possible "hatchling" *Camarasaurus* from the Upper Jurassic Morrison Formation (Dry Mesa Quarry, Colorado) (Britt, Brooks B.)
- Cretaceous rocks of the Dinosaur Triangle (Cole, R. D.)
- Dinosaur tracksites of western Colorado and eastern Utah (Lockley, Martin G.)
- Dinosaur Valley: Colorado's new paleontological museum, Grand Junction, Colorado (Averett, Walter R.)
- Fruita: a place for wee fossils (Callison, George)
- Paleontological significance of the Dinosaur Triangle (Armstrong, Harley J.)
- Stratigraphic correlation of dinosaur quarries near Grand Junction, Colorado (Armstrong, Harley J.)
- Terrestrial lepidosaurs from Fruita: making a living beneath Late Jurassic behemoths (Callison, George)
- The great dinosaur discoveries, Dry Mesa, Colorado (Chenoweth, William L.)
- The Museum of Western Colorado and its Dinosaur Valley exhibit (Prosser, Judy)
- The Riggs Hill and Dinosaur Hill sites, Mesa County, Colorado (Chenoweth, William L.)
- Triassic and Jurassic rocks in the Dinosaur Triangle (Young, Robert G.)
- Vertebrata*: Continuing study of new Jurassic/Cretaceous vertebrate faunas from Colorado and Utah (Jensen, James A.)
- The Fruita microvertebrate site: environment of deposition and paleoecology (Callison, George, et al.)
- Mesa County—sedimentary petrology**
- sedimentary structures*: Subaerial debris-flow deposition in the upper Paleozoic Cutler Formation, western Colorado (Shultz, Albert W.)
- sedimentation*: Alluvial-fan sedimentation of the Cutler Formation (Permo-Pennsylvanian), near Gateway, Colorado (Mack, Greg H.)
- Submarine debris-flow, slump-block, and turbidite deposits in Mancos Shale (Cretaceous) of northwestern Colorado (Lorenz, John C.)
- Tectonic and autocyclic controls on sedimentation of the Cutler Formation (Permo-Pennsylvanian), Gateway, Colorado (Mack, Greg H.)
- Mesa County—soils**
- maps*: Soil survey of Rifle area, Colorado; parts of Garfield and Mesa counties (Harman, Jerry B.)
- Mesa County—stratigraphy**
- Cenozoic*: Cretaceous through Holocene history of the Douglas Creek Arch, Colorado and Utah (Johnson, Ronald C.)
- Cretaceous*: An assessment of gas resources in low-permeability sandstones of the Upper Cretaceous Mesaverde Group, Piceance Basin, Colorado (Johnson, Ronald C., et al.)
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- Cross sections showing correlation of coal beds and coal zones in the Mesaverde Formation in the Carbondale 30' by 60' Quadrangle, west-central Colorado (Ellis, Margaret S., et al.)
- Depositional controls on the late Campanian Sego Sandstone and implications for associated coal-forming environments in the Uinta and Piceance basins (Franczyk, Karen J.)
- Geologic map and cross sections of parts of the Grand Junction and Delta 30' x 60' quadrangles, west-central Colorado (Ellis, Margaret S.)
- Geologic map showing coal beds in the Dakota Sandstone, Harley Dome Quadrangle and parts of the Bitter Creek Well, Westwater 4 SE, and Westwater 4 SW quadrangles, Colorado and Utah (Ellis, M. S.)
- Structure contour map of the top of the Rollins Sandstone Member of the Mesaverde For-

mation and Trout Creek Sandstone Member of the Iles Formation, Piceance Creek basin, Colorado (Johnson, R. C.)

*Eocene*: New names for units in the lower part of the Green River Formation, Piceance Creek basin, Colorado (Johnson, Ronald C.)

*Jurassic*: Stratigraphic correlation of dinosaur quarries near Grand Junction, Colorado (Armstrong, Harley J.)

— Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Dewey Bridge, Utah, to Uravan, Colorado (O'Sullivan, R. B.)

*maps*: Structure contour map of the top of the Rollins Sandstone Member of the Mesaverde Formation and Trout Creek Sandstone Member of the Iles Formation, Piceance Creek basin, Colorado (Johnson, R. C.)

*Paleozoic*: Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)

*Pennsylvanian*: Pennsylvanian-Permian paleostructure and stratigraphy as interpreted from seismic data in the Piceance Basin, Northwest Colorado (Wachter, Noel B.)

*Permian*: Pennsylvanian-Permian paleostructure and stratigraphy as interpreted from seismic data in the Piceance Basin, Northwest Colorado (Wachter, Noel B.)

*Triassic*: Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)

#### Mesa County—structural geology

*faults*: Distribution and structural geometry of faults and folds along the northwestern Uncompahgre Uplift, western Colorado and eastern Utah (Heyman, O. Glenn)

— Seismic and borehole evidence for important pre-Laramide faulting along the axial arch in Northwest Colorado (Stone, Donald S.)

*fractures*: Fracture history of the Plateau Creek and adjacent Colorado River valleys, southern Piceance Basin; implications for predicting joint patterns at depth (Grout, Marilyn A.)

*tectonics*: Cretaceous through Holocene history of the Douglas Creek Arch, Colorado and Utah (Johnson, Ronald C.)

— Laramide deformation of the Uncompahgre Plateau; geometry and mechanisms (Heyman, O. G., et al.)

— Pennsylvanian-Permian paleostructure and stratigraphy as interpreted from seismic data in the Piceance Basin, Northwest Colorado (Wachter, Noel B.)

— Regional compression as the cause for Laramide deformation of the northwestern Uncompahgre Plateau, western Colorado and eastern Utah (Heyman, Oscar Glenn)

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Cretaceous stratigraphy and paleontology in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Kues, Barry S.)

— Regional correlation of Dakota Group disconformities; Front Range, New Mexico to Wyoming (Mateer, Niall J.)

— The Dakota Group of northeastern New Mexico and southern Colorado (Mateer, Niall J.)

— Water-bearing characteristics of geologic formations in northeastern New Mexico-southeastern Colorado (Kilmer, L. Clay)

#### Mesaverde Group

3-D characterization of fractures in Mesaverde reservoirs, or why the sugar cube reservoir model doesn't always work (Lorenz, John C.)

— A case study of a stimulation experiment in a fluvial, tight, sandstone gas reservoir (Warpinski, N. R., et al.)

— A depositional model for middle Mesaverde coals, Yampa Field, northwestern Colorado (Fenske, John M., Jr.)

— A geologic analysis of the Fruitland Formation coal and coal-bed methane resources of the San Juan Basin, southwestern Colorado and northwestern New Mexico (Kelso, Bruce S.)

— A guide to dinosaur tracksites of the Colorado Plateau and American Southwest (Lockley, Martin)

— A model for fracture genesis; application to Mesaverde Group, Piceance Creek basin, Colorado (Teufel, Lawrence W., et al.)

— A preliminary interpretation of carbon and oxygen isotopic data from surface rocks, Southern Ute Indian Reservation, southwestern Colorado (Henry, Mitchell E.)

— A regionally extensive altered air-fall ash for use in correlation of lithofacies in the Upper Cretaceous Williams Fork Formation, northeastern Piceance Creek and southern Sand Wash basins, Colorado (Brownfield, Michael E.)

— A regionally extensive altered air-fall ash for use in correlation of lithofacies in Upper Cretaceous Williams Fork Formation, northeastern Piceance Creek and southern Sand Wash basins, Colorado (Johnson, Edward A.)

— Acquisition and processing of azimuthal vertical seismic profiles at multi-well experiment site, Garfield County, Colorado (Lee, Myung W.)

— Age of Douglas Creek Arch, Colorado and Utah (Johnson, Ronald C.)

— Altered-stress fracturing (Warpinski, Norman R.)

— An application of azimuthal vertical seismic profiles (Lee, M. W.)

— An assessment of gas resources in low-permeability sandstones of the Upper Cretaceous Mesaverde Group, Piceance Basin, Colorado (Johnson, Ronald C., et al.)

— An assessment of gas resources in low-permeability sandstones of the Upper Cretaceous Mesaverde Group, Piceance Basin, Colorado (Johnson, Ronald C., et al.)

— An assessment of tight sand development potential in the South Rulison area, Garfield County, Colorado (Duda, J. R.)

— An associated partial skeleton of *Symbos cavifrons* (Artiodactyla: Bovidae) from Montezuma County, Colorado (McDonald, Jerry N., et al.)

— Anastomosing and meandering fluvial systems, Mesaverde Group, (Campanian), northwestern Colorado (Payne, John Beckwith)

— Application of Thematic Mapper-type data over a porphyry-molybdenum deposit in Colorado (Rickman, D. L.)

— Appropriate stratigraphic nomenclature for coal reservoirs in Piceance Basin, Colorado (Decker, David)

— Capillary pressures and gas relative permeabilities of low-permeability sandstone (Ward, J. S.)

— Case history of hydraulic fracture performance in the naturally fractured paludal zone; the transitory effects of damage (Branagan, P. T., et al.)

— Case study of gas migration in the Wasatch and Mesaverde formations of the Piceance Basin, Colorado (Mercer, J. C., et al.)

— Case study of gas migration in the Wasatch and Mesaverde formations of the Piceance Basin, Colorado (Mercer, J. C., et al.)

— Chemical analyses of coal samples from the Green River region (Khalsa, Nirbhao S.)

— Chemical analyses of coal samples from the Uinta region (Khalsa, Nirbhao S.)

— Chemical analyses of the coal from the Mesaverde Formation, Grand Mesa coal field, Delta and Mesa counties, Colorado (Affolter, Ronald H., et al.)

— Clay identification and amount measured by laboratory techniques compared to well log responses; application to tight gas sands and shales (Heinze, David M.)

— Coal-bed methane and tight gas sands interrelationships (Rightmire, Craig T.)

— Comparison of in situ dynamic moduli and laboratory moduli of Mesaverde rocks (Lin, W.)

— Cross sections showing correlation of coal beds and coal zones in the Mesaverde Formation in the Carbondale 30' by 60' Quadrangle, west-central Colorado (Ellis, Margaret S., et al.)

— Cross sections showing stratigraphic framework of Upper Cretaceous Dakota Sandstone, Mancos Shale, Mesaverde Group, and Mesaverde Formation, and lower Tertiary Wasatch Formation, west-central Piceance Basin, Garfield County, Colorado (Ellis, M. S.)

— Crosswell seismic measurement of transverse anisotropy in Vp and Qp (Johnson, Paul A.)

— Delineation of lenticular-type sand bodies by the vertical seismic profiling method (Lee, Myung W.)

— Depositional history and sedimentology of Upper Cretaceous Mancos Shale and lower Mesaverde Group, northwestern Colorado; migrating shelf-bar and wave-dominated shoreline deposits (Boyles, Joseph Michael)

— Depositional systems of a tight gas-productive barrier-strandplain sequence; Corcoran and Cozzette sandstones, Northwest Colorado (Finley, Robert J.)

— Depositional systems of the Upper Cretaceous Mancos and Mesaverde groups, Axial Basin region, northwestern Colorado (Tondur, R. Joe.)

— Description and origin of the lower part of the Mesaverde Group in Rifle Gap, Garfield County, Colorado (Madden, Dawn J.)

— Detection and delineation of lenticular-type sand bodies by the vertical seismic profiling method (Lee, Myung W.)

— Determination of in situ stress from anelastic strain recovery measurements of oriented core; comparison to hydraulic fracture stress measurements in the Rollins Sandstone, Piceance Basin, Colorado (Teufel, Lawrence W.)

- Determination of textural signature and their relation to paleoenvironment for nine fluvial channel sequences from the Upper Cretaceous Mesaverde Group of Piceance Creek Basin, northwestern, Colorado (North, Robert)
- Determination of widths of meander-belt sandstone reservoirs from vertical downhole data (Lorenz, John C.)
- Determination of widths of meander-belt sandstone reservoirs from vertical downhole data, Mesaverde Group, Piceance Creek basin, Colorado (Lorenz, John C., et al.)
- Differences in fracture characteristics and related production of natural gas in different zones of the Mesaverde Formation, northwestern Colorado (Lorenz, J. C.)
- Differences in fracture characteristics and related production; Mesaverde Formation, northwestern Colorado (Lorenz, J. C.)
- Dual leakoff behavior in hydraulic fracturing of tight, lenticular gas sands (Warpinski, N. R.)
- Early Cenozoic history of the Uinta and Piceance Creek basins, Utah and Colorado, with special reference to the development of Eocene Lake Uinta (Johnson, Ronald C.)
- Estimates of vertical hydraulic conductivity and regional ground-water flow rates in rocks of Jurassic and Cretaceous age, San Juan Basin, New Mexico and Colorado (Frenzel, Peter F.)
- Estuarine and anastomosing fluvial systems of the lower Mesaverde Group, northwestern Colorado (Nelson, Katherine Helen)
- Estuarine and fluvial systems, lower Mesaverde Group (Campanian), northwestern Colorado (Nelson, Katherine)
- Facies analysis of the lower cycles of the Mesaverde Group (Upper Cretaceous) in northwestern Colorado (Kiteley, Louise W.)
- Facies relationships and reservoir potential of Ohio Creek Interval across Piceance Creek basin, northwestern Colorado (Rutledge, Anne K.)
- Facies relationships in Campanian wave-dominated coastal deposits in Sand Wash Basin (Siepman, Bret R.)
- Facies relationships, reservoir potential of Ohio Creek interval across the Piceance Creek basin (Lorenz, John C.)
- First day, road log from Durango, Colorado around northwest rim of San Juan Basin via Cedar Hill, Aztec and La Plata, New Mexico and Soda Springs, Marvel, and Breen, Colorado (Fassett, James E.)
- Fluorescent spectral types of selected Colorado bituminous coals (Pasley, Mark A.)
- Fluvial sedimentology of the Mesaverde Formation as revealed in continuous subsurface core (Lorenz, John C.)
- Fracture characteristics and reservoir behavior of stress-sensitive fracture systems in flat-lying lenticular formations (Lorenz, J. C., et al.)
- Fracture studies in Cretaceous and Paleocene strata in and around the Piceance Basin, Colorado; preliminary results and their bearing on a fracture-controlled natural-gas reservoir at the MWX site (Verbeek, Earl R.)
- Fracturing and testing case study of paludal, tight, lenticular gas sands (Warpinski, N. R., et al.)
- General hydrogeology of the aquifers of Mesozoic age, upper Colorado River basin; excluding the San Juan Basin, Colorado, Utah, Wyoming, and Arizona (Freethey, Geoffrey W., et al.)
- General surface- and ground-water quality in a coal-resource area near Durango, southwestern Colorado (Butler, David L.)
- Geologic and engineering implications of production history from five Mesaverde wells in central Piceance Creek basin, Northwest Colorado (Chancellor, R. E.)
- Geologic characterization of a field laboratory for coalbed methane exploration and development (Wiman, Stephen K., et al.)
- Geologic evidence of Quaternary faulting near Carbondale, Colorado, with possible associations to the 1984 Carbondale earthquake swarm (Stover, Bruce K.)
- Geologic history and hydrocarbon potential of Late Cretaceous-age, low-permeability reservoirs, Piceance Basin, western Colorado (Johnson, Ronald C.)
- Geologic history and hydrocarbon potential of Late Cretaceous-age, low-permeability reservoirs, Piceance Basin, western Colorado; final report (Johnson, R. C.)
- Geologic implications of coal dewatering (Law, B. E., et al.)
- Geologic map and cross sections of parts of the Grand Junction and Delta 30' x 60' quadrangles, west-central Colorado (Ellis, Margaret S.)
- Geologic map of the Mt. Axtell Quadrangle, Gunnison County, Colorado (Gaskill, D. L., et al.)
- Geologic overview, coal deposits, and potential for methane recovery from coalbeds, Piceance Basin; Colorado (Choate, R., et al.)
- Geologic overview, coal deposits, and potential methane recovery from coalbeds of the Uinta Basin; Utah and Colorado (Adams, M. A.)
- Geologic overview, coal, and coalbed methane resources of the greater Green River coal region; Wyoming and Colorado (McCord, J. P.)
- Geological and production characteristics of the nonmarine part of the Mesaverde Group, Rulison Field area, Piceance Basin, CO (Peterson, R. E.)
- Geology and energy resources of the Piceance Creek basin (Donnell, John R.)
- Geology and overview of coalbed methane resources and activity in the Piceance Creek basin, Colorado (Larsen, Veryl E.)
- Geology and petrography of Crested Butte Laccolith, Gunnison County, Colorado (Bevier, Mary Lou)
- History of gas produced from coal seams in the San Juan Basin (Dugan, Thomas A.)
- History of gas produced from coal seams; San Juan Basin (Dugan, Thomas A.)
- Hydraulic fracture stimulation and openhole testing of a deeply buried coal seam in the Piceance Basin, Colorado (Logan, T. L., et al.)
- Hydraulic fracture stimulation results and diagnostics in deeply buried coal seams, Piceance Basin, Colorado (Logan, Terry L., et al.)
- Hydrogeochemical characterization of the Durango, Colorado, tailings and raffinate pond areas (Kearl, Peter)
- Hydrogeology of the upper part of the Mesaverde Group, Williams Fork Mountains, Routt and Moffatt counties, Colorado (Stewart, Michael)
- In situ stress and natural fracture distribution at depth in the Piceance Basin, Colorado; implications to stimulation and production of low permeability gas reservoirs (Teufel, Lawrence W.)
- In-situ dynamic moduli of Mesaverde rocks, compared to static and dynamic laboratory moduli (Lin, W.)
- In-situ stress measurements at U.S. DOE's multiwell experiment site, Mesaverde Group, Rifle, Colorado (Warpinski, N. R., et al.)
- In-situ stresses in low-permeability, non-marine rocks (Warpinski, N. R.)
- Influence of shale conductivities on the electrical conductivity of low-permeability rocks (Volk, L. J., et al.)
- Insights into natural gas production from low-permeability reservoirs (Northrop, D. A.)
- Insights into the relationship between wellbore breakouts, natural fractures, and in situ stress (Teufel, Lawrence W.)
- Interference testing of the naturally fractured Cozzette Sandstone; a case study at the DOE MWX site (Branagan, Paul, et al.)
- Interpretation of azimuthal vertical seismic profile survey at multi-well experimental site, Garfield County, Colorado (Lee, Myung W.)
- Joint patterns on the northwest side of the San Juan Basin, (Southern Ute Indian Reservation), Southwest Colorado (Condon, Steven M.)
- Late Cretaceous (Campanian) estuarine and fluvial systems associated with rapid subsidence, northwestern Colorado (Nelson, K.)
- Late Cretaceous Mesaverde Group outcrops at Rifle Gap, Piceance Creek basin, northwestern Colorado (Lorenz, J. C.)
- Late Cretaceous through early Tertiary general stratigraphy and structural geology of the Piceance Creek basin, Colorado (Johnson, Ronald C.)
- Log analysis techniques for quantifying the permeability of submillidarcy sandstone reservoirs (Kukul, G. C.)
- Log-derived evaluation of shaly sandstone reservoirs (Fertl, Walter H.)
- Dinoflagellates as indicators of depositional environments in Craig, Colorado; Upper Cretaceous (Martinez, Hernan, Enrique)
- Mechanical properties of Mesaverde shale and sandstone at high pressure (Wunan Lin)
- Mineral investigation of the Hack Lake Wilderness Study Area, Garfield County, Colorado (Kluender, Steven E.)
- Neutronic properties of Mesaverde sands: I, Calibration of the Advanced Reactivity Measurement Facility (Lysne, P.)
- Neutronic properties of Mesaverde sands: II, Results (Lysne, P.)
- On the performance of noncontinuous tight gas sands (Ubani, E. A.)
- Origin and distribution of fractures in lower Tertiary and Upper Cretaceous rocks, Piceance Basin, Colorado, and their relation to the occurrence of hydrocarbons (Pitman, Janet K.)

- Origin and distribution of fractures in Tertiary and Cretaceous rocks, Piceance Basin, Colorado, and their relation to hydrocarbon occurrence (Pitman, Janet K.)
- Origin and occurrence of fracture-filling cements in the Upper Cretaceous Mesaverde Formation at MWX, Piceance Creek basin, Colorado (Pitman, Janet K.)
- Pattern recognition and tomography using crosswell acoustic data (Albright, J. N., et al.)
- Petrography, mineralogy, and reservoir characteristics of the Upper Cretaceous Mesaverde Group in the east-central Piceance Basin, Colorado (Pitman, Janet K., et al.)
- Petrology of selected sandstones in the MWX wells (Northwest Colorado) and its relationship to borehole geophysical-log analysis and reservoir quality (Pitman, Janet K.)
- Petrology, provenance, and tectonic significance of Upper Cretaceous Ohio Creek Member, Williams Fork Formation, Piceance Creek basin, Colorado (Whited, Joseph Michael)
- Porosity, permeability, and pore structure of the tight Mesaverde Sandstone, Piceance Basin, Colorado (Soeder, D. J.)
- Porphyrin types and epimers of triterpanes and steranes in coals of different ranks in southeastern Uinta region (Gu, Yong-da, et al.)
- Pre-frac interference testing of a naturally fractured, tight fluvial reservoir (Branagan, P. T., et al.)
- Predicting the influences of post-mining conditions on surface and groundwater resources (Day, Michael J., et al.)
- Prediction of subsurface fracture patterns from surface studies of joints; an example from the Piceance Creek basin, Colorado (Verbeek, Earl R.)
- Predictions of size and orientations of lenticular reservoirs in the Mesaverde Group, northwestern Colorado (Lorenz, J. C.)
- Preliminary sedimentology and biostratigraphy, Upper Cretaceous Williams Fork Formation (Mesaverde Group), Rio Blanco County, Piceance Creek basin, NW Colorado (Noll, Michael D.)
- Production characterization of tight lenticular gas sands in the Rulison area of western Colorado (Mercer, J. C.)
- Production strategies for tight gas sands; a case study of the upper Cozzette blanket sand (Bezilla, M., et al.)
- Reconnaissance of ground-water resources in the lower Gunnison River basin, southwestern Colorado (Brooks, Tom)
- Red Mountain Unit, Piceance Basin, Colorado: field laboratory for research and development in coal bed methane production (Wiman, Stephen K.)
- Red Mountain Volcano: a source for local basalt flows north of Gunnison, Colorado (Rubel, N. Daniel)
- Regional correlation of the middle coal group of the Upper Cretaceous Mesaverde Group, Yampa coal field, Moffat and Routt counties, Colorado (Johnson, E. A.)
- Remains of ancient life in Cretaceous rocks of the Dinosaur Triangle (Young, Robert G.)
- Reservoir characteristics of ancient fluvial deposits with emphasis on Rocky Mountain and Midcontinent regions (Ethridge, Frank G.)
- Reservoir characterization for numerical simulation of Mesaverde meanderbelt sandstone, northwestern Colorado (Jones, Jon Rex, Jr.)
- Reservoir characterization of Mesaverde (Campanian) bedload fluvial meanderbelt sandstones, northwestern Colorado (Jones, Jon R., Jr.)
- Reservoir sedimentology of Mesaverde rocks at the MWX site (Lorenz, John C.)
- Results of the Multiwell Experiment; in situ stresses, natural fractures, and other geological controls on reservoirs (Lorenz, John C., et al.)
- Reworked Cretaceous palynomorphs in late Quaternary deposits from central Colorado, USA (Scott, L.)
- Sandstone petrography of the Mesaverde Group of northwestern Colorado (Rogers, D. J.)
- Second day, road log from Durango, Colorado around northeast rim of San Juan Basin via Bayfield, Chimney Rock, Arboles, Allison, and Ignacio, Colorado and back to Durango (Fassett, James E.)
- Sedimentological aspects of stratigraphic correlations in the Upper Cretaceous Ericson Sandstone, Greater Green River basin, Wyoming, Colorado, and Utah (Law, B. E., et al.)
- Segmented vitrinite reflectance profile from the Deep Seam Project, Piceance Creek basin, Colorado; evidence of previous high pore pressure (Law, Ben E.)
- Seismic interpretation in the Piceance Basin, Northwest Colorado (Waechter, Noel B.)
- Seismic investigation of the Big Pie Structure, a probable laccolithic intrusion, Routt County, Colorado (Hickenlooper, John W.)
- Shallow marine depositional environments in the Upper Cretaceous of northern Colorado (Kiteley, Louise W.)
- Significance of drilling and coring-induced fractures in Mesaverde core, northwestern Colorado (Finley, Sharon J.)
- Source areas and paleotectonic implications of Upper Cretaceous Ohio Creek Member of Mesaverde Group, Piceance Basin, Colorado (Whited, Mike)
- Source rock evaluation; a method of predicting dominant reservoir mechanisms of deeply buried, low-permeability coal reservoirs (Decker, A. D.)
- Stimulation-fluid systems for naturally fractured tight gas sandstones; a general case study from Multiwell Experiment stimulations (Sattler, A. R., et al.)
- Stratigraphic distribution suggesting environmental significance of pollen in Late Cretaceous upper Iles and lower Williams Fork formations, Rifle Gap, Garfield County, Colorado (Madden-McGuire, Dawn J.)
- Stratigraphic framework of Upper Cretaceous (Campanian) coal in western Colorado (Newman, Karl R.)
- Stratigraphy and depositional environments of a portion of upper Campanian Mesaverde Group, central Grand Hogback, Northwest Colorado (Madden, Dawn J.)
- Stratigraphy and palynology of Late Cretaceous and early Tertiary rocks, Tommy's Draw, Rio Blanco County, Colorado (Zeiler, Rose M.)
- Stratigraphy and petroleum potential of Trout Creek and Twentymile sandstones (Upper Cretaceous), Sand Wash Basin, Colorado (Siepman, Bret R.)
- Stratigraphy of Grand Hogback Coalfield, upper Campanian Mesaverde Group, Rifle Gap to New Castle, Garfield County, Colorado (Madden, Dawn J.)
- Stratigraphy of the Mesaverde Formation, Mt. Gunnison coal property, Gunnison County, Colorado (Wellborn, Jewel E. F.)
- Stratigraphy, depositional environments, and paleogeography of coal-bearing strata in the Upper Cretaceous Mesaverde Group, central Grand Hogback, Garfield County, Colorado (Madden, Dawn J.)
- Stress-dependent permeability and porosity of coal (McKee, Chester R., et al.)
- Structural and thermal history of Piceance Creek basin, Colorado, in relationship to hydrocarbon occurrence in Mesaverde Group (Johnson, Ronald C.)
- Structural and thermal history of the Piceance Creek basin, western Colorado, in relation to hydrocarbon occurrence in the Mesaverde Group (Johnson, Ronald C.)
- Structure contour map of the top of the Rollins Sandstone Member of the Mesaverde Formation and Trout Creek Sandstone Member of the Iles Formation, Piceance Creek basin, Colorado (Johnson, R. C.)
- Surface and subsurface correlations showing depositional environments of the Upper Cretaceous Mesaverde Group and associated formations, Cow Creek in Southwest Wyoming to Mount Harris in Northwest Colorado (Roehler, H. W.)
- Surface-subsurface correlations of the Mesaverde Group and associated Upper Cretaceous formations, Rock Springs, Wyoming, to Mount Harris, Colorado (Roehler, H. W.)
- The Debeque Canyon landslide (Stover, Bruce K.)
- The effects of depositional environment on petrophysical properties of Mesaverde reservoirs, northwestern Colorado (Lorenz, J. C., et al.)
- The geologic aspects of reservoir characterization for numerical simulation; Mesaverde meanderbelt sandstone, northwestern Colorado (Jones, J. R., et al.)
- The Ignacio Blanco gas field, northern San Juan Basin, Colorado (Harr, Clarence L.)
- The multiwell experiment core program, II (Sattler, A. R.)
- The paleobiological and paleoenvironmental importance of dinosaur footprints (Lockley, Martin G.)
- Thermal maturation and burial history of the Upper Cretaceous Mesaverde Group, including the Multiwell Experiment (MWX), Piceance Creek basin, Colorado (Nuccio, Vito F.)
- Thermal maturity and hydrocarbon source-rock potential of the Eagle Basin, northwestern Colorado (Nuccio, Vito F.)
- Tidal influences on Cretaceous Fox Hills barrier-strandplain sandstone geometries (Horne, John C., et al.)
- Upper Cretaceous and Tertiary cross sections, Moffat County, Colorado (Irwin, C. Dennis)

- Variation of mechanical strength with rank of gassy coals (Bell, G. J.)
- Variations in shoreline sandstones from a Late Cretaceous interdeltaic embayment, Segó Sandstone (Campanian), northwestern Colorado (Noe, David Charles)
- Variations in vitrinite reflectance values for the Upper Cretaceous Mesaverde Formation, southeastern Piceance Basin, northwestern Colorado; implications for burial history and potential hydrocarbon generation (Nuccio, Vito F.)
- Vertical seismic profiles at the multi-well experiment site, Garfield County, Colorado (Lee, Myung W.)
- Vertically stacked barrier island systems, Segó Sandstone (Campanian), Northwest Colorado (Stancliffe, Richard John)
- Vitrinite reflectance and temperature gradient models applied at a site in Piceance Basin, Colorado (Bostick, Neely H.)

**Mesozoic** *see* Cretaceous; Jurassic; Triassic  
*see under stratigraphy under* Archuleta County; Colorado Plateau; Delta County; Dolores County; El Paso County; Garfield County; Gunnison County; Jackson County; Jefferson County; La Plata County; Montezuma County; Montrose County; Pueblo County; Rio Blanco County; San Miguel County; Western U.S.

#### Mesozoic—petrology

*plutonic rocks:* Tabulation of uranium and thorium data on the Mesozoic-Cenozoic intrusive rocks of known chemical composition in Colorado (Phair, George)

**metal ores** *see* aluminum ores; base metals; beryllium ores; copper ores; gold ores; iron ores; lead ores; lead-zinc deposits; molybdenum ores; polymetallic ores; pyrite ores; rare earth deposits; silver ores; thorium ores; tin ores; titanium ores; tungsten ores; uranium ores; vanadium ores; zinc ores

*see under biogeochemical methods under* mineral exploration

*see under economic geology under* Alamosa County; Archuleta County; Boulder County; catalogs; Chaffee County; Clear Creek County; Conejos County; Custer County; data processing; Delta County; Dolores County; Eagle County; Fremont County; Gilpin County; Grand County; Gunnison County; Hinsdale County; Huerfano County; Jackson County; La Plata County; Lake County; Larimer County; Las Animas County; Mesa County; Mineral County; North America; Ouray County; Pitkin County; Rio Grande County; Routt County; Saguache County; San Juan County; San Miguel County; Summit County; Teller County; United States; Western U.S.

*see under geobotanical methods under* mineral exploration

*see under geochemical methods under* mineral exploration

*see under geochemistry under* arsenic; copper; fluid inclusions; gold; hydrogen; lead; silver; tellurium; zinc

*see under geologic thermometry under* fluid inclusions

*see under geological methods under* mineral exploration

*see under volcanic rocks under* igneous rocks

*see under economic geology*

*see under isotopes*

*see under* mineral deposits, genesis

*see under* paragenesis

#### metal ores—genesis

*classification:* Comparative anatomy of epithermal precious- and base-metal districts hosted by volcanic rocks (Heald-Wetlaufer, P., et al.)

*epithermal processes:* Comparative anatomy of volcanic-hosted epithermal deposits; acid-sulfate and adularia-sericite types (Heald, Pamela, et al.)

#### metal ores—properties

*evaluation:* Report of the bi-metallic mine (McCulloch, Richard)

**metallogeny** *see* mineral deposits, genesis

#### metals—geochemistry

*breccia:* Petrography and trace metal chemistry of intrusion breccias, eastern Breckenridge mining district, Summit County, Colorado (Warlow, Joseph Charles)

*sedimentary rocks:* Stratigraphic sections, depositional environment, and metal content of the upper part of the Middle Pennsylvanian Minturn Formation, northern Sangre de Cristo Range, Custer and Saguache counties, Colorado (Clark, R. F.)

*sediments:* Dilution mixing estimates of trace metal concentrations in suspended sediments (Marcus, W. Andrew)

*soils:* A reconnaissance study of the bioavailability of copper, iron, lead, magnesium, manganese, silver and zinc on the polymetallic Aqueduct Prospect, Breckenridge, Colorado (McDonald, Cecilia Louise)

*stocks:* Trace metal geochemistry and hydrothermal alteration of three molybdenum-bearing stocks, Gunnison and Pitkin counties, Colorado (Perkins, R. A.)

*surface water:* Evaluation of natural tracers in an acidic and metal-rich stream (Bencala, Kenneth E., et al.)

— Geochemistry and dissolved metals in St. Kevin Gulch, an acidic mountain stream near Leadville, Colorado (Kimball, Briant A., et al.)

— Practical aspects of tracer experiments in acidic, metal enriched streams (Zellweger, Gary W., et al.)

*thermal waters:* Analytical results for 38 hot spring samples collected in the Western United States (Ficklin, Walter H., et al.)

*vegetation:* Temporal variation of metal concentrations in biogeochemical samples over the Royal Tiger Mine, Colorado; Part I, Within year variation (Stednick, J. D., et al.)

*water:* Heavy metal concentrations from abandoned mine drainage in Coal Creek, Colorado (Hilton, Joanne)

**metamorphic rocks** *see* igneous rocks; metamorphism; metasomatism

*see under* petrology

#### metamorphic rocks—amphibolites

*genesis:* Tectonic setting and petrogenesis of early Proterozoic amphibolites from west-central Colorado (Knoper, Michael W.)

*geochemistry:* Geochemistry and petrogenesis of early Proterozoic amphibolites, west-central Colorado, U.S.A. (Knoper, Michael W.)

*mineral composition:* Migmatitic amphibolite; a newly-defined isograd in the northern Colorado Front Range (Shaver, Kenneth C.)

#### metamorphic rocks—composition

*whole rock:* Metamorphic fluid flow: a question of scale, crustal depth and bulk rock composition (Tracy, Robert J.)

#### metamorphic rocks—eclogite

*composition:* Eclogite-facies ultramafic xenoliths from Colorado Plateau kimberlites; comparison with eclogites in crustal environments, and evaluation of the subduction hypothesis (Helmstaedt, Herwart)

*genesis:* Petrogenesis of the A.O. porphyry copper complex in Jackson and Grand Counties, northwestern Colorado (Karimpour, M. H.)

*mineral composition:* A diamond-graphite eclogite from the Sloan 2 kimberlite, Colorado, U.S.A. (McCandless, T. E.)

*trace elements:* Trace element, isotopic and seismic velocity characteristics of eclogites and other inclusions derived from the lower crust of southern Australia and the Colorado Plateau (Arculus, R. J., et al.)

#### metamorphic rocks—facies

*amphibolite facies:* A model for garnite and magnetite formation during metamorphism of sulfide-rich rocks (Ririe, G. Todd)

— Evidence for two stages of Precambrian metamorphism in the Salida area, central Colorado (Boardman, Shelby J.)

— Geochemistry and origin of Proterozoic amphibolites from Salida, Colorado (Boardman, Shelby J.)

— Middle Proterozoic metamorphism; central Front Range, Colorado (Swayze, Gregg A.)

— Precambrian geology of the Iris area, Gunnison and Saguache counties, Colorado (Afifi, Abdulkader M.)

— Proterozoic geology of the Needle Mts., Colorado (Tewksbury, B. J.)

*granulite facies:* Granulite facies and related xenoliths from Colorado-Wyoming kimberlite (Bradley, Scott D.)

— Granulite facies and related xenoliths from Colorado-Wyoming kimberlite (Bradley, S. D.)

*greenschist facies:* Proterozoic geology of the Middle Mountain area, Needle Mountains, Colorado (Gonzales, David A.)

— The Irving Formation and the Proterozoic sequence in the Needle Mountains, southwestern Colorado (Ellingson, Jack A., et al.)

#### metamorphic rocks—geochemistry

*trace elements:* A Proterozoic volcano-plutonic terrane, Gunnison and Salida areas, Colorado (Bickford, M. E.)

— Changes in chemical parameters around a massive sulfide deposit (Ririe, G. T.)

— Geochemistry and petrotectonic setting of bimodal volcanic and volcanoclastic rocks, Cochetopa Canyon area, central Colorado (Bennett, Gregory S., et al.)

— Geochronology and geochemistry of Proterozoic metamorphic rocks, near Eldora, Colorado (Abashian, Mark S.)

#### metamorphic rocks—gneisses

*amphibolite facies:* Structural studies in a Proterozoic gneiss complex and adjacent cover rocks, West Needle Mountains, Colorado (Gibson, Richard G.)

*biotite gneiss*: Analytical data on the crystalline rocks of the Strawberry Lake area, Grand County, Colorado (Young, Edward J.)

*paragneiss*: Chemical characteristics and U-Pb zircon ages of Proterozoic rocks in the Wet Mountains region, Colo., USA (Cullers, Robert L.)

*petrology*: Geology of the Precambrian metamorphic rocks along South Hardscrabble Creek, Wet Mountains, Colorado (Noblett, Jeffrey B.)

— The granites and derived gneisses of the Pikes Peak folio of the geologic atlas of the United States (Mathews, E. B.)

*textures*: Petrology of flecked gneisses in the northern Wet Mountains, Fremont County, Colorado (Trumbull, Robert B.)

— Petrology of flecked gneisses in the northern Wet Mountains, Fremont County, Colorado (Trumbull, Robert Bruce)

**metamorphic rocks—granulites**

*petrology*: Lower crustal xenoliths from Colorado-Wyoming state line kimberlites (Bradley, S. D.)

**metamorphic rocks—lithostratigraphy**

*Precambrian*: Precambrian rocks of Clear Creek Canyon (Reed, John C., Jr.)

— The Precambrian of the Rocky Mountain region (Hedge, Carl E., et al.)

*Proterozoic*: Chronology of igneous events in the Proterozoic of central Colorado (Bickford, M. E., et al.)

— Metamorphic stratigraphy along South Hardscrabble Creek, Wet Mountains, Colorado (Noblett, Jeffrey B.)

— Revised interpretation of the age of allochthonous rocks of the Uncompahgre Formation, Needle Mountains, Colorado (Tewksbury, B. J.)

**metamorphic rocks—metaigneous rocks**

*geochemistry*: Geochemistry of the Proterozoic igneous and metaigneous rocks near Gunnison, Colorado (Blackburn, W. H.)

**metamorphic rocks—metasedimentary rocks**

*environmental analysis*: Geology of Precambrian metasedimentary rocks of Lester Mountain, Colorado; a study of depositional environment, metamorphism and structure (White, Christine Anne)

— Proterozoic Uncompahgre Formation; remnant of a Precambrian fold and thrust belt (Houston, Betty Green)

*genesis*: Petrogenesis of the Pre-Cambrian metasedimentary rocks of the Almont area, Gunnison County, Colorado (Navarro, Enrique)

*metapelite*: Contact metamorphism of metapelites in the Front Range, Colorado; a study of disequilibrium reactions (Cameron, Donald Eugene)

— Timing of crenulation cleavage development in metapelites of the Precambrian Uncompahgre Formation, Needle Mountains, Colorado (Tewksbury, B. J.)

— Variation in distribution patterns of Precambrian  $Al_2SiO_5$  minerals in the Rocky Mountains (Heinrich, E. W.)

*metasandstone*: Early Proterozoic metasediments from north-central Colorado; metamorphism, provenance, and tectonic setting;

discussion and reply (Ingersoll, Raymond V., et al.)

*mineral assemblages*: Alteration zones related to igneous activity, Spanish Peaks area, Las Animas and Huerfano counties, Colorado (Hutchinson, Robert M.)

*mineral composition*: Petrology and geochemistry of a progressively metamorphosed sedimentary formation in Big Thompson Canyon, Larimer County, Colorado (Martell, Charles)

*petrofabrics*: Conjugate crenulation cleavages in the Uncompahgre Formation, Needle Mountains, Colorado (Tewksbury, B. J.)

**metamorphic rocks—metavolcanic rocks**

*genesis*: Origin of Precambrian metavolcanic rocks from New Mexico, Colorado, and Wyoming, and the isotopic evolution of Proterozoic mantle (Nelson, Bruce K.)

*geochemistry*: 1,700-Myr greenstone volcanic successions in southwestern North America and isotopic evolution of Proterozoic mantle (Nelson, Bruce K.)

— Early Proterozoic bimodal volcanic rocks in central Colorado, U.S.A.: Part II, Geochemistry, petrogenesis and tectonic setting (Boardman, Shelby J.)

*petrography*: A geologic investigation of the early Proterozoic Irving Formation, southeastern Needle Mountains, Colorado (Gonzales, David A.)

— Early Proterozoic bimodal volcanic rocks in central Colorado, U.S.A.; Part I, Petrography, stratigraphy and depositional history (Boardman, Shelby J.)

**metamorphic rocks—migmatites**

*composition*: The composition and role of the fluid in migmatites; a fluid inclusion study of the Front Range rocks (Olsen, S. N.)

*fluid inclusions*: Fluid inclusions in migmatites (Touret, J.)

— Variations in abundance and density of  $CO_2$ -rich fluid inclusions within a migmatite (Olsen, Sakiko N.)

*genesis*: Mass balance in migmatites (Olsen, Sakiko N.)

*gneisses*: U-Pb zircon chronology of early and middle Proterozoic igneous events in the Gunnison, Salida, and Wet Mountains areas, Colorado (Bickford, M. E., et al.)

*mass balance*: A quantitative approach to local mass balance in migmatites (Olsen, S. N.)

*metasomatism*: Metasomatism and partial melting in the Front Range migmatites (Olsen, Sakiko N.)

*microthermometry*: High density  $CO_2$  inclusions in the Colorado Front Range (Olsen, S. N.)

*petrofabrics*: The geology, microstructures, and small-scale structures in the vicinity of Upper Cataract Lake, Gore Range, Colorado (Sauls, Brian D.)

*petrology*: Mass-balance and mass-transfer in migmatites from the Colorado Front Range (Olsen, S. N.)

*phase equilibria*: Phase equilibria and spatial extent of chemical equilibration of migmatite rocks from Colorado, U.S.A., and Venezuela (Urbani P., Franco)

**metamorphic rocks—mineral assemblages**

*facies*: Heating, cooling, and uplift during Tertiary time, northern Sangre de Cristo Range, Colorado (Lindsey, David A., et al.)

*interpretation*: Cyclic development of hydrothermal mineral assemblages related to multiple intrusions at the Henderson porphyry molybdenum deposit, Colorado (Seedorff, Eric)

*petrography*: Precambrian petrochemistry of the northern Park Range, Colorado, and its implications for studies of crustal derivation (Snyder, George L., et al.)

*phase equilibria*: Metamorphic petrology of the Northeast Front Range, Colorado; the Pingree Park area (Nesse, William D.)

**metamorphic rocks—properties**

*density*: A gravity survey of the Moffat, Eisenhower and Johnson tunnels in the Front Range of Colorado (Upp, Charles S.)

*permeability*: Permeability of unsaturated, fractured metamorphic rocks near an underground opening (Montazer, Parviz)

**metamorphic rocks—quartzites**

*genesis*: A model for the tectonic evolution of the PC-X (?) Red Creek Quartzite, Utah and Colorado (Sears, James W., et al.)

*structural analysis*: Dynamic analysis of quartzites from the Sawatch and Parting formations, White River Uplift, Northwest Colorado (Dula, William F., Jr.)

**metamorphic rocks—schists**

*greenstone*: Time-stratigraphic equivalence of the Dubois Greenstone and felsic volcanic-sedimentary gneiss terrain, Gunnison Uplift, Gunnison and Saguache counties, Colorado (Shonk, Kenneth N.)

**metamorphic rocks—textures**

*fabric*: Proterozoic polydeformation in basement rocks of the Needle Mountains, Colorado (Gibson, Richard G.)

— Structural and petrologic studies of a Proterozoic terrain: "Gold Brick District", Gunnison County, Colorado (Earley, Drummond, III)

*shape analysis*: The effect of thermal metamorphism on quartz shape; Fourier-series analysis (Murray, David H., Jr.)

**metamorphism** *see* metamorphic rocks; metasomatism

*see under* petrology

**metamorphism—burial metamorphism**

*P-T conditions*: Application of Lopatin's method to determine burial history, evolution of the geothermal gradient, and timing of hydrocarbon generation in Cretaceous source rocks in the San Juan Basin, northwestern New Mexico and southwestern Colorado (Bond, Wendell A.)

— Cretaceous and lower Tertiary coals as sources for gas accumulations in the Rocky Mountain area (Meissner, Fred F.)

*thermal history*: Heating, cooling, and uplift during Tertiary time, northern Sangre de Cristo Range, Colorado (Lindsey, David A., et al.)

**metamorphism—contact metamorphism**

*geochemistry*: Contact metamorphism of metapelites in the Front Range, Colorado; a study of disequilibrium reactions (Cameron, Donald Eugene)

*P-T conditions*: The kinetics of smectite → illite reaction in contact metamorphic shales (Pytte, A. M.)

- plutons*: Redistribution of U and Th in shallow plutonic environments (Gosnold, William D., Jr.)
- metamorphism—evolution**  
*deformation*: Middle Proterozoic metamorphism; central Front Range, Colorado (Swayze, Gregg A.)
- metamorphism—grade**  
*low-grade metamorphism*: Petrology and geochemistry of a progressively metamorphosed sedimentary formation in Big Thompson Canyon, Larimer County, Colorado (Martell, Charles)
- metamorphism—migration of elements**  
*fluid flow*: Metamorphic fluid flow; a question of scale, crustal depth and bulk rock composition (Tracy, Robert J.)  
*gold ores*: Lateral zonation within epithermal gold mineralisation, Misima Island, Papua New Guinea (Clarke, Donald S.)
- metamorphism—P-T conditions**  
*indicators*: The geology, microstructures, and small-scale structures in the vicinity of Upper Cataract Lake, Gore Range, Colorado (Sauls, Brian D.)  
*isograds*: Metamorphic petrology of the Northeast Front Range, Colorado; the Pingree Park area (Nesse, William D.)  
*zoning*: Precambrian history of the Northeast Front Range, Colorado (Nesse, William D.)
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*evolution*: Precambrian petrochemistry of the northern Park Range, Colorado, and its implications for studies of crustal derivation (Snyder, George L., et al.)
- metamorphism—processes**  
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*migmatization*: Mass balance in migmatites (Olsen, Sakiko N.)  
— Mass-balance and mass-transfer in migmatites from the Colorado Front Range (Olsen, S. N.)  
— The composition and role of the fluid in migmatization of the Front Range rocks; a fluid inclusion study (Olsen, Sakiko N.)  
*segregation*: Petrology of flecked gneisses in the northern Wet Mountains, Fremont County, Colorado (Trumbull, Robert B.)
- metamorphism—regional metamorphism**  
*high-grade metamorphism*: Migmatitic amphibolite; a newly-defined isograd in the northern Colorado Front Range (Shaver, Kenneth C.)  
*mineral assemblages*: Occurrences of sapphirine in the Wet Mountains, Custer County, Colorado (Raymond, William H., et al.)
- metamorphism—retrograde metamorphism**  
*effects*: Geology of the Granby and Strawberry Lake 7 1/2' quadrangles, Grand County, Colorado (Schroeder, David Alan)
- metamorphism—shock metamorphism**  
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— The Cretaceous-Tertiary (K-T) boundary interval, Raton Basin, Colorado and New Mexico, and its content of shock-metamorphosed minerals; implication concerning the K-T boundary impact-extinction theory (Izett, Glen A.)  
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- metasomatic rocks** *see* igneous rocks; metamorphic rocks; metamorphism; metasomatism
- metasomatic rocks—greisen**  
*mineral assemblages*: Cyclic development of hydrothermal mineral assemblages related to multiple intrusions at the Henderson porphyry molybdenum deposit, Colorado (Seedorff, Eric)
- metasomatism** *see* metamorphism; metasomatic rocks  
*see under* petrology
- metasomatism—geochemistry**  
*migration of elements*: Redistribution of U and Th in shallow plutonic environments (Gosnold, William D., Jr.)  
*potassium*: Potash metasomatism in the La Plata Mountains, Colorado (Schultz, Leonard Gene)
- metasomatism—materials**  
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- meteorites—composition**  
*chondrites*: The Julesburg, Colorado, meteorite, a new L3 find (Graham, A. L.)
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- Regional study of mineralizing fluids, Breckenridge mining district, Colorado (Gerdienich, Michael J., et al.)
- The petrology of Tertiary intrusions associated with epithermal veins in the Georgetown-Silver Plume District; Clear Creek County, Colorado (Connors, Katherine A.)
- porphyry:** Stable isotopic composition of fluid inclusions in a porphyry-style hydrothermal system near Silverton, San Juan Mountains, Colorado (Ringrose, C. R., et al.)
- structural controls:** A study of residual gravity maps to delineate deep controls of ore deposits in the Colorado mineral belt (Kutina, Jan)
- Halogens in biotite, sericite, and apatite in relation to alteration and mineralization in the vicinity of Mount Manitou, Bonanza mining district, Saguache County, Colorado (Woodland, Alan Butler)
- Mineral resources of the Black Canyon and South Piney Creek Wilderness Study Areas, Saguache County, Colorado (Lindsey, David A., et al.)
- supergene processes:** Genesis of acid-sulfate alteration and Au-Cu-Ag mineralization at Summitville, Colorado (including sections on supergene alteration and clay mineralogy of the deposit) (Stoffregen, Roger Eben)
- The occurrence of aluminum phosphate-sulfate minerals in the advanced argillic alteration assemblage (Stoffregen, R. E.)
- volcanic processes:** Computer analysis of mineralization within evolving subvolcanic and caldera systems, Breckenridge and Bonanza regions, Colorado mineral belt, U.S.A. (Pride, D. E.)

- Deep environment of volcanogenic epithermal mineralization; proposed research drilling at Creede, Colorado (Bethke, Philip M.)
- Episodic metallization in the western San Juan Caldera complex, Colorado (Grauch, R. I., et al.)
- mineral deposits, genesis—molybdenum ores**
- environment:* A lower crustal origin for molybdenum porphyry systems; lead isotope evidence from southern Cordilleran deposits (Stein, Holly J.)
- epithermal processes:* Stable isotope and fluid inclusion investigations of epithermal vein and porphyry molybdenum mineralization in the Rico mining district, Colorado (Larson, Peter B.)
- geochemical controls:* Oxidation of molybdenite at Climax CO. and other deposits; implications for exploration (Leanderson, P. James, et al.)
- hydrothermal processes:* A strontium and oxygen isotope study of Laramide magmatic and hydrothermal activity near Central City, Colorado (Dickin, A. P., et al.)
- Central City, Colorado; the upper part of an alkaline porphyry molybdenum system (Rice, C. M., et al.)
- Cyclic development of hydrothermal mineral assemblages related to multiple intrusions at the Henderson porphyry molybdenum deposit, Colorado (Seedorff, Eric)
- The Climax porphyry molybdenum system (Wallace, S. R.)
- igneous processes:* Comparison of field-based studies of the Henderson porphyry molybdenum deposit, Colorado, with experimental and theoretical models of porphyry systems (Carten, R. B., et al.)
- Cyclic development of igneous features and their relationship to high-temperature hydrothermal features in the Henderson porphyry molybdenum deposit, Colorado (Carten, Richard B., et al.)
- Evolution of immiscible Cl- and F-rich liquids from ore magmas, Henderson porphyry molybdenum deposit, Colorado (Carten, Richard B.)
- ore-forming fluids:* Henderson porphyry molybdenum deposit; cyclic alteration-mineralization and geochemical evolution of topaz- and magnetite-bearing assemblages (Seedorff, Charles Eric)
- Movement and origin of ore fluids in climax-type systems (Stein, Holly J.)
- Origin of crenulate quartz layers: evidence from the Hall (Nevada Moly) molybdenum deposit, Nevada (Shaver, Stephen Allen)
- Origin of differences between Climax-type and quartz monzonite-type porphyry moly deposits (Shaver, Stephen Allen)
- Porphyry molybdenum-style mineralisation near Central City, Colorado (Rice, C. M., et al.)
- The Mount Emmons porphyry molybdenum deposit; a lower crustal origin; lead and oxygen isotope evidence (Stein, H. J.)
- Trace element mineralogy in the porphyry molybdenum environment (Gunow, Alexander James)
- patterns:* Descriptive model of Climax Mo deposits (Ludington, Stephen D.)
- porphyry molybdenum:* A heavy isotope enriched sulfur source for climax-type porphyry molybdenum deposits; molybdenite compositions (Stein, H. J.)
- Henderson porphyry molybdenum deposit, Colorado; space-time evolution of the hydrothermal system (Seedorff, Eric)
- The Mount Emmons porphyry molybdenum deposit, Colorado; magmatic degassing and meteoric water overprinting (Taylor, B. E., et al.)
- rift zones:* The timing and tectonic setting of molybdenum mineralization in the southern Rocky Mountains (Stein, Holly J.)
- structural controls:* Controls on molybdenite deposition at Henderson Mine, Empire, Colorado (Carten, R. B., et al.)
- Molybdenum tectonics (Kirkham, R. V.)
- Tilting of Urad-Henderson and Climax porphyry molybdenum systems, central Colorado, as related to northern Rio Grande Rift tectonics (Geraghty, Ennis P., et al.)
- mineral deposits, genesis—pegmatite**
- geochemical controls:* The distribution and chemistry of allanite and samarskite in the South Platte pegmatite district and their genetic implications (Brewster, Renee Harrison)
- hydrothermal processes:* Niobian rutile and ilmenite from the McGuire Pegmatite, Colorado and their breakdown products (Cerny, Petr, et al.)
- igneous processes:* The Pikes Peak Batholith and associated plutons, Colorado (Wobus, Reinhard A.)
- ore-forming fluids:* The Mount Antero and California intrusions, Chaffee County, Colorado; evidence for early evolution of pegmatitic fluids (Shannon, James R.)
- processes:* Precambrian history of the Northeast Front Range, Colorado (Nesse, William D.)
- mineral deposits, genesis—polymetallic ores**
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- The Gladiator Mine, Lake City, Colorado; the mineralogy and paragenesis of an epithermal base- and precious-metal vein system (Bove, Dana J.)
- host rocks:* Paleomagnetism and rock magnetism of the Mississippian Leadville (carbonate) Formation and implications for the age of sub-regional dolomitization (Horton, Robert A., Jr.)
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- Geochemistry of precious- and base-metal veins, Lake City area, Colorado (Sanford, Richard F.)
- Solfataric alteration in the San Juan Mountains, Colorado: oxygen isotope variations in a boiling hydrothermal environment (Larson, Peter B.)
- igneous processes:* A fluid inclusion and sulfur isotopic study of precious and base metal mineralization spatially associated with the Patch and Gold Cup breccia pipes, Central City, Colorado (Spry, Paul G.)
- Genetic traits of climax-type granites and molybdenum mineralization, Colorado mineral belt (Stein, Holly J.)
- volcanic processes:* U-Pb isochron age and Pb isotope systematics of the Golden Fleece vein; implications for the relationship of mineralization to the Lake City Caldera, western San Juan Mountains, Colorado (Hon, Ken, et al.)
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- Stable isotope geochemistry of the Creede, Colorado, hydrothermal system (Rye, Robert O., et al.)
- The Silver Plume-Georgetown District (Bookstrom, A. A.)
- The Virginium vein ore deposit, northwestern San Juan Mountains, Colorado; a study of the mineralogy, structure, and fluid inclusions of an epithermal base-metal and silver vein in a volcanic environment (Coxe, Berton Woodward)
- Three major types of epithermal precious-metal deposits (Bonham, Harold F., Jr.)
- Tops of epithermal veins in the Axell District, Platoro Caldera, San Juan Mountains, Colorado (Butler, Brian F.)
- exogene processes:* Oligocene volcanic rocks as a uranium source for sandstone-type uranium deposits in central Colorado (Dickinson, Kendall A.)
- hydrothermal processes:* A six-component chlorite solid solution model and the conditions of chlorite formation in hydrothermal and geothermal systems (Walshe, John L.)
- Evolution of the Red Mountain alunite deposit, Lake City Caldera, Colorado (Bove, Dana J., et al.)
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- Geology of the Central City area, Colorado; a Laramide mining district (Sims, P. K.)
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- Origin of the ore deposits at Gilman, Colorado; oxygen and hydrogen isotopic constraints (Beaty, David W., et al.)
- Pre-ore potassium metasomatism, Creede mining district, Colorado (Bethke, Philip M., et al.)
- Progress in the development of the six component chlorite solid solution model and the search for uniqueness in chemical models of hydrothermal ore deposit formation (Walshe, J. L.)
- Scientific drilling to study the roots and margins of hydrothermal mineral systems (Eidel, J. James)

- igneous processes:* The concentration and transport of molybdenum in magmatic systems, experimental evidence (Tingle, Tracy N.)
- mineralization:* Geology and mineralization of the Paradise Pass area, Pitkin County, Colorado (Pillmore, Kathryn A.)
- paragenesis:* Paragenesis of the ores of Poughkeepsie Gulch, San Juan Mountains, Colorado (Silver, Leon T.)
- supergene processes:* History and geology of the Leadville District (Beaty, David W.)
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- controls:* Controls on silver mineralization in the Creede Formation, Creede, Colorado (Rice, John Albert)
- epithermal processes:* Geology and geochemistry of the Caribou Mine, Boulder County, Colorado (Francis, Kevin Albert)
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- Mineralogy and fluid inclusion study of the southern Amethyst vein system, Creede mining district, Colorado (Robinson, Richard W.)
- ore-forming fluids:* Paleohydrology in the Creede Formation and formation of a disseminated silver deposit (Thompson, Tommy B.)
- Significance of mineral variations in time and space along the Bulldog Mountain vein system with respect to the district-wide hydrology, Creede District, Colorado (Heald-Wetlaufer, P.)
- Silver stockwork mineralization and associated wall rock alteration of Creede, Colorado (O'Brien, James D.)
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- absolute age:* The Schwartzwalder uranium deposit; II, Age of uranium mineralization and lead isotope constraints on genesis (Ludwig, K. R., et al.)
- controls:* Geology and geochemistry of the Pitch uranium mine area, Saguache County, Colorado (Nash, J. Thomas)
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- Geology of volcanogenic uranium deposits within the Tallahassee Creek Conglomerate, Tallahassee Creek uranium district, Colorado (Hon, Ken)
- The Hansen uranium orebody, Tallahassee Creek District, Fremont County, Colorado (Chapin, Charles E., et al.)
- environment:* Preliminary report on and measured sections of the Middle Jurassic Entrada Sandstone and Wanakah Formation near Placerville, southwestern Colorado (Steele, Brenda A.)
- epigene processes:* Rocks of the Thirtynine Mile volcanic field as possible sources of uranium for epigenetic deposits in central Colorado, U.S.A. (Dickinson, Kendall A.)
- geochemical controls:* Alteration and mineralization in the Uruvan mineral belt, Colorado (Rohl, Arthur N.)
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- hydrogeological controls:* Uranium distribution and sandstone depositional environments—Oligocene and Upper Cretaceous sediments, Cheyenne Basin, Colorado (Nibbelink, Kenneth A.)
- hydrothermal processes:* Alteration and vein mineralization, Schwartzwalder uranium mine, Jefferson County, Colorado (Wallace, Alan R.)
- Episodic uranium mineralization in the western San Juan caldera complex, Colorado (Grauch, Richard I., et al.)
- Geology and origin of the Schwartzwalder uranium deposit, Front Range, Colorado, USA (Wallace, A. R.)
- The age and origin of the Schwartzwalder uranium deposit, Front Range, Colorado (Wallace, A. R., et al.)
- igneous processes:* Mid-Proterozoic post-orogenic granites, and associated uranium mineralization of the Needle Mountains, southwestern Colorado (Collier, James D.)
- interpretation:* A comparison of uranium-bearing sequences in the Newark Basin, Pennsylvania and New Jersey, and the San Juan Basin, New Mexico (Turner-Peterson, Christine E.)
- metamorphic processes:* Assessment of role of metamorphic remobilization in genesis of uranium ores from Ralston Buttes area, Colorado (Chatterjee, Subir K.)
- ore-forming fluids:* Chemical and thermal evolution of diagenetic fluids and the genesis of uranium and copper ore in and adjacent to the Paradox Basin with emphasis on the Lisbon Valley and Temple Mountain areas, Utah and Colorado (Morrison, Stan Jay)
- Geology and uranium mineralization of the Florida Mountain area, Needle Mountains, southwestern Colorado (Collier, James D.)
- The Schwartzwalder uranium deposit; III, Alteration, vein mineralization, light stable isotopes, and genesis of the deposit (Wallace, Alan R.)
- processes:* Alteration and vein mineralization, Schwartzwalder uranium deposit, Front Range, Colorado (Wallace, A. R.)
- Uraniferous Proterozoic marginal marine sediments; precursors to major uranium deposits in metamorphic rocks (Nash, J. Thomas)
- provenance:* Upper Jurassic groundwater flow in the Colorado Plateau; the key to formation of uranium ore deposits (Sanford, Richard F.)
- sedimentary processes:* Favorability of Precambrian quartz-pebble conglomerates in the United States as uranium hosts (Anderson, J. R., et al.)
- The formation and alteration of tabular-type uranium-vanadium deposits as a variant of normal diagenetic processes in organic-rich sediments (Spirakis, Charles S.)
- structural controls:* Geologic and structural maps and sections of the Marshall Pass mining district, Saguache, Gunnison, and Chaffee counties, Colorado (Olson, J. C.)
- Geology and genesis of uranium deposits at the Pitch Mine, Saguache County, Colorado (Nash, J. T.)
- Structure contour map of the San Juan Basin and vicinity (Thaden, Robert E.)
- Summary of the geology, economic aspects, and geochemistry of the Schwartzwalder uranium-bearing area, Ralston Buttes District, Jefferson County, Colorado (Young, E. J.)
- Tectonic setting of the San Juan Basin in the Jurassic (Santos, Elmer S.)
- The Schwartzwalder uranium deposit; I, Geology and structural controls on mineralization (Wallace, Alan R.)
- syngensis:* Trace-element geochemistry of sandstones hosting uranium-vanadium deposits in the La Sal Mountains region of Utah and Colorado, U.S.A. (LaPensee, Earl Francis)
- veins:* Examples of organization of networks of mineralized fractures in diverse structural models (Ruhland, M.)
- Genetic implications of preliminary mineralogical, paragenetic and fluid inclusion data for the Schwartzwalder uranium mine, Colorado (Rich, R. A.)
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- gold ores:* Preliminary studies of *Bacillus cereus* distribution near a gold vein and a disseminated gold deposit (Parduhn, Nancy L.)
- Recent studies of the distribution of *Bacillus cereus* near subsurface gold deposits (Parduhn, Nancy L., et al.)
- metal ores:* Luminometry and isotopy in microbiological exploration for mineral deposits (Michaels, Glenda B.)
- Microbiological exploration for mineral deposits; a new technique (Michaels, Glenda B.)
- Temporal variation of metal concentrations in biogeochemical samples over the Royal Tiger Mine, Colorado: Part II, Between-year variation (Stednick, J. D.)
- mull:* Utility of mull in geochemical exploration (Curtin, G. C.)
- vegetation:* Temporal variation of metal concentrations in biogeochemical samples over the Royal Tiger Mine, Colorado: Part I, Within year variation (Stednick, J. D., et al.)

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*metal ores:* Metal uptake by young conifer trees (King, Harley D., et al.)

*surveys:* A reconnaissance study of the bioavailability of copper, iron, lead, magnesium, manganese, silver and zinc on the polymetallic Aqueduct Prospect, Breckenridge, Colorado (McDonald, Cecilia Louise)

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*data processing:* A stream sediment data base for the state of Colorado, USA (Bolivar, Stephen L.)

— Computer analysis of mineralization within evolving subvolcanic and caldera systems, Breckenridge and Bonanza regions, Colorado mineral belt, U.S.A. (Pride, D. E.)

*fluid inclusions:* Application of fluid inclusion and rock-gas analysis in mineral exploration (Kessler, Stephen E., et al.)

*heavy minerals:* Geochemical exploration using heavy minerals in the San Luis Valley, Colorado (Thomas, Robert Brinley)

— Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates derived from stream sediments and ridgetop soils from the upper Keyser Creek basin in the St. Louis Peak Roadless Area, Grand County, Colorado (Barton, H. N.)

— Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridgetop soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)

*helium:* Helium in soil gas and well water in the vicinity of a uranium deposit, Weld County, Colorado (Reimer, G. M.)

*interpretation:* Geochemical data for the Vasquez Peak Wilderness Study Area (A2361), the Williams Fork Further Planning Area (2-114), and the St. Louis Peak Roadless Area (F2361), Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)

*metal ores:* A stream sediment data base for the state of Colorado, U.S.A. (Bolivar, Stephen L.)

— Gas halos in hydrothermal clays associated with ore shoots at Creede, Colorado (Schnorr, Patricia H., et al.)

*molybdenum ores:* GRANNY, a data bank of chemical analyses of Laramide and younger high-silica rhyolites and granites from Colorado and north-central New Mexico (Steigerwald, C. H., et al.)

— Oxidation of molybdenite at Climax CO. and other deposits; implications for exploration (Leanderson, P. James, et al.)

*ore guides:* Changes in chemical parameters around a massive sulfide deposit (Ririe, G. T.)

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*rocks:* Geochemical and mineralogical data for altered rocks and soils collected in and near the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

*soil sampling:* A comparison of instantaneous versus integrative techniques in soil-gas sampling (Jaacks, J. A.)

*stream sediments:* Analytical data report for a pilot-study of twenty stream-sediment, heavy-

mineral concentrate, and rock samples from the Sangre de Cristo Wilderness Study Area, south-central Colorado (Zimbelman, D. R., et al.)

— Analytical results and sample locality map of stream-sediment and panned-concentrate samples from the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Domenico, James A., et al.)

— Diamond exploration geochemistry in the North American Cordillera (Dummett, H. T., et al.)

— Evaluation of integrated data sets (Bolivar, Stephen L., et al.)

— Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates of stream sediments from Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)

— Geology and mineral resource potential of the Black Ridge Canyon Wilderness Study Area, Mesa County, Colorado (GEM Phase 2) (Toth, M. I., et al.)

— Geology and mineral resource potential of the Dominguez Canyon Wilderness Study Area, Delta, Mesa, and Montrose counties, Colorado (GEM phase 2) (Toth, M. I., et al.)

— Geology and mineral resource potential of the Sewemup Mesa Wilderness Study Area, Mesa and Montrose counties, Colorado (GEM phase 2) (Soulliere, S. J., et al.)

— Hydrogeochemical and stream sediment reconnaissance of the National Uranium Resource Evaluation Program; April-September 1978; primarily for the Rocky Mountain states of New Mexico, Colorado, Wyoming, and Montana and the State of Alaska (Aamodt, Paul L., et al.)

— Mineral resource evaluation of the Browns Canyon area, Chaffee County, Colorado, using stream-sediment geochemistry (Leibold, Anne M.)

— Stream-sediment and panned-concentrate geochemical maps of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, Gary A.)

*surveys:* Geochemical detection of sulfide-bearing vein structures in a disturbed surficial environment, Central City District, Colorado (Pivonka, Lee J.)

— Geochemical map of the Piedra Wilderness Study Area, Archuleta and Hinsdale counties, Colorado (Franczyk, Karen J., et al.)

— Magnetic tape containing spectrographic and chemical analyses of rocks and stream sediment from the study areas contiguous to the Uncompahgre Primitive Area, Colo. (Steven, T. A.)

— Magnetic tape containing spectrographic and chemical analyses of stream sediments, rocks, and panned concentrates from the West Elk Wilderness and vicinity, Delta and Gunnison counties, Colorado (McDanal, S. K., et al.)

— Magnetic tape containing spectrographic and chemical analysis of stream sediments and rocks from the Chama-Southern San Juan Mountains Wilderness Study Area, Mineral,

Rio Grande, Archuleta, and Conejos counties, Colorado (McDanal, S. K., et al.)

— Maps showing anomaly patterns for silver, molybdenum, lead, and zinc in altered rocks and soils, Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

— Maps showing water geochemistry of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, G. A., et al.)

— Mineral resources of the Eagle Mountain Wilderness Study Area, Pitkin County, Colorado (Soulliere, Sandra J., et al.)

*techniques:* A comparison of geochemical sampling and analytical techniques used for precious metal exploration in northeastern Gunnison County, Colorado (Clark, J. Robert, et al.)

— Chemical analysis and statistical data for water samples collected in Colorado, New Mexico, and Arizona as part of a study of surface-water and stream-sediment sampling techniques used in uranium exploration (Burnside, S. S.)

*trace elements:* A new method of analysis for trace elements in gold-silver deposits; comparison with Lake City data (Sanford, Richard F.)

— Analytical results and sample locality map of stream sediment, heavy-mineral-concentrate, and rock samples from the Lost Creek Wilderness Area, Jefferson and Park counties, Colorado (Domenico, James A.)

— Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

— Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate and rock samples from the Sangre de Cristo Wilderness Study Area, Saguache, Alamosa, Fremont, Custer, and Huerfano counties, Colorado (Adrian, Betty M., et al.)

— Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Beaver Creek Wilderness Study Area (CO-050-016), El Paso, Fremont, and Teller counties, Colorado (Detra, David E., et al.)

— Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Bull Gulch Wilderness Study Area (CO-070-430), Eagle County, Colorado (Detra, David E., et al.)

— Analytical results and sample locality map of stream-sediment, panned-concentrate, and rock samples from the Fossil Ridge Wilderness Study Area, Gunnison County, Colorado (Adrian, Betty M., et al.)

— Analytical results and sample locality maps of stream-sediment and heavy-mineral-concentrate samples from Dolores River Canyon Wilderness Study Area (CO-030-290), Montrose and San Miguel counties, Colorado (Bullock, John H., Jr., et al.)

— Analytical results and sample locality maps of stream-sediment and heavy-mineral-concentrate samples from Westwater Canyon (UT-060-118) and Black Ridge Canyons West

- (CO-070-113A, UT-060-116/117) Wilderness Study Areas, Grand County, Utah and Mesa County, Colorado (Bullock, John H., Jr., et al.)
- Analytical results for 102 water samples from sites draining the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Ficklin, W. H., et al.)
  - Central City, Colorado; the upper part of an alkaline porphyry molybdenum system (Rice, C. M., et al.)
  - Chemical data concerning Proterozoic ores and rocks from the Sedalia Mine area, Chaffee County, Colorado (Sheridan, Douglas M., et al.)
  - Comparison of the chemical composition of mineralized and unmineralized sandstone and conglomerate samples from the uranium-bearing Chinle Formation of the Colorado Plateau (Pierson, Charles T.)
  - Geochemical data from the West Needle and West Needle Contiguous Wilderness Study Areas, San Juan and La Plata counties, Colorado (Birmingham, Scott D.)
  - Geochemical data, Red Mountains mining district, San Juan Mountains, Colorado (Fisher, Frederick S.)
  - Geochemical evaluation of mineral resources in the Chama-Southern San Juan Mountains Wilderness Study Area, Colorado (Brock, Maurice R., et al.)
  - Geochemical map and interpretations for the Fossil Ridge Wilderness Study Area, Gunnison County, Colorado (Clark, J. Robert)
  - Geologic setting and petrochemistry of the Late Cretaceous-early Tertiary intrusives in the northern Front Range mineral belt, Colorado (Gable, Dolores J.)
  - Geology and geochemistry of the Caribou Mine, Boulder County, Colorado (Francis, Kevin Albert)
  - Geology and mineral resource potential of the Palisade Wilderness Study Area, Mesa County, Colorado (GEM Phase 2) (Hovorka, D. S., et al.)
  - Geology and resources of thorium and associated elements in the Wet Mountains area, Fremont and Custer counties, Colorado (Armbrustmacher, Theodore J.)
  - Mineral resources of the Beaver Creek Wilderness Study Area, Fremont, El Paso, and Teller counties, Colorado (Lindsey, David A., et al.)
  - Trace elements in sphalerite, galena, and pyrite from molybdenum and non-molybdenum systems (Steininger, Roger C.)
- uranium ores:** Gaseous emanations associated with sandstone-type uranium deposits (Reimer, G. M.)
- Geochemical characterization of the Mt. Harvard 15-minute quadrangle, Colorado, using NURE data (Ludlam, John R.)
  - Geology and uranium geochemistry of the western margin of the Thirtynine Mile volcanic field, Park, Chaffee and Fremont counties, Colorado (Smith, Larry B.)
  - Regional geochemical patterns in Wyoming and northern Colorado as defined by analysis of stream sediment samples (Warren, Richard G., et al.)
  - Reports on field investigations of uranium anomalies (Goodknight, Craig S.)

**volatiles:** Environmental influences upon mercury, radon and helium concentrations in soil gases at a site near Denver, Colorado (Klusman, Ronald W.)

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**drilling:** Scientific drilling to study the roots and margins of hydrothermal mineral systems (Eidel, J. James)

**fluorspar:** Map showing hydrothermal alteration and fluorite occurrences in the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G.)

**geologic thermometry:** Recognition and use of paleothermal anomalies as a new exploration tool (Cunningham, Charles G.)

**heavy minerals:** Map showing the distribution of selected mineral assemblages in nonmagnetic heavy-mineral concentrates from stream sediments from the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

**metal ores:** Geologic characteristics of the Scotia-Vanderbilt Vein, Silverton, Colorado; implications for epithermal precious metal exploration in volcanic settings (Standen, Allan R.)

**ore guides:** Precambrian deposits of zinc-copper-lead sulfides and zinc spinel (gahnite) in Colorado (Sheridan, Douglas M.)

**stream sediments:** Stream sediment exploration sampling for kimberlite in Colorado-Wyoming and techniques of diamond extraction (Brink, Carl, et al.)

**uranium ores:** Physical properties of uranium host rocks and experimental drilling at Long Park, Montrose County, Colo. (Manger, G. E., et al.)

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**factor analysis:** Statistical techniques using NURE airborne geophysical data and NURE geochemical data (Campbell, K.)

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- see* metal ores; nonmetal deposits
- see under* bibliography *under* economic geology
- see under* economic geology *under* Alamosa County; Archuleta County; Boulder County; catalogs; Chaffee County; Clear Creek County; Conejos County; Costilla County; Custer County; data processing; Delta County; Dolores County; Eagle County; El Paso County; Fremont County; Garfield County; Gilpin County; Grand County; Gunnison County; Hinsdale County; Huerfano County; Jackson County; Jefferson County; La Plata County; Lake County; Larimer County; Las Animas County; Mesa County; Mineral County; Moffat County; Montrose County; Ouray County; Park County; Pitkin County; Pueblo County; Rio Blanco County; Rio Grande County; Rocky Mountains; Routt County; Saguache County; San Juan County; San Miguel County; Southwestern U.S.; Summit County; Teller County; United States; Weld County; Western U.S.
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*Mammalia*: Paleontology, taphonomy, and stratigraphy of the Browns Park Formation (Oligocene and Miocene) near Maybell, Moffat County, Colorado (Honey, James G.)

*Reptilia*: Dinosaur National Monument; paleontology in the public eye (Chure, Daniel J.)

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*intrusions*: Igneous dikes of the eastern Uinta Mountains, Utah and Colorado (Ritzma, Howard R.)

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— Variations in vitrinite reflectance values for the Upper Cretaceous Mesaverde Formation, southeastern Piceance Basin, northwestern Colorado; implications for burial history and potential hydrocarbon generation (Nuccio, Vito F.)

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*Cambrian*: Paleomagnetism of a Late Cambrian or Early Ordovician dike from Lodore Canyon, northwestern Colorado (Hudson, Mark R.)

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*faults*: History of faulting in the eastern Uinta Mountains, Colorado and Utah (Hansen, Wallace R.)

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— Structural development and oil occurrence on northeast flank of Uinta Mountains near Irish Canyon, northwestern Colorado (Roehler, Henry W.)

— The geology of the Cross Mountain Anticline, Moffat County, Colorado (Vinson, George L.)

**Mohorovicic discontinuity** *see* crust; mantle *see under* tectonophysics *under* Colorado Plateau

#### Molas Formation

Geology of the Steer Creek area northeast of Salida, Colorado (Thayer, James Bliss)

— Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)

— The stratigraphy of the Molas Formation of southwestern Colorado (Winar, Richard Marion)

**Mollusca** *see under* paleontology

**Mollusca—Ammonoidea**

*Cretaceous*: Preserved ammonitellas of Scaphites (Ammonoidea, Ancyloceratina) (Landman, Neil H.)

— Tarrantoceras Stephenson and related ammonoid genera from Cenomanian (Upper Cretaceous) rocks in Texas and the Western Interior of the United States (Cobban, William A.)

— The Upper Cretaceous (Cenomanian) ammonites Metengonoceras dumbli (Cragin) and M. acutum Hyatt (Cobban, William A.)

— The Upper Cretaceous ammonite Watinoceras Warren in the Western Interior of the United States (Cobban, William A.)

**Mollusca—Archaeogastropoda**

*Pennsylvanian*: Responses to cycles within and among Pennsylvanian basins; migration, ecotopy or evolution? (Schindel, David E.)

**Mollusca—Bivalvia**

*Pennsylvanian*: A new pernopecten (Bivalvia; Pectinacea) from the Pennsylvanian Gothic Formation of Colorado (Rice, William F.)

**Mollusca—Desmoceratida**

*Cretaceous*: The Cretaceous ammonite Eopachydiscus and the origin of the Pachydiscidae (Kennedy, W. J., et al.)

**Mollusca—Lytoceratida**

*Cretaceous*: The Upper Cretaceous ammonite Rhaeboceras Meek in the Western Interior of the United States (Cobban, William A.)

**Mollusca—Monoplacophora**

*Paleozoic*: Larval development, musculature, and relationships of Sinuitopsis and related Baltic bellerophonts (Dzik, Jerzy)

**mollusks—ammonoids**

*Cretaceous*: Ammonite record from Bridge Creek Member of Greenhorn Limestone at Pueblo Reservoir State Recreation Area, Colorado (Cobban, William A.)

— Ammonites in clasts of the Juana Lopez Member of the Carlile Shale (Upper Cretaceous) near Pueblo, Colorado (Cobban, William A.)

— An ammonoid fauna from the Glencairn Shale Member of the Lower Cretaceous Purgatoire Formation, Baca County, Colorado (Cobban, William A.)

— Biostratigraphic correlation of Cretaceous-Tertiary boundary rocks, Colorado to San Juan Basin, New Mexico (Newman, Karl R.)

— Biostratigraphic correlation of K-T rocks from northwestern Colorado to San Juan Basin, Colorado and New Mexico (Newman, Karl R.)

— Geologic and biostratigraphic map of the Pierre Shale in the Colorado Springs-Pueblo area, Colorado (Scott, Glenn R.)

— Geologic, biostratigraphic, and structure map of the Pierre Shale between Loveland and Round Butte, Colorado (Scott, G. R.)

— Significance of the rate of deposition of uppermost Upper Cretaceous rocks of the San Juan Basin, New Mexico and Colorado (Fassett, James E.)

— Stratigraphy of Grand Hogback Coalfield, upper Campanian Mesaverde Group, Rifle Gap to New Castle, Garfield County, Colorado (Madden, Dawn J.)

— The ages of the continental, Upper Cretaceous, Fruitland Formation and Kirtland Shale based on a projection of ammonite zones from the Lewis Shale, San Juan Basin, New Mexico and Colorado (Fassett, James E.)

**mollusks—biogeography**

*Cenozoic*: Evolution of freshwater drainages and mollusks in western North America (Taylor, Dwight W.)

**mollusks—biostratigraphy**

*Cretaceous*: Biostratigraphy of Fruitland, Kirtland, and Animas formations (Cretaceous and Paleocene), northern San Juan Basin, Colorado (Newman, Karl R.)

— Cretaceous stratigraphy and paleontology in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Kues, Barry S.)

— Iridium abundance maxima in the upper Cenomanian extinction interval (Orth, C. J., et al.)

— Mid-Cretaceous molluscan biostratigraphy and paleogeography of southwestern part of Western Interior, United States (Cobban, William A.)

— Stratigraphy and depositional environments of a portion of upper Campanian Mesaverde Group, central Grand Hogback, Northwest Colorado (Madden, Dawn J.)

— Texigryphaea in the Glencairn Formation near Two Buttes, Colorado, with notes on an assemblage of Texigryphaea from the Kiowa Formation of southern Kansas (Kues, Barry S.)

*Eocene*: New names for units in the lower part of the Green River Formation, Piceance Creek basin, Colorado (Johnson, Ronald C.)

*Jurassic*: Reconstruction of a Late Jurassic lacustrine ecosystem (Lockley, M. G., et al.)

*Mesozoic*: The stratigraphy of the Nugget Sandstone (Doelger, Nancy M.)

*Pennsylvanian*: A field guide to the Pennsylvanian biofacies of the Minturn Formation, Bond-McCoy area, central Colorado Trough (Houck, Karen J.)

*Pleistocene*: Nonmarine mollusks as indicators of local paleoenvironments in fluvial deposits; an example from the Pleistocene of Northwest Colorado (Evanoff, Emmett)

— Paleoclimatic implications of fluvial deposits and nonmarine mollusks in Pleistocene terraces along the White River, near Meeker, Colorado (Evanoff, Emmett)

*Quaternary*: Pleistocene and Holocene dune stratigraphy, Wray dune field, Colorado-Nebraska (Madole, Richard F.)

*Tertiary*: Stratigraphic sections of lower Tertiary strata and charts showing palynomorph and mollusk assemblages, Douglas Creek Arch area, Colorado and Utah (Johnson, R. C., et al.)

**mollusks—bivalves**

*Cretaceous*: Regional analysis of rhythmic bedding in the Fort Hays Limestone Member, Niobrara Formation (Upper Cretaceous), U.S. Western Interior (Lafriere, Alan Price)

— The Carlile-Niobrara (Upper Cretaceous) unconformity in southeastern Colorado, southwestern Kansas, and northeastern New Mexico (Lafriere, Alan P.)

*Jurassic*: Paleobiocenoses presumably related to submarine springs in a sedimentary environment; the pseudobioherms of the Terres Noires

Formation (southeastern France) and the tepee buttes of the Pierre Shale Formation, Colorado, U.S.A. (Gaillard, C.)

**mollusks—gastropods**

*Quaternary*: Quaternary paleotemperature estimates using amino-acid ratios measured on terrestrial gastropods from fluvial sequences in Colorado (Nelson, A. R., et al.)

**mollusks—paleoecology**

*Cretaceous*: Biogeographic influences on Early Cretaceous paleocommunities, Western Interior (Scott, R. W.)

*Jurassic*: Interpretations of some depositional environments and paleoecology in the Morrison Formation of southeastern Colorado (Frazier, F., et al.)

**molybdates** *see under* minerals

**molybdenum—geochemistry**

*ground water*: Ground-water flow and quality near Canon City, Colorado (Hearne, Glenn A.)

*igneous rocks*: The concentration and transport of molybdenum in magmatic systems, experimental evidence (Tingle, Tracy N.)

*metamorphic rocks*: Molybdenum distribution in Precambrian rocks of the Colorado Mineral Belt (Lehmann, Bernd)

*peat*: Selected trace element anomalies in a Front Range bog, Larimer County, Colorado (Sarnecki, Joseph C.)

*rocks*: Maps showing anomaly patterns for silver, molybdenum, lead, and zinc in altered rocks and soils, Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

**molybdenum ores** *see under* economic geology; isotopes; mineral deposits, genesis; paragenesis

*see under* economic geology *under* Boulder County; Clear Creek County; Gilpin County; Grand County; Gunnison County; Jackson County; Lake County; Pitkin County; Saguache County

*see under* geochemical methods *under* mineral exploration

*see under* geochemistry *under* deuterium

*see under* ore guides *under* mineral exploration

**molybdenum ores—genesis**

*igneous processes*: Molybdenum tectonics (Kirkham, R. V.)

**Monkeymeyer Sandstone**

The Creede Formation silver deposit (Rice, John A.)

**Monotony Tuff**

<sup>18</sup>O/<sup>16</sup>O relationships in Tertiary ash-flow tuffs from complex caldera structures in northern Nye County, Nevada, and the central San Juan Mountains, Colorado (Larson, Peter B.)

**Montana Group**

Depositional environments and diagenetic features of a Cretaceous clastic sequence, Fox Hills Sandstone of northern Great Plains Province (Wilde, Edith M.)

— Depositional environments of the Fox Hills Sandstone (Upper Cretaceous), Cheyenne Basin, Colorado (Nibbelink, Kenneth A.)

**Montezuma County—areal geology**

*guidebook*: Field trip guidebook; paleotectonics; San Juan Mountains; Dolores Formation; Paleosols and depositional systems;

Jurassic depositional systems; San Juan Basin; Quaternary deposits and soils; Durango area (Brew, Douglas C.)

— Road log from Trout Lake to Dunton and Rico areas, San Miguel, Dolores, and Montezuma counties, Colorado (Anonymous)

*maps*: Preliminary geologic map of the Hermosa Peak Quadrangle, Dolores, San Juan, La Plata, and Montezuma counties, Colorado (Pratt, W. P.)

#### Montezuma County—economic geology

*fuel resources*: Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

*oil and gas fields*: Aztec Wash (oil) (Armstrong, Karen, et al.)

— Chipeta (oil) (Armstrong, Karen, et al.)

— Mancos River (oil) (Emmendorfer, Alan P.)

— Menefee Mountain (oil) (Roth, George)

— Point Lookout (gas) (Lauth, Robert E.)

— Ramona (oil) (Armstrong, Karen, et al.)

— Sentinel Peak (oil) (Nicolais, Steve M.)

— Sierra (oil) (Lauth, Robert E.)

*petroleum*: McClean Field, T37N, R19W, Montezuma County, Colorado (Matheny, J. Paul)

— Petroleum geology and hydrocarbon plays of the San Juan Basin petroleum province (Huffman, A. Curtis, Jr.)

*water resources*: Water resources of the Cottonwood Wash watershed, Ute Mountain Ute Indian Reservation, southwestern Colorado (Geldon, Arthur L.)

#### Montezuma County—environmental geology

*conservation*: A vibration study of the archaeological ruins, Hovenweep National Monument, Utah-Colorado (King, Kenneth W.)

*geologic hazards*: Regional hydrology of the Dolores River basin, eastern Paradox Basin, Colorado and Utah (Weir, J. E., Jr., et al.)

*impact statements*: Proposed resource management plan and environmental impact statement for the San Juan/San Miguel planning area (U. S. Bureau of Land Management, Montrose District)

— Resource Management Plan for the San Juan and Uncompahgre resource areas (U. S. Bureau of Land Management, Montrose District)

— San Juan-San Miguel Planning Area (U. S. Bureau of Land Management, Uncompahgre Resource Area)

*land use*: Remote sensing in cultural resource management; the San Juan Basin Project (Drager, Dwight L.)

*waste disposal*: Regional hydrology of the Blanding-Durango area, southern Paradox Basin, Utah and Colorado (Whitfield, M. S., et al.)

#### Montezuma County—geochronology

*Pleistocene*: An associated partial skeleton of *Symbos cavifrons* (Artiodactyla: Bovidae) from Montezuma County, Colorado (McDonald, Jerry N., et al.)

#### Montezuma County—geophysical surveys

*well-logging*: McClean Field, T37N, R19W, Montezuma County, Colorado (Matheny, J. Paul)

#### Montezuma County—hydrogeology

*ground water*: Estimates of vertical hydraulic conductivity and regional ground-water flow

rates in rocks of Jurassic and Cretaceous age, San Juan Basin, New Mexico and Colorado (Frenzel, Peter F.)

— Plan of study for the regional aquifer-system analysis of the San Juan structural basin, New Mexico, Colorado, Arizona, and Utah (Welder, G. E.)

*maps*: Hydrogeology of the Dakota Sandstone in the San Juan structural basin, New Mexico, Colorado, Arizona, and Utah (Craig, Steven D., et al.)

*springs*: Water resources of the Cottonwood Wash watershed, Ute Mountain Ute Indian Reservation, southwestern Colorado (Geldon, Arthur L.)

#### Montezuma County—paleobotany

*Plantae*: Gemstones; search for identity (Taylor, Raymond C.)

#### Montezuma County—paleontology

*Mammalia*: An associated partial skeleton of *Symbos cavifrons* (Artiodactyla: Bovidae) from Montezuma County, Colorado (McDonald, Jerry N., et al.)

#### Montezuma County—sedimentary petrology

*reefs*: Platy algal reef mounds, Paradox Basin (Choquette, Philip W.)

#### Montezuma County—soils

*classification*: Selected properties, distribution, source, and age of eolian deposits and soils of Southwest Colorado (Price, A. B., et al.)

*Paleosols*: Calcareous Paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)

#### Montezuma County—stratigraphy

*Cretaceous*: Mid-Cretaceous alluvial-plain incision related to eustasy, southeastern Colorado Plateau (Aubrey, W. M.)

*Holocene*: Comparison of modern surface pollen samples with samples from Sagehen Marsh, Dolores River valley, Montezuma County, southwestern Colorado (Petersen, Kenneth Lee)

— Palynology in Montezuma County, southwestern Colorado; the local history of the pinyon pine (*Pinus edulis*) (Petersen, Kenneth Lee)

*Mesozoic*: Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

*Paleozoic*: Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

*Pennsylvanian*: McClean Field, T37N, R19W, Montezuma County, Colorado (Matheny, J. Paul)

*Triassic*: Calcareous Paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)

— Nonmarine depositional environments and Paleosol development in the Upper Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)

#### Montezuma Stock

Isotopic age determinations, unaltered and hydrothermally altered igneous rocks, north-central Colorado mineral belt (Bookstrom, Arthur A., et al.)

#### Montrose County—areal geology

*maps*: Geologic map of the Buckhorn Lakes Quadrangle, Gunnison, Montrose, and Ouray counties, Colorado (Dickinson, R. G.)

— Geologic map of the Washboard Rock Quadrangle, Gunnison, Montrose, and Ouray counties, Colorado (Dickinson, R. G.)

— Geologic reconnaissance map of the Government Springs Quadrangle, Montrose and Ouray counties, Colorado (Hail, William J., Jr.)

— Geologic reconnaissance map of the Log Hill Mesa area, Ouray, Montrose, and San Miguel counties, Colorado (Hail, W. J., Jr.)

— Geologic reconnaissance map of the Montrose West Quadrangle, Montrose County, Colorado (Hail, William J., Jr.)

— Reconnaissance geologic map of the Colona Quadrangle, Montrose and Ouray counties, Colorado (Hail, W. J., Jr.)

— Reconnaissance geologic map of the Horsefly Peak Quadrangle, Ouray, Montrose, and San Miguel counties, Colorado (Hail, W. J., Jr.)

#### Montrose County—economic geology

*coal*: First annual report; evaluation of coking-coal deposits in Colorado (Jones, David C.)

*copper ores*: Chemical and thermal evolution of diagenetic fluids and the genesis of uranium and copper ore in and adjacent to the Paradox Basin with emphasis on the Lisbon Valley and Temple Mountain areas, Utah and Colorado (Morrison, Stan Jay)

*fuel resources*: New activity rejuvenating Paradox Basin (McCaslin, John C.)

— Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Uravan to Telluride in southwestern Colorado (O'Sullivan, R. B.)

— Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

*maps*: Geology, structure, and uranium deposits of the Moab Quadrangle, Colorado and Utah (Williams, P. L.)

— Mineral investigation of a part of the Dominguez Canyon Wilderness Study Area (CO-070-150), Delta, Mesa, and Montrose counties, Colorado (Schreiner, Russell A.)

— Mineral investigation of the Dolores River Canyon Wilderness Study Area (CO-030-290) and a part of the Sewemup Mesa Wilderness Study Area (CO-070-176), Mesa, Montrose, and San Miguel counties, Colorado (Martin, Clay M.)

— Mineral resources of the Dolores River Canyon Wilderness Study Area, Montrose and San Miguel counties, Colorado (Gerlitz, Carol N., et al.)

— Mineral resources of the Gunnison Gorge Wilderness Study Area, (CO-030-388), Delta and Montrose counties, Colorado (Brown, S. Don)

— Mineral resources of the Gunnison Gorge Wilderness Study Area, Montrose and Delta counties, Colorado (Armbrustmacher, Theodore J., et al.)

*mineral resources*: Analytical results and sample locality maps of stream-sediment and heavy-mineral-concentrate samples from Dolores River Canyon Wilderness Study Area (CO-030-290), Montrose and San Miguel counties, Colorado (Bullock, John H., Jr., et al.)



- Geology and mineral resource potential of the Dominguez Canyon Wilderness Study Area, Delta, Mesa, and Montrose counties, Colorado (GEM phase 2) (Toth, M. I., et al.)
- Geology and mineral resource potential of the Sewemup Mesa Wilderness Study Area, Mesa and Montrose counties, Colorado (GEM phase 2) (Soulliere, S. J., et al.)
- Mineral investigation of a part of the Dominguez Canyon Wilderness Study Area (CO-070-150), Delta, Mesa, and Montrose counties, Colorado (Schreiner, Russell A.)
- Mineral investigation of the Dolores River Canyon Wilderness Study Area (CO-030-290) and a part of the Sewemup Mesa Wilderness Study Area (CO-070-176), Mesa, Montrose, and San Miguel counties, Colorado (Martin, Clay M.)
- Mineral resources of the Dolores River Canyon Wilderness Study Area, Montrose and San Miguel counties, Colorado (Gerlitz, Carol N., et al.)
- Mineral resources of the Dominguez Canyon Wilderness Study Area, Delta, Mesa, and Montrose counties, Colorado (Toth, Margo I., et al.)
- Mineral resources of the Gunnison Gorge Wilderness Study Area, (CO-030-388), Delta and Montrose counties, Colorado (Brown, S. Don)
- Mineral resources of the Gunnison Gorge Wilderness Study Area, Montrose and Delta counties, Colorado (Armbrustmacher, Theodore J., et al.)
- Mineral resources of the Sewemup Mesa Wilderness Study Area, Mesa and Montrose counties, Colorado (Soulliere, Sandra J., et al.)
- Remote sensing study in support of mineral resource appraisal of the Dominguez Canyon Wilderness Study Area, Montrose, Mesa, and Delta counties, Colorado (Lee, Keenan)
- Remote sensing study in support of mineral resource appraisal of the Sewemup Wilderness Study Area, Mesa and Montrose counties, Colorado (Lee, Keenan)
- Remote sensing study in support of mineral resource appraisal of wilderness study areas near Moab, Utah; Dolores River Canyon Wilderness Study Area, Montrose and San Miguel counties, Colorado; Lost Spring Canyon Wilderness Study Area, Grand County, Utah; Behind the Rocks Wilderness Study Area, Grand and San Juan counties, Utah; and Butler Wash Wilderness Study Area, San Juan County, Utah (Lee, Keenan)
- natural gas:* An assessment of gas resources in low-permeability sandstones of the Upper Cretaceous Mesaverde Group, Piceance Basin, Colorado (Johnson, Ronald C., et al.)
- uranium ores:* Chemical and thermal evolution of diagenetic fluids and the genesis of uranium and copper ore in and adjacent to the Paradox Basin with emphasis on the Lisbon Valley and Temple Mountain areas, Utah and Colorado (Morrison, Stan Jay)
- Geology, structure, and uranium deposits of the Moab Quadrangle, Colorado and Utah (Williams, P. L.)
- Paradox Valley, Colorado; a collapsed salt anticline (Chenoweth, William L.)

- Physical properties of uranium host rocks and experimental drilling at Long Park, Montrose County, Colo. (Manger, G. E., et al.)
- Preliminary report on and measured sections of the Middle Jurassic Entrada Sandstone and Wanakah Formation near Placerville, southwestern Colorado (Steele, Brenda A.)
- Structure in the vicinity of the C-JD-7 mining area, Paradox Valley, Montrose County, Colorado (Strauss, Robert G.)
- Trace-element geochemistry of sandstones hosting uranium-vanadium deposits in the La Sal Mountains region of Utah and Colorado, U.S.A. (LaPensee, Earl Francis)
- vanadium ores:* Paradox Valley, Colorado; a collapsed salt anticline (Chenoweth, William L.)
- Preliminary report on and measured sections of the Middle Jurassic Entrada Sandstone and Wanakah Formation near Placerville, southwestern Colorado (Steele, Brenda A.)
- The significance of clay mineralogy in the amenability of sandstone vanadium ores (Hausen, D. M.)

**Montrose County—engineering geology**  
*waste disposal:* Paradox Basin, Utah; hydrology (Wilson, William E.)

**Montrose County—environmental geology**  
*geologic hazards:* Regional hydrology of the Dolores River basin, eastern Paradox Basin, Colorado and Utah (Weir, J. E., Jr., et al.)  
*impact statements:* AB Lateral Hydropower Facility, Uncompahgre Valley Hydropower Project, Montrose and Delta counties, Colorado (U. S. Bureau of Reclamation, et al.)  
 — Proposed resource management plan and environmental impact statement for the San Juan/San Miguel planning area (U. S. Bureau of Land Management, Montrose District)  
 — Resource Management Plan for the San Juan and Uncompahgre resource areas (U. S. Bureau of Land Management, Montrose District)  
 — San Juan-San Miguel Planning Area (U. S. Bureau of Land Management, Uncompahgre Resource Area)  
*land use:* Land use and land cover and associated maps for Moab, Utah; Colorado (U. S. Geological Survey)  
*maps:* Land use and land cover and associated maps for Moab, Utah; Colorado (U. S. Geological Survey)  
*waste disposal:* Hydrogeologic reconnaissance of the San Miguel River basin, southwestern Colorado (Ackerman, D. J.)

**Montrose County—geochemistry**  
*maps:* Analytical results and sample locality maps of stream-sediment and heavy-mineral-concentrate samples from Dolores River Canyon Wilderness Study Area (CO-030-290), Montrose and San Miguel counties, Colorado (Bullock, John H., Jr., et al.)  
*trace elements:* Geochemistry and petrogenesis of early Proterozoic amphibolites, west-central Colorado, U.S.A. (Knoper, Michael W.)  
 — Trace-element geochemistry of sandstones hosting uranium-vanadium deposits in the La Sal Mountains region of Utah and Colorado, U.S.A. (LaPensee, Earl Francis)

**Montrose County—geochronology**  
*Paleozoic:* Petrologic, paleomagnetic, and structural evidence of a Paleozoic rift system in Oklahoma, New Mexico, Colorado, and Utah (Larson, E. E., et al.)

**Montrose County—geomorphology**  
*fluvial features:* A heuristic method for measurement and characterization of river meander wavelength (Sinnock, Scott)

**Montrose County—geophysical surveys**  
*gravity surveys:* Principal facts for gravity stations in the La Sal Mountains area, Grand and San Juan counties, Utah, and Mesa and Montrose counties, Colo. (Joesting, H. R.)  
 — Principal facts for gravity stations in the Moab-Needles area, Grand and San Juan counties, Utah; and for the Lisbon Valley area, San Juan County, Utah, and Montrose and San Miguel counties, Colo. (Joesting, H. R., et al.)  
 — Principal facts for gravity stations in the UraVan area, Mesa, Montrose, and San Miguel counties, Colo. (Joesting, H. R.)  
*remote sensing:* Remote sensing study in support of mineral resource appraisal of the Dominguez Canyon Wilderness Study Area, Montrose, Mesa, and Delta counties, Colorado (Lee, Keenan)  
 — Remote sensing study in support of mineral resource appraisal of the Sewemup Wilderness Study Area, Mesa and Montrose counties, Colorado (Lee, Keenan)  
 — Remote sensing study in support of mineral resource appraisal of wilderness study areas near Moab, Utah; Dolores River Canyon Wilderness Study Area, Montrose and San Miguel counties, Colorado; Lost Spring Canyon Wilderness Study Area, Grand County, Utah; Behind the Rocks Wilderness Study Area, Grand and San Juan counties, Utah; and Butler Wash Wilderness Study Area, San Juan County, Utah (Lee, Keenan)

**Montrose County—hydrogeology**  
*ground water:* Reconnaissance of ground-water resources in the lower Gunnison River basin, southwestern Colorado (Brooks, Tom)  
*springs:* Ground-water data from the San Miguel River basin, southwestern Colorado (Ackerman, D. J.)

**Montrose County—paleontology**  
*Reptilia:* Small pterosaurs and dinosaurs from the Uncompahgre fauna (Brushy Basin Member, Morrison Formation: ?Tithonian), Late Jurassic, western Colorado (Jensen, James A.)  
*Vertebrata:* Continuing study of new Jurassic/Cretaceous vertebrate faunas from Colorado and Utah (Jensen, James A.)

**Montrose County—stratigraphy**  
*Cretaceous:* An assessment of gas resources in low-permeability sandstones of the Upper Cretaceous Mesaverde Group, Piceance Basin, Colorado (Johnson, Ronald C., et al.)  
 — Mid-Cretaceous alluvial-plain incision related to eustasy, southeastern Colorado Plateau (Aubrey, W. M.)  
*Jurassic:* Preliminary report on and measured sections of the Middle Jurassic Entrada Sandstone and Wanakah Formation near Placerville, southwestern Colorado (Steele, Brenda A.)  
 — Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Slick

- Rock to Uravan in southwestern Colorado (O'Sullivan, R. B.)
- Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Uravan to Telluride in southwestern Colorado (O'Sullivan, R. B.)
- Mesozoic*: Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)
- Paleozoic*: Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)
- Montrose County—structural geology**
- faults*: Structure in the vicinity of the C-JD-7 mining area, Paradox Valley, Montrose County, Colorado (Strauss, Robert G.)
- monzonites** *see under* igneous rocks
- moraines** *see under* dates *under* absolute age  
*see under* glacial features *under* glacial geology  
*see under* glaciation *under* glacial geology
- Morapos Sandstone Member**
- Sedimentological aspects of stratigraphic correlations in the Upper Cretaceous Ericson Sandstone, Greater Green River basin, Wyoming, Colorado, and Utah (Law, B. E., et al.)
- Morgan County—areal geology**
- maps*: Historic trail maps of the Sterling 1' by 2' Quadrangle, northeastern Colorado (Scott, Glenn R.)
- Morgan County—economic geology**
- fuel resources*: Isoreflectance map of the J Sandstone in the Denver Basin of Colorado (Higley, D. K., et al.)
- maps*: Isoreflectance map of the J Sandstone in the Denver Basin of Colorado (Higley, D. K., et al.)
- petroleum*: Core porosity, permeability, and vitrinite reflectance data from the Lower Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)
- water resources*: Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)
- Conjunctive use of groundwater and surface water for irrigated agriculture; risk aversion (Bredehoeft, John D.)
- Morgan County—engineering geology**
- underground installations*: Colorado Geological Survey involvement in SSC siting and characterization (Rogers, W. P.)
- waterways*: Streamflow gain-and-loss and suspended-sediment characteristics of the South Platte River and three irrigation canals near Fort Morgan, Colorado (Ruddy, Barbara C.)
- Morgan County—environmental geology**
- impact statements*: Narrows Unit, Pick-Sloan Missouri Basin Program, Colorado (U. S. Bureau of Reclamation, Lower Missouri Region)
- Morgan County—geophysical surveys**
- seismic surveys*: A comparison and analysis of seismic land source energy relationships and radiation patterns (Janak, Peter M.)
- Comparison and analysis of downgoing waveforms from land seismic sources (Sixta, David P.)
- Morgan County—hydrogeology**
- ground water*: Hydrogeologic data from parts of the Denver Basin, Colorado (Major, Thomas J., et al.)
- Simulated effects of the proposed Narrows Reservoir on the water-table aquifer, Morgan County, Colorado (Burns, A. W.)
- hydrology*: A discrete kernel simulation model for conjunctive management of a stream-aquifer system (Illangasekare, Tissa H.)
- Selected hydrologic characteristics of the South Platte River in the vicinity of the proposed Narrows Reservoir near Fort Morgan, Colorado (Minges, Donald R.)
- Morgan Formation**
- Cretaceous and Pennsylvanian oil and gas production at Elk Springs and Winter Valley pools, Moffat County, Colorado (MacMillian, Logan)
- Diagenetic aspects of Morgan Formation (Pennsylvanian) shelf carbonates, northern Utah and Colorado (Driese, Steven G.)
  - Late Paleozoic stratigraphy and syndepositional tectonism, Northwest Colorado (De Voto, Richard H., et al.)
  - Model for sandstone-carbonate "cyclothem" based on upper member of Morgan Formation (Middle Pennsylvanian) of northern Utah and Colorado (Driese, Steven G.)
  - Model for sandstone-carbonate "cyclothem" based on upper member of Morgan Formation (Middle Pennsylvanian) of northern Utah and Colorado; discussion and reply (Morrow, David W., et al.)
  - Pennsylvanian-Permian paleostructure and stratigraphy as interpreted from seismic data in the Piceance Basin, Northwest Colorado (Waechter, Noel B.)
  - Quantitative analysis of Pennsylvanian conodont biofacies patterns, northern Utah and Colorado (Driese, Steven G., et al.)
  - Quantitative analysis of Pennsylvanian shallow-water conodont biofacies, Utah and Colorado (Driese, Steven G., et al.)
  - The Eagle Basin; a new exploration frontier (Dodge, Constance Nuss)
- Morrison Aquifer**
- Meeker Dome salinity investigation (Feast, Charles F.)
- Morrison Formation**
- A guide to dinosaur tracksites of the Colorado Plateau and American Southwest (Lockley, Martin)
- A new species of sauropod dinosaur, *Haplocanthosaurus delfsi* sp. nov., from the Upper Jurassic Morrison Fm. of Colorado (McIntosh, John S.)
  - A possible "hatchling" *Camarasaurus* from the Upper Jurassic Morrison Formation (Dry Mesa Quarry, Colorado) (Britt, Brooks B.)
  - A sedimentary analysis of the Upper Jurassic Morrison Formation as it is exposed in the vicinity of Canon City, Colorado (Sweet, Rebecca Gail)
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  - Alteration related to red bed copper mineralizing brines and other fault-controlled solutions in Lisbon Valley, Utah, and the Slick Rock District, Colorado (Breit, G. N., et al.)
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  - Continuing study of new Jurassic/Cretaceous vertebrate faunas from Colorado and Utah (Jensen, James A.)
  - Dakota Aquifer system in the state of Colorado (Pearl, R. H.)
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  - Structure of the Raton Basin from a regional seismic line (Applegate, James K.)
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  - Use of rhythmic bedding patterns for locating structural features, Niobrara Formation, United States Western Interior (Laferrriere, Alan P.)
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  - What now in Colorado's North Park Basin? (McCaslin, John C.)
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— A two-dimensional, finite difference model of the Pleistocene Nussbaum Alluvium in the southern Denver Basin; a case history in the use of vertical variability parameter estimation (Paschke, S. S.)

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— Evaluating vertical variability of hydraulic conductivity and specific yield in fluvial deposits (Gutentag, E. D., et al.)

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— Interstate groundwater management preference differences; the Ogallala region (Kromm, David E.)

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— Variability in adjustment preferences to groundwater depletion in the American High Plains (Kromm, David E.)

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— Applicability of models to a large aquifer; the Ogallala Formation of Colorado (Luckey, Richard R.)

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— Geologic results of the TMS survey over Mt. Emmons, Colorado (Rickman, D. L.)

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  - Stratigraphy and palynology of Late Cretaceous and early Tertiary rocks, Tommy's Draw, Rio Blanco County, Colorado (Zeiler, Rose M.)
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— Magnetostratigraphy of the Treasure Mountain Tuff, Platoro-Summitville caldera complex, San Juan volcanic field, Colorado (Brown, Laurie L.)

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— Correlation of early Paleocene palynomorph biozones, Montana, Colorado, and New Mexico (Newman, Karl R.)

— Early Tertiary paleogeography and paleotectonics of the San Juan Basin area, New Mexico and Colorado (Fassett, James E.)

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— Preliminary basin analysis of Pictured Cliffs to Ojo Alamo sequence in western and southern San Juan Basin, New Mexico (Hunt, Adrian)

— Significance of the rate of deposition of uppermost Upper Cretaceous rocks of the San Juan Basin, New Mexico and Colorado (Fassett, James E.)

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- organic materials—pigments**
- porphyrins*: The role of kerogen in the origin and evolution of nickel and vanadyl geoporphyrins (Van Berkel, Gary Joseph)
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- Laramide Orogeny*: Age of Douglas Creek Arch, Colorado and Utah (Johnson, Ronald C.)  
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 — Cenozoic stress rotation, northeastern Colorado Plateau (Verbeek, Earl R.)  
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 — Log for joint SEPM-Colorado Scientific Society field trip from Westcliffe to Crestone, Colorado, September 20-21, 1986; late Paleozoic sedimentation and Laramide tectonics of the Sangre de Cristo Range (Lindsey, David A.)  
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 — Structural features of a Laramide fold and thrust belt, east flank of the Sangre de Cristo Range, Colorado (Schavran, Gabrielle)  
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- Otero County—hydrogeology**
- ground water*: Quality of the ground water (Horr, C. A.)  
 — Role of solute-transport models in the analysis of groundwater salinity problems in agricultural areas (Konikow, L. F.)
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 — Calibration and use of an interactive-accounting model to simulate dissolved solids, streamflow, and water-supply operations in the Arkansas River basin, Colorado (Burns, Alan W.)  
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- maps*: Relations of specific conductance to streamflow and selected water-quality characteristics of the Arkansas River basin, Colorado (Cain, Doug)

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*Mollusca*: Interpretations of some depositional environments and paleoecology in the Morrison Formation of southeastern Colorado (Frazier, F., et al.)

*Reptilia*: Late Jurassic dinosaur trackways from S.E. Colorado (Prince, Nancy K.)

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*maps*: Soil survey of Otero County, Colorado (Larsen, Roy J., et al.)

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*Dunmore Mine*: Geology and ore deposits of the Dunmore Mine, Ouray County, Colorado (Silver, Caswell)

*maps*: Geologic map of the Buckhorn Lakes Quadrangle, Gunnison, Montrose, and Ouray counties, Colorado (Dickinson, R. G.)

— Geologic map of the Courthouse Mountain Quadrangle, Gunnison, Hinsdale, and Ouray counties, Colorado (Dickinson, R. G.)

— Geologic map of the Handies Peak Quadrangle, San Juan, Hinsdale, and Ouray counties, Colorado (Luedke, R. G.)

— Geologic map of the Washboard Rock Quadrangle, Gunnison, Montrose, and Ouray counties, Colorado (Dickinson, R. G.)

— Geologic reconnaissance map of the Government Springs Quadrangle, Montrose and Ouray counties, Colorado (Hail, William J., Jr.)

— Geology and mineral deposits of the region surrounding the American Flats Wilderness Study Area, western San Juan Mountains, Colorado (Hon, Ken, et al.)

— Reconnaissance geologic map of the Colona Quadrangle, Montrose and Ouray counties, Colorado (Hail, W. J., Jr.)

— Reconnaissance geologic map of the Horsely Peak Quadrangle, Ouray, Montrose, and San Miguel counties, Colorado (Hail, W. J., Jr.)

— Reconnaissance geologic map of the Ridgway Quadrangle, Ouray County, Colorado (Hail, W. J., Jr.)

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*coal*: First annual report; evaluation of coking-coal deposits in Colorado (Jones, David C.)

*copper ores*: Great pockets; the National Belle Mine (Smith, Arthur E., Jr.)

*fuel resources*: Weminuche Wilderness, Colorado (Steven, Thomas A.)

*gold ores*: Cripple Creek, Cresson, Camp Bird (Poss, John R.)

*maps*: Mineral resources of the American Flats Wilderness Study Area, Ouray and Hinsdale counties, Colorado (Hon, Ken, et al.)

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— Study areas contiguous to the Uncompahgre Primitive Area, Colorado (Steven, Thomas A.)

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*quartz crystal*: The Ohio Mine, Ouray County, Colorado; a famous quartz locality rediscovered (Stouffer, Robert)

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*maps*: Debris-flow hazard in the immediate vicinity of Ouray, Colorado (Jochim, Candace L.)

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*isotopes*: Patterns of oxygen isotope depletion, multiple hydrothermal circulation systems, and the cooling history of the Stony Mountain intrusive complex, Colorado (Crowley, Julia C.)

*maps*: Compilation of rock-chip and stream-sediment geochemical data for the American

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— Geochemical data, Red Mountains mining district, San Juan Mountains, Colorado (Fisher, Frederick S.)

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*Paleozoic*: Petrologic, paleomagnetic, and structural evidence of a Paleozoic rift system in Oklahoma, New Mexico, Colorado, and Utah (Larson, E. E., et al.)

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*miscellaneous minerals*: Recent mineral discoveries in Ouray County, Colorado (Muntyan, Barbara L.)

— The Grizzly Bear Mine, Ouray County, Colorado (Rosemeyer, Tom)

— Through the 'scope; microminerals of the San Juan Mountains, southwestern Colorado (Rosemeyer, Tom)

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**Ouray County—petrology**

*igneous rocks*: Komatiitic trends in early Proterozoic volcanic rocks in central Colorado (Sauer, Peter E.)

**Ouray County—soils**

*Paleosols*: Calcareous Paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)

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*Cretaceous*: Foraminifera of the Storm King Mountain Shale Member, Mancos Shale, western Colorado (Von Holdt, Laura Lynn)

*Jurassic*: Preliminary report on and measured sections of the Middle Jurassic Entrada Sandstone and Wanakah Formation near Placerville, southwestern Colorado (Steele, Brenda A.)

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**oxygen—<sup>18</sup>O/<sup>16</sup>O**

*O-18/O-16*: <sup>18</sup>O/<sup>16</sup>O ratios in ash-flow tuffs and lavas erupted from the central Nevada caldera complex and the central San Juan caldera complex, Colorado (Larson, P. B.)

— <sup>18</sup>O/<sup>16</sup>O relationships in hydrothermally altered rocks of the 22.5 m.y. Lake City Caldera, San Juan Mts., Colo. (Larson, Peter B.)

— <sup>18</sup>O/<sup>16</sup>O relationships in Tertiary ash-flow tuffs from complex caldera structures in northern Nye County, Nevada, and the central San Juan Mountains, Colorado (Larson, Peter B.)

— A lead, strontium, and sulfur isotope study of Laramide-Tertiary intrusions and mineralization in the Colorado mineral belt with emphasis on climax-type porphyry molybdenum systems plus a summary of other newly acquired isotopic and rare earth element data (Stein, Holly Jayne)

— A preliminary interpretation of carbon and oxygen isotopic data from surface rocks,

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  - An integrated geochemical and paleoecological approach to petroleum source rock evaluation, lower Niobrara Formation (Cretaceous), Lyons, Colorado (Barlow, Lisa K.)
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  - An oxygen-isotope study of water-rock interaction in the granite of Cataract Gulch, western San Juan Mountains, Colorado (Larson, Peter B.)
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  - Diagenesis of late Proterozoic carbonates; the Beck Spring Dolomite of eastern California (Zempolich, William G., et al.)
  - Diagenetic facies of the Sharon Springs Member of the Pierre Shale (Cretaceous), Denver Basin (Gautier, Donald L.)
  - Evolution of the early Oligocene Bonanza Caldera, Northeast San Juan volcanic field, Colorado (Varga, Robert J.)
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  - Genetic traits of climax-type granites and molybdenum mineralization, Colorado mineral belt (Stein, Holly J.)
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  - Geologic systems as analogs for long-term radioactive waste isolation (Wollenberg, Ernesto A., et al.)
  - Geology and origin of the Schwartzwalder uranium deposit, Front Range, Colorado, USA (Wallace, A. R.)
  - Geology and significance of the auriferous manto deposits at Tennessee Pass, Colorado (Beaty, David W., et al.)
  - Ground water age determinations, Piceance Creek basin, Colorado (Kimball, Briant A.)
  - History and geology of the Gilman District (Beaty, David W.)
  - Hydrothermal fluid flow patterns associated with resurgent doming of the 23 m.y.-old Lake City Caldera, San Juan Mountains, Colorado (Larson, P. B.)
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  - Integrated geochemical and paleoecological approach to petroleum source rock evaluation, Cretaceous Niobrara Formation, Lyons, Colorado (Barlow, L. K.)
  - Isotopic and sedimentological study of the lower Niobrara Formation, Lyons, Colorado (Pratt, Lisa M.)
  - Isotopic data bearing on the origin of Mesozoic and Tertiary granitic rocks in the Western United States (DePaolo, Donald J.)
  - Isotopic geochemistry and chronology of porphyry-style mineralisation near Ophir, San Juan Mountains, Colorado (Jackson, S. E., et al.)
  - Isotopic research, climate, and the genesis of mineral deposits (Doe, B. R.)
  - Isotopic studies of organic matter and carbonate in rocks of the Greenhorn marine cycle (Pratt, Lisa M.)
  - Meteoric hydrothermal circulation along the Trapdoor Ring Fault system of the Bonanza Caldera, N.E. San Juan volcanic field, Colorado (Smith, Brian M.)
  - Middle Pleistocene (late Irvingtonian: Nebraskan) climatic changes in south-central Colorado (Rogers, Karel L., et al.)
  - Movement and origin of ore fluids in climax-type systems (Stein, Holly J.)
  - Origin and distribution of fractures in lower Tertiary and Upper Cretaceous rocks, Piceance Basin, Colorado, and their relation to the occurrence of hydrocarbons (Pitman, Janet K.)
  - Origin and occurrence of fracture-filling cements in the Upper Cretaceous Mesaverde Formation at MWX, Piceance Creek basin, Colorado (Pitman, Janet K.)
  - Origin of the ore deposits at Gilman, Colorado; oxygen and hydrogen isotopic constraints (Beaty, David W., et al.)
  - Oxygen and hydrogen isotope variations in mid-Tertiary intrusions, Gunnison County, Colorado (Weidemann, Donna Elizabeth)
  - Oxygen and sulfur isotope variations in oxidation of sulfides during formation of acid mine drainage (Wheeler, Mark C.)
  - Oxygen isotope analyses of early authigenic clays in sandstone; a new approach to paleoclimate interpretation (Dutta, Prodip K.)
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  - Oxygen isotope compositions of selected Laramide-Tertiary granitoid stocks in the Colorado mineral belt and their bearing on the origin of climax-type granite-molybdenum systems (Hannah, Judith L.)
  - Oxygen isotope variations in phosphate of biogenic apatites; III, Conodonts (Luz, Boaz, et al.)
  - Paleofluids in the copper and uranium bearing sandstones, central Colorado Plateau; fluid inclusion and isotopic evidence in calcite (Meunier, J. D.)
  - Paleohydrology of the Bonanza trapdoor caldera, N.E. San Juan volcanic field, Colorado; oxygen isotopes and hydrothermal metamorphism of Rawley Andesite (Smith, Brian M., et al.)
  - Paragenesis and fluid characteristics of the Mammoth Revenue vein, Platoro Caldera, San Juan Mountains, Colorado (Brooks, J. W., et al.)
  - Patterns of oxygen isotope depletion, multiple hydrothermal circulation systems, and the cooling history of the Stony Mountain intrusive complex, Colorado (Crowley, Julia C.)
  - Porphyry molybdenum-style mineralisation near Central City, Colorado (Rice, C. M., et al.)
  - Preliminary interpretation of soil-gas and relationships to other hydrocarbon microseepage indicators, Four Corners Platform-San Juan Basin transitional area, Southwest Colorado and Northwest New Mexico (Cunningham, Kimberley I.)
  - Solfataric alteration in the San Juan Mountains, Colorado; oxygen isotope variations in a boiling hydrothermal environment (Larson, Peter B.)
  - Stable isotope and fluid inclusion investigations of epithermal vein and porphyry molybdenum mineralization in the Rico mining district, Colorado (Larson, Peter B.)
  - Stable isotope geochemistry of a porphyry-style hydrothermal system, West Silverton District, San Juan Mountains, Colorado, U.S.A. (Ringrose, Christopher R., et al.)
  - Stable isotope geochemistry of the Creede, Colorado, hydrothermal system (Rye, Robert O., et al.)
  - Stable isotopic composition of fluid inclusions in a porphyry-style hydrothermal system near Silverton, San Juan Mountains, Colorado (Ringrose, C. R., et al.)
  - The age and origin of the Schwartzwalder uranium deposit, Front Range, Colorado (Wallace, A. R., et al.)
  - The Leadville, Colo. district; oxygen isotopic evidence for a magmatic-hydrothermal origin (Beaty, D. W., et al.)
  - The Mount Emmons porphyry molybdenum deposit, Colorado; magmatic degassing and meteoric water overprinting (Taylor, B. E., et al.)
  - The Mount Emmons porphyry molybdenum deposit; a lower crustal origin; lead and oxygen isotope evidence (Stein, H. J.)
  - The origin and significance of the stratabound, carbonate-hosted gold deposits at Tennessee Pass, Colorado (Beaty, David W., et al.)
  - The origin of water in salt (Knauth, L. Paul)
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  - Trace-element behavior within a fossil hydrothermal zone; strontium-isotope data (Murphy, Mark Thomas)

## P

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## Page Sandstone

### Page Sandstone

Permeability transects in eolian sands and their use in generating random permeability fields (Goggin, D. J., et al.)

### Paguete Sandstone Member

Depositional environments of the Dakota Sandstone and adjacent units in the San Juan Basin utilizing discriminant analysis of trace elements in shales (Walters, Lester J., Jr., et al.)

### Pahute Mesa Member

Evidence for magma mixing in a zoned magma body; phenocryst heterogeneity in pumice from an ash-flow sheet (Vogel, Thomas A., et al.)

### Pajarito Shale

Cretaceous stratigraphy and paleontology in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Kues, Barry S.)

— Regional correlation of Dakota Group disconformities; Front Range, New Mexico to Wyoming (Mateer, Niall J.)

— The Dakota Group of northeastern New Mexico and southern Colorado (Mateer, Niall J.)

### paleobotany

*algae*: Fossil Scenedesmus (Chlorococcales) from the Raton Formation, Colorado and New Mexico, U.S.A. (Fleming, R. Farley)

— Late Cretaceous (Campanian-Maastrichtian) diatoms from the Pierre Shale, Wyoming, Colorado and Kansas (Bergstresser, Thomas J.)

— Preliminary study of coccoliths and discoasters from Mancos Shale of eastern Utah and western Colorado (Cohen, Carel Lodewijk David)

*angiosperms*: Flora of the Lower Cretaceous Cedar Mountain Formation of Utah and Colorado; Part III, Icacinoxylon pittense n. sp. (Thayn, G. F., et al.)

*fungi*: Fungi as potential indicators of periglacial soils (Christensen, Martha)

*gymnosperms*: Flora of the Lower Cretaceous Cedar Mountain Formation of Utah and Colorado; Part IV, Palaeopiceoxylon thinosus (Protopinaceae) (Tidwell, W. D.)

*Plantae*: Vegetation, climate and altitude of the Creede Caldera (Axelrod, Daniel I.)

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### Paleocene—stratigraphy

*chemostratigraphy*: The Cretaceous-Tertiary boundary problem; an assessment from lead isotope systematics (Dia, Aline, et al.)

### paleoclimatology—Cretaceous

*Boulder County*: Integrated geochemical and paleoecological approach to petroleum source rock evaluation, Cretaceous Niobrara Formation, Lyons, Colorado (Barlow, L. K.)

*Colorado*: An initial study of the sensitivity of modeled Cretaceous climate to cyclical insolation forcing (Glancy, T. J., Jr., et al.)

*global*: Cretaceous rhythmic bedding sequences; a plausible link between orbital variations and climate (Barron, Eric J., et al.)

*Moffat County*: Depositional environments of some Upper Cretaceous coal-bearing strata at Trapper Mine, Craig, Colorado (Massoth, Terry Wayne)

### paleoclimatology—Eocene

*Colorado Plateau*: The depositional setting of the Eocene rocks of the Green River basin (Sullivan, Raymond)

*Moffat County*: Climate record in varved sediments of the Eocene Green River Formation (Crowley, Kevin D., et al.)

### paleoclimatology—Holocene

*Chaffee County*: Geology of archeological sites in Middle Cottonwood Creek valley and Taylor Park, Chaffee and Gunnison counties, Colorado (Madole, Richard F.)

*Colorado*: Age and paleoclimatic significance of Holocene sand dunes in northeastern Colorado (Muhs, Daniel R.)

— Climate during Anasazi occupation and abandonment of SW Colorado, USA; new evidence from pollen and tree-rings (Petersen, Kenneth Lee)

— Dendroecological studies in the Front Range, Colorado, U.S.A. (Kienast, Felix)

— Holocene dynamics of the subalpine forest in central Colorado (Fall, Patricia L.)

— Holocene vegetation dynamics and treeline fluctuations in the southern Rocky Mountains (Fall, Patricia L.)

— Isotopic evidence of Holocene climatic change in the San Juan Mountains, Colorado (Friedman, Irving, et al.)

— Paleoclimatic significance of changes in deuterium content in Holocene wood in the San Juan Mountains of southwestern Colorado (Friedman, Irving, et al.)

— Paleoenvironmental interpretations of Holocene insect fossil assemblages from four high-altitude sites in the Front Range, Colorado, U.S.A. (Elias, Scott A.)

— Palynology of Holocene sediments, Colorado Front Range; vegetation and treeline changes in the subalpine forest (Short, Susan K.)

— Topoclimate and the distribution of Neoglacial facies in the Indian Peaks section of the Front Range, Colorado, U.S.A. (Olyphant, Greg A.)

*Gunnison County*: Geology of archeological sites in Middle Cottonwood Creek valley and Taylor Park, Chaffee and Gunnison counties, Colorado (Madole, Richard F.)

*Montezuma County*: Palynology in Montezuma County, southwestern Colorado; the local history of the pinyon pine (*Pinus edulis*) (Petersen, Kenneth Lee)

*Rocky Mountains*: Pedologic evidence for Holocene treeline 100 meters above its present upper limit in the Colorado Rocky Mountains (Shroba, Ralph R.)

*Southwestern U.S.*: Drought indicated in carbon-13/carbon-12 ratios of Southwestern tree rings (Leavitt, Steven W.)

*Western U.S.*: Pollen in packrat (*Neotoma*) middens; pollen transport and the relationship of pollen to vegetation (Davis, Owen K.)

### paleoclimatology—indicators

*ichnofossils*: Trace-fossil model for reconstruction of paleo-oxygenation in bottom waters (Savrda, Charles E.)

*isotopes*: Isotopic research, climate, and the genesis of mineral deposits (Doe, B. R.)

— Oxygen isotope analyses of early authigenic clays in sandstone; a new approach to paleoclimate interpretation (Dutta, Prodip K.)

*sedimentary rocks*: Alluvial sandstone composition and paleoclimate; I, Framework mineralogy (Suttner, Lee J.)

— Alluvial sandstone composition and paleoclimate; II, Authigenic mineralogy (Dutta, Prodip K.)

### paleoclimatology—Oligocene

*Colorado*: Paleoecologic, paleoclimatic, and evolutionary significance of the Oligocene Creede flora, Colorado (Wolfe, Jack A.)

*Rocky Mountains*: An evaluation of the methods for estimating paleoaltitudes using Tertiary floras from the Rio Grande Rift vicinity, New Mexico and Colorado (Meyer, Herbert William)

*Teller County*: The Florissant Fossil Beds National Monument, Teller County, Colorado (Hutchinson, Robert M.)

### paleoclimatology—Paleozoic

*Eagle County*: Stratigraphic and sedimentologic studies of late Paleozoic strata in the Eagle Basin and northern Aspen Sub-basin, Northwest Colorado (Johnson, Samuel Y.)

*Garfield County*: Stratigraphic and sedimentologic studies of late Paleozoic strata in the Eagle Basin and northern Aspen Sub-basin, Northwest Colorado (Johnson, Samuel Y.)

*global*: Early diagenesis in arkose and paleoclimate (Suttner, Lee J.)

*Rio Blanco County*: Stratigraphic and sedimentologic studies of late Paleozoic strata in the Eagle Basin and northern Aspen Sub-basin, Northwest Colorado (Johnson, Samuel Y.)

### paleoclimatology—Pennsylvanian

*Colorado*: Provenance and paleoclimatic interpretations from a petrographic comparison of Holocene sands and the Fountain Formation (Pennsylvanian) in the Colorado Range Front (Mack, Gregory Harold)

— Tectonic and climatic controls on alluvial fan sedimentation of the Cutler Formation (Permo-Pennsylvanian) in southwestern Colorado (Rasmussen, Keith A.)

*El Paso County*: Climatic influence on Fountain sedimentation in the Manitou Embayment (Suttner, Lee J.)

*Fremont County*: Climatic influence on Fountain sedimentation in the Manitou Embayment (Suttner, Lee J.)

*Teller County*: Climatic influence on Fountain sedimentation in the Manitou Embayment (Suttner, Lee J.)

### paleoclimatology—Permian

*Colorado*: Tectonic and climatic controls on alluvial fan sedimentation of the Cutler Formation (Permo-Pennsylvanian) in southwestern Colorado (Rasmussen, Keith A.)

*Mesa County*: Alluvial-fan sedimentation of the Cutler Formation (Permo-Pennsylvanian), near Gateway, Colorado (Mack, Greg H.)

### paleoclimatology—Pleistocene

*Alamosa County*: Pleistocene high altitude amphibians and reptiles from Colorado (Alamosa local fauna; Pleistocene, Irvingtonian) (Rogers, Karel L.)

**Colorado:** Climatic change in the Colorado Rocky Mountains; estimates based on modern climate at late Pleistocene equilibrium lines (Leonard, Eric M.)

— Middle Pleistocene (late Irvingtonian; Nebraskan) climatic changes in south-central Colorado (Rogers, Karel L., et al.)

**Grand County:** New pollen and beetle analyses at the Mary Jane site, Colorado; evidence for late glacial tundra conditions (Short, Susan K.)

**Great Plains:** Grass-opal phytoliths as climatic indicators of the Great Plains Pleistocene (Twiss, Page C.)

**Park County:** Middle Pleistocene arvicoline rodents and environmental change at 2900-meters elevation, Porcupine Cave, South Park, Colorado (Barnosky, Anthony D.)

**Rio Blanco County:** Paleoclimatic implications of fluvial deposits and nonmarine mollusks in Pleistocene terraces along the White River, near Meeker, Colorado (Evanoff, Emmett)

#### paleoclimatology—Quaternary

**Colorado:** Extractable Fe and Al in late Pleistocene and Holocene Paleosols on Niwot Ridge, Colorado Front Range (Mahaney, W. C.)

— Quaternary deposits and landscapes of the Chaco River area, southeastern Colorado Plateau: an example of complex geomorphic responses in large drainage systems (Wells, S. G., et al.)

— Quaternary paleotemperature estimates using amino-acid ratios measured on terrestrial gastropods from fluvial sequences in Colorado (Nelson, A. R., et al.)

— The Fourth of July Valley: glacial geology and archeology of the timberline ecotone (Benedict, James B.)

**Great Plains:** Quaternary pollen records from the Great Plains and central United States (Baker, Richard G.)

**Gunnison County:** Quaternary glacial geology of the Crested Butte area, Gunnison County, Colorado (Dea, Peter A.)

**Southwestern U.S.:** Quaternary pollen analysis and vegetational history of the Southwest (Hall, Stephen A.)

**Western U.S.:** Chronology and sedimentology of some North American cold climate dune fields (Ahlbrandt, Thomas S.)

#### paleoclimatology—Triassic

**Eagle County:** Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)

**Garfield County:** Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)

**Gunnison County:** Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)

**La Plata County:** Calcareous Paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)

**Lake County:** Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)

**Mesa County:** Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)

**Montezuma County:** Calcareous Paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)

**Ouray County:** Calcareous Paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)

**Pitkin County:** Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)

**Rio Blanco County:** Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)

**San Miguel County:** Calcareous Paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)

**Summit County:** Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)

#### paleoecology—algal flora

**Cretaceous:** Biostratigraphy and paleoecology of calcareous nannofossils in the Greenshorn marine cycle (Watkins, David K.)

**Pennsylvanian:** Paleoecology of phylloid algal mud mounds, Honaker Trail Formation (Pennsylvanian), Southwest Colorado (Soar, Linda Katherine)

— Pennsylvanian (Minturn Formation) algal-mound facies, Rio Blanco County, Colorado (Brinton, L.)

#### paleoecology—conodonts

**Pennsylvanian:** Quantitative analysis of Pennsylvanian conodont biofacies patterns, northern Utah and Colorado (Driese, Steven G., et al.)

#### paleoecology—Cretaceous

**Boulder County:** An integrated geochemical and paleoecological approach to petroleum source rock evaluation, lower Niobrara Formation (Cretaceous), Lyons, Colorado (Barlow, Lisa K.)

— Integrated geochemical and paleoecological approach to petroleum source rock evaluation, Cretaceous Niobrara Formation, Lyons, Colorado (Barlow, L. K.)

**El Paso County:** Codell and Juana Lopez in south-central Colorado (McLane, Michael)

**Fremont County:** Codell and Juana Lopez in south-central Colorado (McLane, Michael)

**Huerfano County:** Codell and Juana Lopez in south-central Colorado (McLane, Michael)

**La Plata County:** Stratigraphy & palynology of the Upper Lewis Shale, Pictured Cliffs Sandstone, & Lower Fruitland Formation (Upper Cretaceous) near Durango, CO (Manfrino, Carrie)

**Pueblo County:** Codell and Juana Lopez in south-central Colorado (McLane, Michael)

**Teller County:** Codell and Juana Lopez in south-central Colorado (McLane, Michael)

**Western U.S.:** Linking impacts in plant extinctions (Leahy, Guy D., et al.)

#### paleoecology—foraminifers

**Cretaceous:** Foraminifera of the Storm King Mountain Shale Member, Mancos Shale, western Colorado (Von Holdt, Laura Lynn)

— Foraminiferal evidence for the development of anoxic conditions, Niobrara Formation (Upper Cretaceous), Boulder, Colorado, with paleoceanographic implications for the Western Interior Seaway (Beatty, Charles A.)

#### paleoecology—fossil man

**Holocene:** Man at the montane glacier margin, Colorado Fort Range (Benedict, James B.)

#### paleoecology—Holocene

**Chaffee County:** Geology of archeological sites in Middle Cottonwood Creek valley and Taylor Park, Chaffee and Gunnison counties, Colorado (Madole, Richard F.)

**Colorado:** Holocene dynamics of the subalpine forest in central Colorado (Fall, Patricia L.)

— Holocene tree limit positions and paleoenvironments of the Colorado Front Range, based on insect fossil assemblages from five high altitude sites (Elias, Scott A.)

— Palynology of Holocene sediments, Colorado Front Range; vegetation and treeline changes in the subalpine forest (Short, Susan K.)

**Gunnison County:** Geology of archeological sites in Middle Cottonwood Creek valley and Taylor Park, Chaffee and Gunnison counties, Colorado (Madole, Richard F.)

**Weld County:** Archaeology of the Jurgens Site (Scott, Douglas D.)

**Western U.S.:** Pollen in packrat (*Neotoma*) middens; pollen transport and the relationship of pollen to vegetation (Davis, Owen K.)

#### paleoecology—ichnofossils

**Cretaceous:** Stratigraphy of the Codell Sandstone and Juana Lopez members of the Carlile Formation (Upper Cretaceous), El Paso and Fremont counties, Colorado (Aulia, Karsani)

**Jurassic:** The sedimentology of the Purgatoire tracksite region, Morrison Formation of southeastern Colorado (Prince, Nancy K.)

**marine environment:** Trace-fossil model for reconstruction of paleo-oxygenation in bottom waters (Savrdá, Charles E.)

**Phanerozoic:** Development and evaluation of a trace fossil model for the reconstruction of paleo-oxygenation in marine environments (Savrdá, Charles Edward)

— The paleoenvironmental significance of the nearshore *Curvolithus* ichnofacies (Lockley, Martin G., et al.)

#### paleoecology—insects

**Holocene:** Paleoenvironmental interpretations of Holocene insect fossil assemblages from four high-altitude sites in the Front Range, Colorado, U.S.A. (Elias, Scott A.)

— Paleoenvironmental interpretations of the late Holocene, Rocky Mountain national Park, Colorado, USA (Elias, S. A., et al.)

#### paleoecology—interpretation

**shelf environment:** Depositional environment and tectonic significance of the Permo-Triassic Lykins Formation, Golden-Morrison area, Jefferson County, Colorado (Wiggs, Calvin R.)

#### paleoecology—Jurassic

**Colorado:** Reconstruction of a Late Jurassic lacustrine ecosystem (Lockley, M. G., et al.)

— The Purgatoire Valley dinosaur tracksite region, Southeast Colorado (Lockley, Martin G.)

## paleoecology—mammals

*Otero County*: Interpretations of some depositional environments and paleoecology in the Morrison Formation of southeastern Colorado (Frazier, F., et al.)

## paleoecology—mammals

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*Pleistocene*: Review of the Dent mammoth site (Cassells, E. Steve)

## paleoecology—mollusks

*Cenozoic*: Evolution of freshwater drainages and molluscs in western North America (Taylor, Dwight W.)

*Cretaceous*: *Texigryphaea* in the Glencairn Formation near Two Buttes, Colorado, with notes on an assemblage of *Texigryphaea* from the Kiowa Formation of southern Kansas (Kues, Barry S.)

*Pleistocene*: Nonmarine mollusks as indicators of local paleoenvironments in fluvial deposits; an example from the Pleistocene of Northwest Colorado (Evanoff, Emmett)

## paleoecology—Oligocene

*Colorado*: Palynological interpretation of plant succession, paleoecology, and sediment accumulation in the Florissant Fm. lake beds (Oligocene), Colorado (Hascall, Allan P., et al.)

## paleoecology—palynomorphs

*Cretaceous*: Disruption of the terrestrial plant ecosystem at the Cretaceous-Tertiary boundary, Western Interior (Tschudy, R. H., et al.)  
— Dinoflagellates as indicators of depositional environments in Craig, Colorado; Upper Cretaceous (Marti#2.nez Herna#2.ndez, Enrique)

*Eocene*: Palynomorphs of the Green River Formation (Eocene), Colorado and Utah; some observations and interpretations (Newman, Karl R.)

*Holocene*: Age of pre-Neoglacial cirque moraines in the central North American Cordillera (Davis, P. Thompson)

## paleoecology—Pennsylvanian

*Colorado*: Field Trip No. 4; Pennsylvanian algal carbonates and associated facies, central Colorado (Wray, John L.)

## paleoecology—Pisces

*Eocene*: Paleontology of the Green River Formation, with a review of the fish fauna; second edition (Grande, Lance)

## paleoecology—plants

*Cretaceous*: Extinction and survival of plant life following the Cretaceous/Tertiary boundary event, Western Interior, North America (Tschudy, Robert H.)

*Oligocene*: The Florissant Fossil Beds National Monument, Teller County, Colorado (Hutchinson, Robert M.)

## paleoecology—Pleistocene

*Colorado*: A paleontological analysis of the Alamosa Formation (south-central Colorado; Pleistocene, Irvingtonian) (Rogers, Karel L.)

*Grand County*: New pollen and beetle analyses at the Mary Jane site, Colorado; evidence for late glacial tundra conditions (Short, Susan K.)

## paleoecology—Quaternary

*Colorado*: Fungi as potential indicators of periglacial soils (Christensen, Martha)

— Late Quaternary vegetation dynamics in the Southern Rocky Mountains, U.S.A. (Fall, Patricia L.)

*Great Plains*: Quaternary pollen records from the Great Plains and central United States (Baker, Richard G.)

*Southwestern U.S.*: Quaternary pollen analysis and vegetational history of the Southwest (Hall, Stephen A.)

*Western U.S.*: Comparison of plant macrofossils in woodrat (*Neotoma* sp.) and porcupine (*Erethizon dorsatum*) middens from the western United States (Betancourt, Julio L., et al.)

## paleoecology—radiolarians

*Cretaceous*: Radiolaria from the Upper Cretaceous Pierre Shale, Colorado, Kansas, Wyoming (Bergstresser, Thomas J.)

## paleoecology—reptiles

*Jurassic*: North America's largest dinosaur trackway site; implications for Morrison Formation paleoecology (Lockley, Martin G., et al.)

— Paleoecology of the dinosaur-bearing Morrison Formation (Dodson, Peter, et al.)

*Mesozoic*: Triassic and Jurassic vertebrate-dominated trace fossil assemblages of the Cimarron Valley region; implications for paleoecology and biostratigraphy (Conrad, Kelly, et al.)

## paleoecology—Spermatophyta

*Oligocene*: An evaluation of the methods for estimating paleoaltitudes using Tertiary floras from the Rio Grande Rift vicinity, New Mexico and Colorado (Meyer, Herbert William)

## paleoecology—vertebrates

*Cretaceous*: Late Cretaceous nonmarine vertebrates of the Denver Basin (Carpenter, Kenneth)

*Pleistocene*: Late Pleistocene vertebrates from Gunnison County, Colorado (Emslie, Steven D.)

**Paleogene** *see under* geochronology *under* Clear Creek County; Eagle County; Lake County; Summit County

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## paleogeography—Cenozoic

*Colorado Plateau*: Early Cenozoic history of the Uinta and Piceance Creek basins, Utah and Colorado, with special reference to the development of Eocene Lake Uinta (Johnson, Ronald C.)

## paleogeography—Cretaceous

*Boulder County*: Foraminiferal evidence for the development of anoxic conditions, Niobrara Formation (Upper Cretaceous), Boulder, Colorado, with paleoceanographic implications for the Western Interior Seaway (Beatty, Charles A.)

*Colorado*: An initial study of the sensitivity of modeled Cretaceous climate to cyclical insolation forcing (Glancy, T. J., Jr., et al.)

— Depositional environment of the Kremmling Sandstone Member, Pierre Shale, Middle Park, Colorado (Wiedemeier, Todd H.)

*Colorado Plateau*: Mid-Cretaceous alluvial-plain incision related to eustasy, southeastern Colorado Plateau (Aubrey, W. M.)

*Denver Basin*: Codell Sandstone, D-J Basin's new objective (Anonymous)

*Garfield County*: Late Cretaceous through early Tertiary general stratigraphy and structural geology of the Piceance Creek basin, Colorado (Johnson, Ronald C.)

— Reservoir sedimentology of Mesaverde rocks at the MWX site (Lorenz, John C.)

— Stratigraphy of Grand Hogback Coalfield, upper Campanian Mesaverde Group, Rifle Gap to New Castle, Garfield County, Colorado (Madden, Dawn J.)

— Stratigraphy, depositional environments, and paleogeography of coal-bearing strata in the Upper Cretaceous Mesaverde Group, central Grand Hogback, Garfield County, Colorado (Madden, Dawn J.)

*Moffat County*: Facies analysis of the lower cycles of the Mesaverde Group (Upper Cretaceous) in northwestern Colorado (Kiteley, Louise W.)

*Western U.S.*: Natural gamma-ray spectrometry, lithofacies, and depositional environments of selected Upper Cretaceous marine mudrocks, Western United States, including Tropic Shale and Tununk Member of Mancos Shale (Zelt, Frederick Bruce)

## paleogeography—Jurassic

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— Paleogeography and facies distribution of the Todilto Limestone and Pony Express Limestone Member of the Wanakah Formation, Colorado and New Mexico (Ridgley, Jennie L.)

*Colorado Plateau*: Fluvial architecture of Jurassic uranium-bearing sandstones, Colorado Plateau, western United States (Tyler, Noel)

— Upper Jurassic groundwater flow in the Colorado Plateau; the key to formation of uranium ore deposits (Sanford, Richard F.)

## paleogeography—Mesozoic

*Jackson County*: Stratigraphy of upper Morrison and lower Dakota Group of Front Range, Colorado; new play in central Denver Basin? (Wyatt, Danny J.)

*Pueblo County*: Stratigraphy of upper Morrison and lower Dakota Group of Front Range, Colorado; new play in central Denver Basin? (Wyatt, Danny J.)

## paleogeography—Mississippian

*Colorado*: Dolomitization and diagenesis of the Leadville Limestone (Mississippian), central Colorado (Horton, Robert A., Jr.)

## paleogeography—Oligocene

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- Garfield County*: Stratigraphic and sedimentologic studies of late Paleozoic strata in the Eagle Basin and northern Aspen Sub-basin, Northwest Colorado (Johnson, Samuel Y.)
- Rio Blanco County*: Stratigraphic and sedimentologic studies of late Paleozoic strata in the Eagle Basin and northern Aspen Sub-basin, Northwest Colorado (Johnson, Samuel Y.)
- Western U.S.*: Middle Devonian to Late Mississippian geologic history of the Overthrust Belt region, Western U.S. (Sandberg, Charles A., et al.)
- paleogeography—patterns**
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- Colorado*: Minturn and Sangre de Cristo formations of southern Colorado; prograding fan-delta and alluvial-fan sequence shed from ancestral Rocky Mountains (Lindsey, David A., et al.)
- Pennsylvanian and Permian depositional systems and cycles in the Eagle Basin, Northwest Colorado (Johnson, Samuel Y., et al.)
- Eagle Basin*: Sedimentary rocks of the Eagle Basin (Mallory, William W.)
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- Turbidites in the lower part of the Eagle Valley Evaporite, Eagle County, Colorado, and implications for Desmoinesian paleogeography (Schenk, Christopher J.)
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- Western U.S.*: Pennsylvanian repetitive orthoquartzite-carbonate suite of Western United States; sedimentology and paleogeography (Dott, Robert H., Jr., et al.)
- paleogeography—Permian**
- Eagle County*: Evolution of sedimentary basins; Uinta and Piceance basins (Johnson, Samuel Y., et al.)
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- The Fryingpan Member of the Maroon Formation; a Lower Permian(?) basin-margin dune field in northwestern Colorado (Johnson, Samuel Y.)
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- Mesa County*: Alluvial-fan sedimentation of the Cutler Formation (Permo-Pennsylvanian), near Gateway, Colorado (Mack, Greg H.)
- Pitkin County*: The Fryingpan Member of the Maroon Formation; a Lower Permian(?) basin-margin dune field in northwestern Colorado (Johnson, Samuel Y.)
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- paleogeography—Precambrian**
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- paleogeography—Tertiary**
- Colorado*: Map showing late Eocene erosion surface, Oligocene-Miocene paleovalleys, and Tertiary deposits in the Pueblo, Denver, and Greeley 1° by 2° quadrangles, Colorado (Scott, Glenn R.)
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- paleomagnetism see under geochronology; stratigraphy; tectonophysics**
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- paleomagnetism—Cambrian**
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- Paleomagnetic and petrographic study of sandstone dikes and the Cambrian Sawatch Sandstone, eastern flank of the southern Front Range, Colorado (Kost, Linda Suzanne)
- Paleomagnetic dating of hematite authigenesis, Upper Cambrian Peerless Formation, Colorado (Peck, Craig J., et al.)
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- Paleozoic diagenesis of the Upper Cambrian Peerless Formation, Colorado (Peck, Craig J.)
- El Paso County*: Early and late Paleozoic remagnetization of the Cambrian Peerless Formation, Colorado (Peck, C., et al.)
- paleomagnetism—Cenozoic**
- Colorado*: Paleomagnetism of some Laramide intrusives, Jamestown mining district, Colorado (Sheldon, E. K.)
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*remagnetization*: Paleomagnetic assessment of basement rotation along the eastern flank of the Front Range near Boulder, Colorado (Davis, John Wesley)

## paleomagnetism—Miocene

*Colorado*: Paleomagnetic evidence regarding the eruptive and resurgent history of the Lake City Caldera, San Juan Mountains, Colorado (Reynolds, R. L., et al.)

## paleomagnetism—Mississippian

*Colorado*: Dolomitization and diagenesis of the Leadville Limestone (Mississippian), central Colorado (Horton, Robert A., Jr.)

— Paleomagnetism of the Leadville Formation (Mississippian), central Colorado; data bearing on the age of regional dolomitization (Horton, Robert A., Jr.)

*Eagle County*: Paleomagnetism and rock magnetism of the Mississippian Leadville (carbonate) Formation and implications for the age of sub-regional dolomitization (Horton, Robert A., Jr.)

*Lake County*: Paleomagnetism and rock magnetism of the Mississippian Leadville (carbonate) Formation and implications for the age of sub-regional dolomitization (Horton, Robert A., Jr.)

*Pitkin County*: Paleomagnetism and rock magnetism of the Mississippian Leadville (carbonate) Formation and implications for the age of sub-regional dolomitization (Horton, Robert A., Jr.)

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*Clear Creek County*: Paleomagnetism of the Red Mountain intrusive complex (Henderson molybdenum deposit), Empire, Colorado (Graaskamp, G. W., et al.)

*Great Plains*: Oligocene calibration of the magnetic polarity timescale (Prothero, D. R., et al.)

*Saguache County*: Fish Canyon Tuff, Colorado; the problem of two magnetic polarities in a single tuff (Ellwood, Brooks B., et al.)

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*Grand County*: Geology of the Granby and Strawberry Lake 7 1/2' quadrangles, Grand County, Colorado (Schroeder, David Alan)

## paleomagnetism—Paleozoic

*Colorado*: A paleomagnetic investigation of the Permo-Carboniferous Maroon and Upper Permian-Lower Triassic State Bridge formations in north-central Colorado (Christensen, F. Deon)

— Anatomy of redbed remanence in the late Paleozoic Fountain Formation, Colorado, as demonstrated by attritional demagnetization (Larson, E. E., et al.)

*Eagle County*: Magnetostratigraphy of the Red Sandstone Creek Section, Vail, CO (Miller, J.)

— Magnetostratigraphy of the Red Sandstone Creek section; Vail, Colorado (Miller, John D.)

*Fremont County*: Paleomagnetism of Cambro-Ordovician intrusives from Colorado (Lynnes, C. G., et al.)

*Moffat County*: Paleomagnetism of a Late Cambrian or Early Ordovician dike from Lodore Canyon, northwestern Colorado (Hudson, Mark R.)

*Western U.S.*: Petrologic, paleomagnetic, and structural evidence of a Paleozoic rift system in Oklahoma, New Mexico, Colorado, and Utah (Larson, E. E., et al.)

— Petrologic, paleomagnetic, and structural evidence of a Paleozoic rift system in Oklahoma, New Mexico, Colorado, and Utah; discussion and reply (Van der Voo, Rob)

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*intrusions*: Paleomagnetism and tectonic setting of the Red Mountain intrusive complex (Henderson molybdenum deposit); Clear Creek County, Colorado (Graaskamp, Garret)

## paleomagnetism—Pennsylvanian

*Colorado*: A paleomagnetic study of the Minturn Formation from the Arkansas River valley section, Colorado (Magnus, G. J.)

— Characteristic remanent magnetization of boulders and cobbles in red beds of Pennsylvanian and Permian age in Colorado (Larson, E. E.)

## paleomagnetism—Permian

*Colorado*: Paleomagnetic and rock magnetic investigation of the relationship between hydrocarbons and authigenic magnetic minerals in the Permian Lyons Sandstone, northern Front Range and Denver Basin, Colorado (McCollum, Robert Andrew)

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*Colorado*: Paleomagnetic data bearing on Laramide and younger deformation of the northern Mosquito Range, central Colorado (Oppenheimer, William L.)

## paleomagnetism—Pleistocene

*Boulder County*: Paleomagnetic study of a succession of early Pleistocene Paleosols near Boulder, Colorado (Patterson, Penny E., et al.)

*Colorado*: Paleomagnetism of two late Pleistocene lake basins in Colorado; an evaluation of detrital remanent magnetization as a recorder of the geomagnetic field (Rosenbaum, J. G.)

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*Alamosa County*: Compositional control of the low-temperature formation of titanomaghemite and hematite (Munoz, J., et al.)

*Jefferson County*: Compositional control of the low-temperature formation of titanomaghemite and hematite (Munoz, J., et al.)

— Extent of low-temperature oxidation of iron-titanium oxides in alluvial-terrace soils during the last 2 M.Y. (Patterson, P. E.)

*North America*: A review of lacustrine paleomagnetic records from western North America; 0-40 000 years BP (Hanna, Ruth L.)

## paleomagnetism—remanent magnetization

*volcanic rocks*: Summary of natural remanent magnetization, magnetic susceptibility, and density measurements from the Lake City Caldera area, San Juan Mountains, Colorado (Grauch, V. J. S.)

## paleomagnetism—Tertiary

*Colorado*: Estimates of flow direction for calc-alkaline welded tuffs from anisotropy of magnetic susceptibility data (Ellwood, Brooks B.)

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*Echinodermata*: Tertiary echinoids of the Carizzo Creek region in the Colorado Desert (Kew, William S. W.)

*ichnofossils*: Dinosaur footprints from the Dakota Group of eastern Colorado (Lockley, Martin G.)

— Dinosaur trackways from the Triassic of western Colorado (Parrish, J. Michael)

— In the footsteps of dinosaurs?; discussion (Farlow, James O.)

— The sedimentology of the Purgatoire track-site region, Morrison Formation of southeastern Colorado (Prince, Nancy K.)

*Insecta*: Arancid fossils in volcanogenic and non-volcanogenic deposits; a comparison of information lost and found (Licht, Edwin L.)

*Mammalia*: A new species of the Oligocene eomyid rodent *Centimammys* (Martin, Larry D.)

— Apparent evolutionary stasis in the Eocene taeniodont (Mammalia) *Stylinodon mirus* (Schoch, Robert M.)

— Comparative osteology of North American dichobunid artiodactyls (Rose, Kenneth D.)

— Early Eocene artiodactyls from the San Juan Basin, New Mexico and the Piceance Basin, Colorado (Krishtalka, Leonard)

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— Mode and tempo of evolution; a model from early Eocene mammals of Colorado (Kihm, Allen J.)

— New Adapisoricidae, Pentacodontidae, and Hyopsodontidae (Mammalia, Insectivora and Condylarthra) from the late Paleocene of Wyoming and Colorado (Gingerich, Philip D.)

— Part I; Eocene stratigraphy of the Washakie Basin, Wyoming and Colorado; Part III; a new species of anaptomorphid (Morris, W. J.)

— Predation and the formation of fossil mammal accumulations (Mellett, James S.)

— *Stegomastodon* from Pleistocene of Colorado (Lindsey, K. Don, et al.)

— *Symbos* sp. recovered from loess deposits in Southwest Colorado (Clay, Vickie L., et al.)

— The last zygalophodont proboscidean: *Zygalophodon serridens* from late Miocene of Colorado (Madden, Cary T.)

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*Radiolaria*: Radiolaria from the Upper Cretaceous Pierre Shale, Colorado, Kansas, Wyoming (Bergstresser, Thomas J.)

*Reptilia*: Cretaceous disappearance and reappearance of sauropod dinosaurs in the North American Western Interior (Hunt, Adrian P.)

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— Dryosaurus, a hypsilophodontid dinosaur from the Upper Jurassic of North America and Africa; postcranial skeleton (Galton, P. M.)

— Evolution of terrestrial Late Cretaceous faunal communities (Horner, John R.)

— Fertile fossil field (Averett, Walter R.)

— Mid-Mesozoic paleontology of the Rabbit Valley area; western Colorado (Armstrong, Harley J., et al.)

— Remains of ancient life in Cretaceous rocks of the Dinosaur Triangle (Young, Robert G.)

— Textural and mineralogical analysis of a Stegosaurus (*Reptilia*; *Ornithischia*) plate (Brinkman, Daniel L.)

— The land of the terrible lizards (Keith, Sandra L.)

— The major characters of Torvosaurus and a report of its occurrence at Dinosaur National Monument (Britt, Brooks B.)

— Tiny dinosaurs; are they fully grown? (Callison, George)

*Vertebrata*: Late Cretaceous nonmarine vertebrates of the Denver Basin (Carpenter, Kenneth)

**paleontology—concepts**  
*mass extinctions*: Searching land and sea for the dinosaur killer (Kerr, Richard A.)

**paleontology—research**  
*current research*: Shorter contributions to paleontology and stratigraphy (Sando, William J.)

**Paleosols** *see under* soils  
*see under* clastic rocks *under* sedimentary rocks  
*see under* composition *under* sediments  
*see under* dates *under* absolute age  
*see under* environmental analysis *under* sedimentary rocks  
*see under* materials *under* diagenesis  
*see under* soils *under* La Plata County; Montezuma County; Ouray County; San Miguel County

**paleotemperature** *see* geologic thermometry

**Paleozoic** *see* Cambrian; Carboniferous; Devonian; Mississippian; Ordovician; Pennsylvanian; Permian  
*see under* geochronology *under* Delta County; Fremont County; Gunnison County; Hinsdale County; Mesa County; Montrose County; Ouray County; Saguache County  
*see under* stratigraphy *under* Archuleta County; Custer County; Delta County; Dolores County;

Eagle County; El Paso County; Fremont County; Garfield County; Grand County; Gunnison County; Jefferson County; La Plata County; Mesa County; Moffat County; Montezuma County; Montrose County; North America; Pitkin County; Rio Blanco County; Rocky Mountains; Routt County; Saguache County; San Juan County; San Miguel County; Summit County; Western U.S.

**paleozoogeography** *see* biogeography

**palynomorphs—biostratigraphy**

*Cretaceous*: Biostratigraphic correlation of Cretaceous-Tertiary boundary rocks, Colorado to San Juan Basin, New Mexico (Newman, Karl R.)

— Biostratigraphic correlation of K-T rocks from northwestern Colorado to San Juan Basin, Colorado and New Mexico (Newman, Karl R.)

— Biostratigraphy of Fruitland, Kirtland, and Animas formations (Cretaceous and Paleocene), northern San Juan Basin, Colorado (Newman, Karl R.)

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— Cretaceous palynomorph biozones for the Central and Northern Rocky Mountain region of the United States (Nichols, D. J., et al.)

— Field guide and discussions of coal deposits, depositional environments and the Cretaceous-Tertiary boundary, southern Raton Basin (field trip 3) (Pillmore, Charles L.)

— Palynology of the Vermejo Formation coals (Upper Cretaceous) in the Canon City coal field, Fremont County, Colorado (Clarke, Robert Travis)

— Palynology of Upper Cretaceous and lower Tertiary strata from the northern Raton Basin, south-central Colorado (Williams, Carol Alvis)

— Palynomorph assemblages from uppermost Cretaceous deposits, Denver Basin, Colorado (Nichols, Douglas J.)

— Reworked Cretaceous palynomorphs in late Quaternary deposits from central Colorado, USA (Scott, L.)

— Stratigraphic palynology of Cretaceous-Paleocene boundary rocks, San Juan Basin, Colorado and New Mexico (Newman, K. R.)

— Stratigraphy & palynology of the Upper Lewis Shale, Pictured Cliffs Sandstone, & Lower Fruitland Formation (Upper Cretaceous) near Durango, CO (Manfrino, Carrie)

— Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado (Pillmore, Charles L.)

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— Stratigraphy of the Cretaceous-Tertiary boundary in the southern Raton Basin, New Mexico and Colorado (Pillmore, C. L., et al.)

— The Ojo Alamo Sandstone and the Cretaceous-Tertiary boundary, San Juan Basin, New Mexico and Colorado (Fassett, James E.)

*Tertiary*: Stratigraphic sections of lower Tertiary strata and charts showing palynomorph

and mollusk assemblages, Douglas Creek Arch area, Colorado and Utah (Johnson, R. C., et al.)

**palynomorphs—Dinoflagellata**

*Cretaceous*: Fossil Ceratiaceae; a restudy and new taxa from the Mid-Cretaceous of the Western Interior, U.S.A. (Bint, A. N.)

**palynomorphs—dinoflagellates**

*Cretaceous*: Dinoflagellates as indicators of depositional environments in Craig, Colorado; Upper Cretaceous (Martinez, Enrique)

— Mid-Cretaceous dinoflagellates from the Western Interior, U. S. A. (Bint, Anthony Neil)

**palynomorphs—miospores**

*Cretaceous*: Age of the Dawson Arkose, Southwestern Air Force Academy, Colorado, and implications for the uplift history of the Front Range (Kluth, Charles F.)

— Disruption of the terrestrial plant ecosystem at the Cretaceous-Tertiary boundary, Western Interior (Tschudy, R. H., et al.)

— Extinction and survival of plant life following the Cretaceous/Tertiary boundary event, Western Interior, North America (Tschudy, Robert H.)

— Field guide to the continental Cretaceous-Tertiary boundary in the Raton Basin, Colorado and New Mexico (Pillmore, C. L., et al.)

— Geologic framework of nonmarine Cretaceous-Tertiary boundary sites, Raton Basin, New Mexico and Colorado (Pillmore, C. L., et al.)

— Iridium abundance anomalies at the palynological Cretaceous/Tertiary boundary in coal beds of the Raton Formation, Raton Basin, New Mexico and Colorado (Pillmore, C. L., et al.)

— Linking impacts in plant extinctions (Leahy, Guy D., et al.)

— Palynological evaluation of Cedar Mountain and Burro Canyon formations, Colorado Plateau (Tschudy, R. H., et al.)

— Palynology and biostratigraphy of the Upper Cretaceous Adaville Formation (southwestern Wyoming) and biostratigraphic comparison to the Niobrara Formation (Ridgway, Colorado) (Gallucci, Richard Nicholas)

— Raton Basin magnetostratigraphy near Cretaceous-Tertiary boundary (Wolberg, Donald L., et al.)

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— The "fern spike" at the Cretaceous-Tertiary boundary, Western Interior, United States (Tschudy, Robert H.)

— Trace element patterns at a non-marine Cretaceous-Tertiary boundary (Gilmore, J. S., et al.)

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*Holocene*: A Holocene pollen record from Thomas Lakes Bog, Mt. Sopris, Colorado (King, Frances B.)

— Climate during Anasazi occupation and abandonment of SW Colorado, USA; new

evidence from pollen and tree-rings (Petersen, Kenneth Lee)

— Holocene dynamics of the subalpine forest in central Colorado (Fall, Patricia L.)

— Holocene vegetational history of the western United States (Baker, Richard G.)

— Man and environment in the Dolores River valley, SW Colorado; some pollen evidence (Petersen, Kenneth Lee)

— Paleoenvironmental interpretations of the late Holocene, Rocky Mountain national Park, Colorado, USA (Elias, S. A., et al.)

— Palynology in Montezuma County, southwestern Colorado; the local history of the pinyon pine (*Pinus edulis*) (Petersen, Kenneth Lee)

— Palynology of Holocene sediments, Colorado Front Range; vegetation and treeline changes in the subalpine forest (Short, Susan K.)

*Mesozoic*: Fruita; a place for wee fossils (Callison, George)

*occurrence*: Palynological mapping of vertical microseepage over Dragoon and Pollen fields (Groth, Peter K. H.)

*Oligocene*: Palynological interpretation of plant succession, paleoecology, and sediment accumulation in the Florissant Fm. lake beds (Oligocene), Colorado (Hascall, Allan P., et al.)

*Paleocene*: Clay petrology of the conformable Cretaceous/Tertiary boundary interval, Raton Basin, New Mexico and Colorado (Pollastro, Richard M., et al.)

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*Pleistocene*: Grass-opal phytoliths as climatic indicators of the Great Plains Pleistocene (Twiss, Page C.)

— Lake Devlin and Pinedale glacial history, Front Range, Colorado (Madole, Richard F.)

— Late Pleistocene vertebrates from Gunnison County, Colorado (Emslie, Steven D.)

— New pollen and beetle analyses at the Mary Jane site, Colorado; evidence for late glacial tundra conditions (Short, Susan K.)

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— Deglaciation and postglacial timberline in the San Juan Mountains, Colorado (Carrara, P. E., et al.)

— Quaternary glacial geology of the Crested Butte area, Gunnison County, Colorado (Dea, Peter A.)

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— Quaternary pollen records from the Great Plains and central United States (Baker, Richard G.)

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*Holocene*: Age of pre-Neoglacial cirque moraines in the central North American Cordillera (Davis, P. Thompson)

*Pleistocene*: Late Pleistocene paleoenvironmental studies from the Rocky Mountain region: a comparison of pollen and insect fossil records (Elias, Scott A.)

**Pando Porphyry**

Origin of the ore deposits at Gilman, Colorado; oxygen and hydrogen isotopic constraints (Beaty, David W., et al.)

**Paonia Shale Member**

Appropriate stratigraphic nomenclature for coal reservoirs in Piceance Basin, Colorado (Decker, David)

**Parachute Creek Member**

Alternative fuels; Parachute Creek Shale Oil Project's economic and operational outlook (U. S. General Accounting Office)

— Correlation between the  $\delta^{34}\text{S}$  of pyritic and organic sulfur in coal and oil shale (Price, Fred T.)

— Depositional environments of oil shale in the Green River Formation, Douglas Creek Arch, Colorado and Utah (Cole, R. D.)

— Detailed lithologic, rock quality, and hydrologic data from four drill holes in the central Piceance Creek basin, Rio Blanco County, Colorado (Daub, G. J., et al.)

— Effect of mineral species on oil shale char combustion (Cavalieri, Ralph P.)

— Fluorine in Colorado oil shale (Dyini, John R.)

— Inorganic geochemistry of Mahogany Zone oil shale in two cores from the Green River Formation (Tuttle, Michele L., et al.)

— Mechanical characterization of oil shale (Chong, Ken P.)

— Microcrystalline nahcolite on the 1840 level, Horse Draw Mine, Piceance Creek basin, Colorado (Cole, R. D.)

— Mineral reactions for two Colorado oil shale samples; a comparison (Thompson, Lorinda G.)

— Mineralogy of the Mahogany marker tuff of the Green River Formation, Piceance Creek basin, Colorado (Mason, Glenn M.)

— New names for units in the lower part of the Green River Formation, Piceance Creek basin, Colorado (Johnson, Ronald C.)

— Palynomorphs of the Green River Formation (Eocene), Colorado and Utah; some observations and interpretations (Newman, Karl R.)

— Reduction and phenol acid depolymerization of Colorado oil shale kerogen (Solash, J., et al.)

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— Saline dissolution collapse in the Piceance Creek basin (Gulliver, T. W.)

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— Simulated oil-shale mine dewatering using a confined multiaquifer model, Piceance Basin, Colorado, U.S.A. (Weeks, John B.)

— Stratigraphic variation of sulfur isotopes in Colorado Corehole number 1 (Smith, John Ward)

— Supplemental road log Douglas Pass to FAA radar station (Dayvault, Richard D.)

— Trace element distribution and oil yield data from the Parachute Creek Member of the Green River Formation, Colorado (Sullivan, Patrick J.)

— Transient calibration of computer model of ground water flow and transport, Piceance Basin, Colorado (Shepherd, Russell G.)

— Variations in sulfur mineralization in the Parachute Creek Member of Green River Formation, Colorado and Utah (Boyer, David L.)

**Paradox Member**

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— Hydrocarbon potential in Paradox Basin: an overview (Fallin, J. A. Tony)

— Ismay reservoirs, Paradox Basin; diagenesis and porosity development (Dawson, William C.)

— McClean Field, T37N, R19W, Montezuma County, Colorado (Matheny, J. Paul)

— Oil and gas exploration in the Paradox Basin, 1978-1983 (Stevenson, G. M.)

— Papoose Canyon, North (oil and gas) (Lehman, Don)

— Paradox Basin; unravelling the mystery (Anonymous)

— Platy algal reef mounds, Paradox Basin (Choquette, Philip W.)

— Relationship of evaporite and carbonate sedimentation to hydrocarbon accumulation in Pennsylvanian phylloid algal mounds, Paradox Basin, Utah-Colorado (Stevenson, Gene M.)

— Seismic character study, Ismay Cycle, Paradox Formation, Paradox Basin, Southwest Colorado (Bergeon, Thomas C.)

— Seismic exploration for Pennsylvanian algal mounds of the Paradox Basin (Moriarty, Bruce J.)

— Seismic exploration for Pennsylvanian algal mounds, Paradox Basin (Moriarty, Bruce)

— Sentinel Peak (oil) (Nicolais, Steve M.)

— Significance of botryoidal aragonite in early diagenetic history of phylloid algal mounds in Bug and Papoose Canyon fields, southeastern Utah and southwestern Colorado (Roylance, Michael H.)

— Spargo Field, T38 & 39N, R20W, Dolores County, Colorado (Matheny, J. Paul)

— Stratigraphic analysis of the Gothic Formation (Desmoinesian), Pitkin and Gunnison counties, Colorado (Levorsen, Mark K.)

— The significance of botryoidal aragonite in the early diagenetic history of phylloid algal mounds in Bug and Papoose Canyon fields, southeastern Utah and southwestern Colorado (Roylance, Michael H.)

— Wickiup (gas) (Hart, Alan W.)

— Wildwater (gas) (Bevacqua, Louis J.)

**paragenesis—base metals**

*Colorado*: Speculation on the roles of sulfur kinetics and metastable sulfur species in connecting meteoric-hydrothermal systems (Spirakis, Charles S.)

**paragenesis—gold ores**

*Colorado*: Ore petrology and geochemistry of Tertiary gold telluride deposits of the Colorado mineral belt (Saunders, James A.)

- Petrology, mineralogy, and geochemistry of representative gold telluride ores from Colorado (Saunders, James Alexander)
- La Plata County*: Bessie G; a high-grade epithermal gold telluride deposit, La Plata County, Colorado, U.S.A. (Saunders, James A.)
- Park County*: Recent developments at the London mining district, Park County, Colorado (Johansing, Robert J., et al.)
- Rocky Mountains*: Gold in alkaline rocks (Anderson, Randall, et al.)
- Teller County*: Mineralized veins and breccias of the Cripple Creek District, Colorado (Thompson, Tommy B., et al.)
- paragenesis—igneous rocks**
- Colorado*: Magmatic paragenesis of the Fish Canyon ash-flow tuff, central Jose Mountains, Colorado (O'Leary, William J.)
- Primary sulfide inclusions within the Fish Canyon ash-flow tuff and their implications for the paragenesis of calc-alkaline silicic magmas and related ore deposits (Whitney, James A.)
- paragenesis—metal ores**
- Colorado*: Geochemical constraints on the genesis of the Summitville gold-copper deposit (Stoffregen, Roger E.)
- Gold tellurides and the Boulder telluride belt, Colorado (Geller, B. A.)
- Paragenesis and fluid characteristics of the Mammoth Revenue vein, Platoro Caldera, San Juan Mountains, Colorado (Brooks, J. W., et al.)
- Paragenesis of the ores of Poughkeepsie Gulch, San Juan Mountains, Colorado (Silver, Leon T.)
- Conejos County*: A geochemical and fluid inclusion study of the mineral deposits of the Platoro fault zone, Platoro Caldera, San Juan Mountains, Colorado (Peck, Charles W.)
- Gilpin County*: Paragenetic and fluid inclusion study of the Smith Vein, Smith Mine, Blackhawk, Colorado (Kramer, Ann M.)
- Mineral County*: Geochemical environment of mineralization and alteration in the southern OH Vein, Creede, CO (Gorman, Jonathan)
- Mineralogy and geochemistry of the southern Amethyst vein system, Creede mining district, Colorado (Hemingway, Mark P.)
- Ore mineralogy and fluid inclusion study of the southern Amethyst Vein system, Creede, Colorado (Robinson, Richard W.)
- paragenesis—metamorphic rocks**
- Colorado*: A model for garnite and magnetite formation during metamorphism of sulfide-rich rocks (Ririe, G. Todd)
- paragenesis—molybdenum ores**
- Clear Creek County*: Central City, Colorado; the upper part of an alkaline porphyry molybdenum system (Rice, C. M., et al.)
- Gilpin County*: Central City, Colorado; the upper part of an alkaline porphyry molybdenum system (Rice, C. M., et al.)
- Lake County*: Oxidation of molybdenite at Climax CO. and other deposits; implications for exploration (Leanderson, P. James, et al.)
- paragenesis—pegmatite**
- Jefferson County*: Electron microprobe analysis of rare-earth-element-bearing phases from the White Cloud Pegmatite, South Platte District, Jefferson County, Colorado (Wayne, David Matthew)
- paragenesis—polymetallic ores**
- Hinsdale County*: The Gladiator Mine, Lake City, Colorado; the mineralogy and paragenesis of an epithermal base- and precious-metal vein system (Bove, Dana J.)
- Park County*: Growth zoning in tetrahedrite-tennantite from the Hock Hocking Mine, Alma, Colorado (Raabe, Kenneth C.)
- Rio Grande County*: Genesis of acid-sulfate alteration and Au-Cu-Ag mineralization at Summitville, Colorado (Stoffregen, Roger E.)
- paragenesis—silver ores**
- Hinsdale County*: Geology, mineralogy and paragenesis of the Pride of America Mine, Lake City, Hinsdale County, Colorado (Sanford, Richard F., et al.)
- Mineral County*: Mineralogy and fluid inclusion study of the southern Amethyst vein system, Creede mining district, Colorado (Robinson, Richard W.)
- Ouray County*: Supergene silver ores of the Red Mountain District, Ouray County, Colorado (Maher, Brian J.)
- paragenesis—uranium ores**
- Colorado*: Geology and uranium mineralization of the Florida Mountain area, Needle Mountains, southwestern Colorado (Collier, James D.)
- Jefferson County*: Genetic implications of preliminary mineralogical, paragenetic and fluid inclusion data for the Schwartzwalder uranium mine, Colorado (Rich, R. A.)
- The Schwartzwalder uranium deposit; III, Alteration, vein mineralization, light stable isotopes, and genesis of the deposit (Wallace, Alan R.)
- La Plata County*: Geology and uranium mineralization of the Florida Mountain area, Needle Mountains, southwestern Colorado (Collier, James D.)
- Park City Formation**
- Altered igneous rocks around Rocky Mountain manto deposits; the Gilman (Colorado) example (O'Neill, T. F., et al.)
- Cyclic sedimentation in the Permo-Triassic Goose Egg Formation, southeastern Wyoming (Greer, Phillip L.)
- The Willow Creek Fault, eastern Uinta Mountains; geological analysis of a foreland subthrust play (Powers, Richard B.)
- Park County—areal geology**
- Lake George region*: Field guide and road log to the Lake George intrusive center, Pikes Peak Batholith (Field Trip #1, Sunday, June 1) (Wobus, R. A.)
- maps*: Geologic map of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Hedlund, D. C.)
- Geology and petroleum potential, Colorado Park Basin province, north-central Colorado (Maughan, Edwin K.)
- Reconnaissance geologic map of the Florissant 15-minute Quadrangle, Park and Teller counties, Colo. (Wobus, R. A.)
- Reconnaissance geologic map of the Sangre de Cristo Wilderness Study Area, south-central Colorado (Johnson, Bruce R., et al.)
- Park County—economic geology**
- base metals*: Mineralogical, trace-element and Landsat multispectral evaluation of gossans in the Alma mining district, Colorado (Accame, Guillermo M.)
- bibliography*: Leadville 1' by 2' Quadrangle, Colorado; a pre-assessment (Wallace, Alan R., et al.)
- copper ores*: Possible sedimentary sources of sulfur and copper in alkaline-suite porphyry-copper systems (Shannon, Spencer S., Jr., et al.)
- gems*: Outstanding mineral specimens from the Pikes Peak Batholith (Muntyan, Barbara L.)
- Pegmatite cavities in the Lake George area, Colorado (Kile, Daniel E.)
- Topaz in Pikes Peak Batholith (Michalski, Thomas C.)
- gold ores*: Mineralogy and geochemistry of gold-silver veins at the Hock Hocking Mine, Alma, Colorado (Raabe, Kenneth Charles)
- Recent developments at the London mining district, Park County, Colorado (Johansing, Robert J., et al.)
- Temporal variation of metal concentrations in biogeochemical samples over the Royal Tiger Mine, Colorado; Part I, Within year variation (Stednick, J. D., et al.)
- lead-zinc deposits*: Paleotopography as a guide to silver-lead-zinc deposits in the Leadville Dolomite, New York Mine, Park County, Colorado (Johansing, Robert J.)
- maps*: Mineral investigation of the Buffalo Peaks Wilderness Study Area, Chaffee, Lake, and Park counties, Colorado (Wood, Robert H., II)
- Mineral investigation of the Lost Creek Wilderness, Park and Jefferson counties, Colorado (Ellis, Clarence E.)
- Mineral investigation of the Mount Evans Wilderness, Clear Creek and Park counties, Colorado (Korzeb, Stanley L.)
- Mineral resource potential map of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Hedlund, D. C., et al.)
- Problems of using rock volume data in predictive resource studies (Howarth, Richard J.)
- mineral resources*: Analytical results and sample locality map of stream sediment, heavy-mineral-concentrate, and rock samples from the Lost Creek Wilderness Area, Jefferson and Park counties, Colorado (Domenico, James A.)
- Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimbelman, David R., et al.)
- Analytical results and sample locality map of stream-sediment and panned-concentrate samples from the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Domenico, James A., et al.)
- Analytical results for 102 water samples from sites draining the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Ficklin, W. H., et al.)
- Buffalo Peaks Wilderness Study Area, Colorado (Hedlund, D. C.)

## Park County—engineering geology

- Leadville 1' by 2' Quadrangle, Colorado; a pre-assessment (Wallace, Alan R., et al.)
- Maps showing water geochemistry of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, G. A., et al.)
- Mineral appraisal of the San Isabel National Forest, Colorado (U. S. Bureau of Mines, Intermountain Field Operations Center)
- Mineral investigation of the Buffalo Peaks Wilderness Study Area, Chaffee, Lake, and Park counties, Colorado (Wood, Robert H., II)
- Mineral investigation of the Lost Creek Wilderness, Park and Jefferson counties, Colorado (Ellis, Clarence E.)
- Mineral investigation of the Mount Evans Wilderness, Clear Creek and Park counties, Colorado (Korzeb, Stanley L.)
- Mineral resource assessment of the San Isabel National Forest, Colorado; a prototype for 1:250,000-scale multidisciplinary assessments "from the literature" (Taylor, Richard B.)
- Mineral resource potential map of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Hedlund, D. C., et al.)
- Physical-chemical controls of dolomite hosted sherman-type mineralization, Lake and Park counties, Colorado (Johansing, Robert J.)
- Stream-sediment and panned-concentrate geochemical maps of the Buffalo Peaks Wilderness Study Area, Lake, Park, and Chaffee counties, Colorado (Nowlan, Gary A.)
- pegmatite*: Pegmatite cavities in the Lake George area, Colorado (Kile, Daniel E.)
- Topaz in Pikes Peak Batholith (Michalski, Thomas C.)
- petroleum*: Geology and petroleum potential, Colorado Park Basin province, north-central Colorado (Maughan, Edwin K.)
- silver ores*: Buffalo Peaks Wilderness Study Area, Colorado (Hedlund, D. C.)
- Mineralogy and geochemistry of gold-silver veins at the Hock Hocking Mine, Alma, Colorado (Raabe, Kenneth Charles)
- Paleotopography as a guide to silver-lead-zinc deposits in the Leadville Dolomite, New York Mine, Park County, Colorado (Johansing, Robert J.)
- uranium ores*: Geology and uranium geochemistry of the western margin of the Thirtynine Mile volcanic field, Park, Chaffee and Fremont counties, Colorado (Smith, Larry B.)
- Problems of using rock volume data in predictive resource studies (Howarth, Richard J.)
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- geologic hazards*: Evaluation of the flood hydrology in the Colorado Front Range using precipitation, streamflow, and paleoflood data for the Big Thompson River basin (Jarrett, Robert D.)

*waterways*: Evaluation of the flood hydrology in the Colorado Front Range using precipitation, streamflow, and paleoflood data for the Big Thompson River basin (Jarrett, Robert D.)

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- land use*: Land use and land cover and associated maps for Leadville, Colorado (U. S. Geological Survey)
- maps*: Land use and land cover and associated maps for Leadville, Colorado (U. S. Geological Survey)

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- maps*: Analytical results and sample locality map of stream sediment, heavy-mineral-concentrate, and rock samples from the Lost Creek Wilderness Area, Jefferson and Park counties, Colorado (Domenico, James A.)
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- Proterozoic*: Evolution of the early Proterozoic Colorado Province; constraints from U-Pb geochronology; with Suppl. Data 87-31 (Reed, John C., Jr., et al.)

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- gravity surveys*: Gravity survey data and a Bouguer gravity anomaly map of the Lost Creek Wilderness and vicinity, Park and Jefferson counties, Colorado (Sherrard, Mark S., et al.)
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- maps*: Aeromagnetic map of part of the Pike National Forest and vicinity, Colorado (U. S. Geological Survey)
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- The nature and characteristics of lineaments mapped from satellite and aerial imagery in an area of south-central Colorado bounded by 105°00' to 105°30' west longitude to 38°15' to 38°52'30" north latitude (Rowan, Charles David V.)
- seismic surveys*: Seismic investigation of the tectonic and stratigraphic history, eastern

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- hydrology*: Analytical results for 32 water samples from a hydrogeochemical survey of the Geneva Creek area, central Colorado (McHugh, J. B., et al.)
- Hydrogeology of the Upper Drainage, Middle Fork, South Platte River, Park County, Colorado (Butler, Robert)

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- miscellaneous minerals*: Classic Colorado minerals; a portfolio (Muntyan, Barbara L.)
- sulfosalts*: Growth zoning in tetrahedrite-tennantite from the Hock Hocking Mine, Alma, Colorado (Raabe, Kenneth C.)

### Park County—paleontology

- Mammalia*: Middle Pleistocene arvicoline rodents and environmental change at 2900-meters elevation, Porcupine Cave, South Park, Colorado (Barnosky, Anthony D.)
- The carnivores of Porcupine Cave, Park County, Colorado (Anderson, Elaine)
- Reptilia*: Osteology and systematic affinities of the horned alligator *Ceratosuchus* (Reptilia, Crocodylia) (Bartels, William S.)

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- igneous rocks*: Felsic rocks of the central Thirtynine Mile volcanic field (Johnson, David A.)
- The geology of Cover Mountain, Colorado (Rothwarf, Miriam T.)
- The origin of the Dicks Creek Trachyandesite in the Guffey volcanic center, Colorado; a stratigraphic, petrographic, and geochemical study (Keating, Gordon N.)
- The petrology and geochemistry of Castle and McIntyre mountains, Guffey, Colorado (Eide, Elizabeth A.)
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- volcanism*: Petrologic and geochemical studies of the mid-Tertiary Guffey volcanic center, Thirtynine Mile volcanic field, central Colorado (Wobus, Reinhard A.)
- The geology of the Guffey volcanic center, north of Guffey, Park County, Colorado (Venzke, Edward A.)
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- maps*: Soil survey of Golden area, Colorado, parts of Denver, Douglas, Jefferson, and Park counties (Price, Alan B.)

### Park County—stratigraphy

- Oligocene*: The stratigraphy, petrography, and chemistry of the Saddle Mountain area, Thirtynine Mile volcanic field, central Colorado (Sultze, Kimberly)

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- tectonics*: Air-photo lineament analysis; east-central Front Range, Colorado (Steele, S. G.)

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#### Park Creek Rhyodacite

Geochemistry and evolution of post-collapse lavas, Platoro-Summitville caldera complex, Southeast San Juan Mountains, Colorado (Ferguson, K. M., et al.)

#### Parkman Sandstone

- Discovery of Upper Cretaceous "Parkman Sandstone" production, Denver Basin, Colorado (Guion, Douglas J., et al.)
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- Greeley Field reveals Parkman promise (Nelms, Ralph L.)

#### Parting Member

- Dynamic analysis of quartzites from the Sawatch and Parting formations, White River Uplift, Northwest Colorado (Dula, William F., Jr.)
- Lower Paleozoic of Northwest Colorado; a summary (Ross, Reuben J., Jr.)
- Stratigraphy and sedimentology of Devonian and Mississippian strata flanking the Homestake shear zone, northeastern Sawatch Uplift, Eagle County, Colorado (Smith, Patricia Gould)

#### Paterson Toscanite

In search of the base of the Kiaman Superchiron in western North America (Magnis, G. J.)

**patterned ground** *see under* periglacial features *under* glacial geology

#### Pawnee Creek Formation

A new cuckoo and a chachalaca from the early Miocene of Colorado (Martin, Larry D.)

**peat** *see under* economic geology

*see under* dates *under* absolute age  
*see under* geochemistry *under* copper; molybdenum; nickel; uranium; zinc  
*see under* organic residues *under* sediments

#### Peerless Formation

- Early and late Paleozoic remagnetization of the Cambrian Peerless Formation, Colorado (Peck, C., et al.)
- Early and late Paleozoic remagnetization of the Upper Cambrian Peerless Formation, central Colorado (Dubois, Robert L., et al.)
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- Paleomagnetic dating of hematite authigenesis, Upper Cambrian Peerless Formation, Colorado (Peck, Craig J., et al.)
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*see under* dates *under* absolute age  
*see under* economic geology *under* Chaffee County; Douglas County; El Paso County; Fremont County; Gunnison County; Jefferson County; Larimer County; Park County; symposia; Teller County  
*see under* geochemistry *under* rare earths; yttrium  
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**Pelecypoda** *see* Bivalvia

**Pennsylvanian** *see* Carboniferous

*see under* stratigraphy *under* Cheyenne County; Custer County; Delta County; Dolores County; Eagle County; El Paso County; Fremont County; Garfield County; Gunnison County; Huerfano County; La Plata County; Lake County; Mesa County; Moffat County; Montezuma County; Pitkin County; Rio Blanco County; Routt County; Saguache County; San Juan County; Teller County; United States; Western U.S.

**peridotites** *see under* igneous rocks

**periglacial features** *see under* glacial geology

**permafrost** *see under* engineering geology  
*see under* periglacial features *under* glacial geology

**Permian** *see under* stratigraphy *under* Custer County; Delta County; Eagle County; El Paso County; Fremont County; Garfield County; Gunnison County; Huerfano County; Jefferson County; Lake County; Mesa County; Pitkin County; Rio Blanco County; Saguache County; Western U.S.

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Gold in the Chinle Formation of Utah, Colorado, Arizona and New Mexico (Heylman, Edgar B.)

**petroleum** *see under* economic geology; isotopes *see* oil and gas fields

*see under* economic geology *under* Adams County; Alamosa County; Arapahoe County; Archuleta County; Bent County; Boulder County; Cheyenne County; Clear Creek County; Conejos County; Custer County; data processing; Dolores County; Eagle County; Garfield County; Gilpin County; Grand County; Hinsdale County; Huerfano County; Jackson County; Jefferson County; Kiowa County; Kit Carson County; La Plata County; Larimer County; Las Animas County; Lincoln County; Logan County; Mineral County; Moffat County; Montezuma County; Morgan County; North America; Otero County; Park County; Phillips County; Prowers County; Pueblo County; Rio Blanco County; Rio Grande County; Rocky Mountains; Saguache County; San Juan County; Sedgwick County; Southwestern U.S.; Summit County; United States; Washington County; Weld County; Western U.S.; Yuma County  
*see under* geochemistry *under* sulfur  
*see under* hydrocarbons *under* organic materials

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*economics*: Estimating potential for small fields in mature petroleum province (Davis, John C.)

*geochemical methods*: Use of T max as a maturation index in petroleum exploration (Espitalie, J.)

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*simulation*: High temperature simulation of petroleum formation; I, The pyrolysis of Green River Shale (Evans, R. J.)

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*ground water*: Physical chemistry of reservoir fluids (Billo, Saleh M.)

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— The composition and role of the fluid in migmatites: a fluid inclusion study of the Front Range rocks (Olsen, S. N.)

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- A statistical study of phenocryst orientation fabrics in a dacite ignimbrite (Varga, Robert J.)
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- Andesitic volcanics of Table Mountain, central San Juan Mountains, Colorado (Williams, Thomas J., et al.)
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- Coexisting garnet and spinel in upper mantle xenoliths from Colorado-Wyoming kimberlites (Kirkley, M. B., et al.)
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- Limited magma mixing in a basalt-rhyolite complex Handkerchief Mesa; San Juan Mountains, Colorado (Thompson, Ren S.)
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- The Carpenter Ridge Tuff; the development of chemical and thermal gradients through magma mixing in a periodically replenished magma chamber (Whitney, James A., et al.)
- Time-dependent basalt crust interactions in the RGR and the role of assimilation/fractional crystallization (AFC) in the origin of calc-alkaline magmas in a rift setting (Dungan, M. A., et al.)
- maps:* Geology of dikes in part of the Spanish Peaks dike system, south-central Colorado (Smith, Richard P.)
- metamorphic rocks:* A diamond-graphite eclogite from the Sloan 2 Kimberlite, Colorado, USA (McCandless, Tom E.)
- A quantitative approach to local mass balance in migmatites (Olsen, S. N.)
- Dynamic analysis of quartzites from the Sawatch and Parting formations, White River Uplift, Northwest Colorado (Dula, William F., Jr.)
- Early Proterozoic metasediments from north-central Colorado: metamorphism, provenance, and tectonic setting: discussion and reply (Ingersoll, Raymond V., et al.)
- Fluid inclusions in migmatites (Touret, J.)
- Geochemistry and origin of Proterozoic amphibolites from Salida, Colorado (Boardman, Shelby J.)
- Isocon analysis of migmatites, Front Range, Colorado (Grant, James A.)



- Lithologic units of a Proterozoic metasedimentary/metavolcanic package in the Colorado Front Range (Finoli, Lisa Rae)
  - Mass-balance and mass-transfer in migmatites from the Colorado Front Range (Olsen, S. N.)
  - Migmatitic amphibolite; a newly-defined isograd in the northern Colorado Front Range (Shaver, Kenneth C.)
  - Phase equilibria and spatial extent of chemical equilibration of migmatite rocks from Colorado, U.S.A., and Venezuela (Urbani P., Franco)
  - Proterozoic metasediments near Lester Mountain, northern Park Range, Colorado (White, Christine A.)
  - Tectonic setting and petrogenesis of early Proterozoic amphibolites from west-central Colorado (Knoper, Michael W.)
  - The Irving Formation and the Proterozoic sequence in the Needle Mountains, southwestern Colorado (Ellingson, Jack A., et al.)
  - metamorphism*: A crustal source for a mafic alkalic suite from the Colorado mineral belt, with evidence for regional metasomatism (Musselman, Thomas E.)
  - Contact metamorphism of metapelites in the Front Range, Colorado; a study of disequilibrium reactions (Cameron, Donald Eugene)
  - Cyclic development of hydrothermal mineral assemblages related to multiple intrusions at the Henderson porphyry molybdenum deposit, Colorado (Seedorff, Eric)
  - Evidence for two stages of Precambrian metamorphism in the Salida area, central Colorado (Boardman, Shelby J.)
  - Metamorphism, deformation, and geothermometry of Proterozoic rocks along South Hardscrabble Creek, Wet Mountains, Colorado (Noblett, Jeffrey B.)
  - Middle Proterozoic metamorphism; central Front Range, Colorado (Swayze, Gregg A.)
  - Provenance and metamorphism of early Proterozoic rocks of the central Front Range, Colorado (Gable, Dolores J.)
  - Shock-metamorphic minerals at the Cretaceous-Tertiary boundary, Raton Basin, Colorado and New Mexico provide evidence for asteroid impact in continental crust (Izett, G. A.)
  - The composition and role of the fluid in migmatization of the Front Range rocks; a fluid inclusion study (Olsen, Sakiko N.)
  - The effect of thermal metamorphism on quartz shape; Fourier-series analysis (Murray, David H., Jr.)
  - metasomatism*: Carbonate-rich alteration assemblages in porphyry around manto-type orebodies in central Colorado, and their exploration significance (Beaty, David W.)
  - Goyazite in kaolinitic altered volcanic ash beds of Cretaceous age near Denver, Colorado (Triplehorn, Don M.)
  - Infinite variations on a fenite theme (Heinrich, E. William)
  - Kimberlite-transported nodules from Colorado-Wyoming: enrichment of shallow lithosphere by metasomatism (Eggler, David H., et al.)
  - Low temperature alteration of the Midcontinental Proterozoic basement of North America (Wenner, David B.)
  - Metasomatism and partial melting in the Front Range migmatites (Olsen, Sakiko N.)
  - Potash metasomatism in the La Plata Mountains, Colorado (Schultz, Leonard Gene)
  - The kinetics of smectite → illite reaction in contact metamorphic shales (Pytte, A. M.)
  - Wallrock alteration at the Bulldog Mountain Mine, Creede, Colorado (Vergo, Norma)
  - Zoned minerals in peridotite nodules; clues to mantle dynamics (Smith, D., et al.)
  - phase equilibria*: Contrasting volatile behavior in the Bishop and Fish Canyon tuffs; the applications of apatite solid solutions (Tacker, R. Chris)
  - volcanism*: A krakatoan-type caldera at Bonanza, San Juan volcanic field, Colorado (Varga, Robert J.)
  - Characterizing thermal energy and mass transport in volcanic caldera complexes; the role of scientific drilling (Hermance, John F.)
  - Estimates of flow direction for calc-alkaline welded tuffs from anisotropy of magnetic susceptibility data (Ellwood, Brooks B.)
  - Meteoric hydrothermal circulation along the Trapdoor Ring Fault system of the Bonanza Caldera, N.E. San Juan volcanic field, Colorado (Smith, Brian M.)
  - Miocene hydrovolcanism in NW Colorado, USA, fuelled by explosive mixing of basic magma and wet unconsolidated sediment (Leat, P. T.)
  - Quaternary volcanism in northwestern Colorado; implications for the roles of asthenosphere and lithosphere in the genesis of continental basalts (Leat, P. T., et al.)
  - Temporal evolution of the Platoro-Summitville Caldera Complex, SE San Juan volcanic field (Dungan, Michael A., et al.)
  - volcanology*: The Grizzly Peak Cauldron, Colorado; structure and petrology of a deeply dissected resurgent ash-flow caldera (Fridrich, Christopher John)
  - The Lake City Caldera, western San Juan Mountains, Colorado (Hon, Ken, et al.)
  - Trapdoor collapse of a conejos-age summit caldera at Bonanza, Colorado (Varga, Robert J.)
- Phanerozoic** *see* Cambrian; Carboniferous; Cenozoic; Cretaceous; Devonian; Eocene; Holocene; Jurassic; Mesozoic; Miocene; Mississippian; Neogene; Oligocene; Ordovician; Paleocene; Paleogene; Paleozoic; Pennsylvanian; Permian; Pleistocene; Pliocene; Quaternary; Tertiary; Triassic  
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- Phanerozoic—paleontology**  
*ichnofossils*: Development and evaluation of a trace fossil model for the reconstruction of paleo-oxygenation in marine environments (Savrdá, Charles Edward)
- phase equilibria** *see under* petrology
- phase equilibria—experimental studies**  
*oil shale*: Mineral reactions for two Colorado oil shale samples; a comparison (Thompson, Lorinda G.)
- phase equilibria—igneous rocks**  
 $CaAl_2Si_2O_8-NaAlSi_3O_8-KAlSi_3O_8-SiO_2-H_2O$ : Mineralogy, petrology, and magmatic conditions from the Fish Canyon Tuff, central San Juan volcanic field, Colorado (Whitney, James A.)
- chemical fractionation*: Phase equilibria and spatial extent of chemical equilibration of magnetite rocks from Colorado, U.S.A., and Venezuela (Urbani, Franco)  
*P-T conditions*: Proterozoic anorogenic two-mica granites; Silver Plume and St. Vrain batholiths of Colorado (Anderson, J. Lawford)
- phase equilibria—inclusions**  
*xenoliths*: Garnet + spinel xenoliths from Colorado-Wyoming kimberlites reflect Precambrian tectonic events (Kirkley, M.)
- phase equilibria—interpretation**  
*spent shale*: Petrology of spent shale; a review (Wilderman, Thomas R.)
- phase equilibria—lead ores**  
*solid solution*: Multiple coexisting phases of galena and associated sulfosalts from the southern Toquima Range, Nevada and the Idarado Mine, Ouray, Colorado (Foord, Eugene E., et al.)
- phase equilibria—magmas**  
*P-T conditions*: Fugacities of sulfurous gases in pyrrhotite-bearing silicic magmas (Whitney, James A.)
- phase equilibria—metamorphic rocks**  
*granulites*: Lower crustal xenoliths from Colorado-Wyoming state line kimberlites (Bradley, S. D.)  
*migmatites*: Phase equilibria and spatial extent of chemical equilibration of migmatite rocks from Colorado, U.S.A., and Venezuela (Urbani P., Franco)  
*migmatization*: Mass balance in migmatites (Olsen, Sakiko N.)
- phase equilibria—metasedimentary rocks**  
*P-T conditions*: Metamorphic petrology of the Northeast Front Range, Colorado; the Pingree Park area (Nesse, William D.)
- phase equilibria—pyroclastics**  
*tuff*: Experimentally determined conditions in the Fish Canyon Tuff, Colorado, magma chamber (Johnson, Marie C.)
- phase equilibria—sheet silicates, chlorite group**  
*theoretical studies*: A six-component chlorite solid solution model and the conditions of chlorite formation in hydrothermal and geothermal systems (Walshe, John L.)
- phase equilibria—sheet silicates, mica group**  
*experimental studies*: Determination of relative HCl and HF activities in hydrothermal systems from biotite analyses (Munoz, J. L.)
- phase equilibria—sulfates**  
*alunite*: An experimental and field evaluation of the oxonium alunite-potassium alunite solid-solution series as a potential geothermometer (Benoit, Paul Harland)
- Phillips County—areal geology**  
*maps*: Historic trail maps of the Sterling 1' by 2' Quadrangle, northeastern Colorado (Scott, Glenn R.)
- Phillips County—economic geology**  
*fuel resources*: Relation of hydrocarbon type to maturity of organic matter in Upper Cretaceous chalks, eastern Denver Basin (Rice, Dudley D.)  
*petroleum*: Core porosity, permeability, and vitrinite reflectance data from the Lower

Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)

#### Phillips County—geochemistry

*organic materials:* Relation of hydrocarbon type to maturity of organic matter in Upper Cretaceous chalks, eastern Denver Basin (Rice, Dudley D.)

#### Phillips County—hydrogeology

*ground water:* Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)

— Water-level records for the northern High Plains of Colorado, 1970-86 (Reed, Raymond L.)

*maps:* Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)

— Potential well yields from the Ogallala Aquifer in the northern High Plains of Colorado (Lindner-Lunsford, Juli B.)

#### Phoenix Park Quartz Latite

Structure of the Bachelor Caldera, Creede, CO (Sawyer, D. A.)

#### phosphates *see under* minerals

#### Phosphoria Formation

Cyclic sedimentation in the Permo-Triassic Goose Egg Formation, southeastern Wyoming (Greer, Phillip L.)

— Epilogue for the Permian in the western Cordillera; a retrospective view from the Triassic (Paull, Rachel K.)

— Rangely Field summary; 2, Seismic profile, structural cross section, and geochemical comparisons (Stone, Donald S.)

#### phosphorus—geochemistry

*soils:* Biogeochemistry of C, N, and P in a soil catena of the shortgrass steppe (Schimel, D., et al.)

— Soil test phosphorus and solubility relationships in Calcareous soils (Havlin, J. L.)

*surface water:* Uncertainty in phosphorus retention, Williams Fork Reservoir, Colorado (LaBaugh, James W.)

#### physical geography *see* geomorphology

#### Pictured Cliffs Sandstone

A geologic analysis of the Fruitland Formation coal and coal-bed methane resources of the San Juan Basin, southwestern Colorado and northwestern New Mexico (Kelso, Bruce S.)

— Biostratigraphy of Fruitland, Kirtland, and Animas formations (Cretaceous and Paleocene), northern San Juan Basin, Colorado (Newman, Karl R.)

— Coal resources and coal-bed geometry, Fruitland Formation, Southern Ute Indian Reservation, Archuleta and La Plata counties, Colorado (Sandberg, Dorothy T.)

— Coal-bed methane and tight gas sands interrelationships (Righthire, Craig T.)

— Coalbed methane resource evaluation from wireline logs in the northeastern San Juan Basin; a case study (Mullen, M. J.)

— Commercial natural gas from Fruitland Coals, San Juan Basin, New Mexico and Colorado (Aitken, Robert R.)

— Comparison of natural gases produced from Upper Cretaceous Fruitland Formation coal beds and adjacent reservoirs, San Juan Basin,

New Mexico and Colorado (Rice, Dudley D.)

— Cretaceous and lower Tertiary coals as sources for gas accumulations in the Rocky Mountain area (Meissner, Fred F.)

— First day, road log from Durango, Colorado around northwest rim of San Juan Basin via Cedar Hill, Aztec and La Plata, New Mexico and Soda Springs, Marvel, and Breen, Colorado (Fassett, James E.)

— Geologic evaluation of critical production parameters for coalbed methane resources (Ayers, Walter B., Jr.)

— Geometry and depositional environment of Fruitland Formation coal beds, San Juan Basin, New Mexico and Colorado; anatomy of a giant coal-bed methane deposit (Fassett, James E.)

— Geometry and depositional environments of Fruitland Formation coalbeds, San Juan Basin, New Mexico and Colorado; anatomy of a giant coal-bed methane deposit (Fassett, J. E.)

— GRI geologic and economic appraisal of coalbed methane in the San Juan Basin (Kelso, B. S., et al.)

— Identification and importance of coal bed gas, San Juan Basin, southwestern Colorado and northwestern New Mexico (Rice, Dudley D., et al.)

— Identification and significance of coal-bed gas, San Juan Basin, northwestern New Mexico and southwestern Colorado (Rice, Dudley D., et al.)

— Isopach map of interval between top of the Pictured Cliffs Sandstone and the Huerfano Bentonite Bed of the Lewis Shale, La Plata County, Colorado, and Rio Arriba and San Juan counties, New Mexico (Sandberg, D. T.)

— Joint patterns on the northwest side of the San Juan Basin, (Southern Ute Indian Reservation), Southwest Colorado (Condon, Steven M.)

— Preliminary basin analysis of Pictured Cliffs to Ojo Alamo sequence in western and southern San Juan Basin, New Mexico (Hunt, Adrian)

— Second day, road log from Durango, Colorado around northeast rim of San Juan Basin via Bayfield, Chimney Rock, Arboles, Allison, and Ignacio, Colorado and back to Durango (Fassett, James E.)

— Significance of the rate of deposition of uppermost Upper Cretaceous rocks of the San Juan Basin, New Mexico and Colorado (Fassett, James E.)

— Stratigraphic framework of Upper Cretaceous (Campanian) coal in western Colorado (Newman, Karl R.)

— Stratigraphy & palynology of the Upper Lewis Shale, Pictured Cliffs Sandstone, & Lower Fruitland Formation (Upper Cretaceous) near Durango, CO (Manfrino, Carrie)

— Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

— Stratigraphy and palynology of the upper Lewis Shale, Pictured Cliffs Sandstone and lower Fruitland Formation (Upper Cretaceous) near Durango, Colorado (Manfrino, Carrie)

— Stratigraphy and palynology of the upper Lewis Shale, Pictured Cliffs Sandstone, and lower Fruitland Formation (Upper Cretaceous) near Durango, Colorado (Manfrino, Carrie)

— The ages of the continental, Upper Cretaceous, Fruitland Formation and Kirtland Shale based on a projection of ammonite zones from the Lewis Shale, San Juan Basin, New Mexico and Colorado (Fassett, James E.)

— The Ignacio Blanco gas field, northern San Juan Basin, Colorado (Harr, Clarence L.)

— The non-transferability of a Cretaceous coal model in the San Juan Basin of New Mexico and Colorado (Fassett, James E.)

— Well-log determination of ash content in Fruitland Formation coals, Southern Ute Indian Reservation, southwestern Colorado (Prensky, Stephen E.)

#### Pierre Shale

A comparison and analysis of seismic land source energy relationships and radiation patterns (Janak, Peter M.)

— Albitization in the Upper Cretaceous Terry Sandstone, Denver Basin, Colorado (Pittman, Edward D.)

— Application of a Holocene model to the depositional environment of the Tepee Zone of the Pierre Shale, Pueblo County, Colorado (Petta, Timothy Joseph)

— Character and origin of natural gases from Wattenberg area, Denver Basin, Colorado (Rice, Dudley D.)

— Colorado Geological Survey involvement in SSC siting and characterization (Rogers, W. P.)

— Comparison and analysis of downgoing waveforms from land seismic sources (Sixta, David P.)

— Comparison of organic matter in concretions and adjacent shale; possible means to study migration processes (Pratt, L. M., et al.)

— Delineating Pierre Formation fracture reservoirs using compressional and horizontal shear wave seismic data near Florence, Fremont County, Colorado (Gable, Douglas M.)

— Depositional environment of the Kremmling Sandstone Member, Pierre Shale, Middle Park, Colorado (Wiedemeier, Todd H.)

— Depositional history of the Terry and Hygiene sandstone members, Cheyenne Basin (Patton, Jean J.)

— Design and monitoring considerations for a hazardous waste management facility near Byers, Colorado (Heath, Regan A.)

— Diagenesis in the Terry Sandstone Member of the Pierre Shale, Denver Basin, Colorado (Hays, Phillip D.)

— Diagenesis of Terry Sandstone (Upper Cretaceous), Spindle Field, Colorado (Pittman, Edward D.)

— Diagenetic facies of the Sharon Springs Member of the Pierre Shale (Cretaceous), Denver Basin (Gautier, Donald L.)

— Discovery of Upper Cretaceous "Parkman Sandstone" production, Denver Basin, Colorado (Guion, Douglas J., et al.)

— Discovery of Upper Cretaceous Parkman Sandstone production in Colorado (Hutson, L. Roger)

— Downhole simulation cell shows unexpected effects of shale hydration on borehole wall (Simpson, J. P., et al.)

— Exploration intensity map of the Upper Cretaceous Pierre Shale, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)

- Famous mineral localities; Breckenridge, Colorado (Raines, Ed)
  - Field guide and discussions of coal deposits, depositional environments and the Cretaceous-Tertiary boundary, southern Raton Basin (field trip 3) (Pillmore, Charles L.)
  - Field guide to the continental Cretaceous-Tertiary boundary in the Raton Basin, Colorado and New Mexico (Pillmore, C. L., et al.)
  - Frontal thrust structure, south-central Colorado (Ovellette, R. G.)
  - Gamma ray spectral evaluation techniques identify fractured shale reservoirs and source-rock characteristics (Fertl, Walter H.)
  - Gamma-ray spectrometry of the Sharon Springs Member of the Pierre Shale near Canon City, Colorado (Zelt, F. B.)
  - Geochemical evidence for Paleozoic oil in Lower Cretaceous O Sandstone, northern Denver Basin (Clayton, J. L.)
  - Geochemical results of leaching shale at ambient temperature and 100°C (Johnson, Kathryn O.)
  - Geologic and biostratigraphic map of the Pierre Shale in the Colorado Springs-Pueblo area, Colorado (Scott, Glenn R.)
  - Geologic road log from Denver Federal Center to Marshall, Colorado; a visit to the Boulder-Weld coal field and some considerations of burning, subsiding coal mines (Herring, James R.)
  - Geologic, biostratigraphic, and structure map of the Pierre Shale between Loveland and Round Butte, Colorado (Scott, G. R.)
  - Geological and hydrogeological investigation for a hazardous waste management facility near Byers, Colorado (Brazie, Mike E.)
  - Geology of Boulder, Colorado, United States of America (Bilodeau, Sally W., et al.)
  - Interpretation of early diagenesis in ancient marine sediments (Gautier, Donald L.)
  - Investigation of the Rampart Range Fault at the Air Force Academy Trench Site, Colorado Springs, Colorado (Dickson, Peter A.)
  - Late Cretaceous (Campanian-Maastrichtian) diatoms from the Pierre Shale, Wyoming, Colorado and Kansas (Bergstresser, Thomas J.)
  - Marine-shelf bar sand/channelized sand shingled couplet, Terry Sandstone Member of Pierre Shale, Denver Basin, Colorado (Siemers, C. T.)
  - Measured anisotropy in Pierre Shale (White, J. E., et al.)
  - Mixed-layered illite-smectite in a contact-metamorphic environment (Reynolds, R. C.)
  - Mountain front thrust, southeastern Front Range and northeastern Wet Mountains, Colorado (Jacob, Arthur F.)
  - Natural gamma-ray spectrometry, lithofacies, and depositional environments of selected Upper Cretaceous marine mudrocks, Western United States, including Tropic Shale and Tununk Member of Mancos Shale (Zelt, Frederick Bruce)
  - Origin and source-rock potential of the Sharon Springs Member of the Pierre Shale, Colorado and Kansas (Gautier, Donald L., et al.)
  - Potential for artificial recharge of the northern High Plains of Colorado (Warner, James W., et al.)
  - Potential selenium problems in Great Plains soils (Boon, David Y.)
  - Preliminary data report conducted for the Colorado State Geological Survey on the Superconducting, Supercollider study (Collins, Donley S.)
  - Radiolaria from the Upper Cretaceous Pierre Shale, Colorado, Kansas, Wyoming (Bergstresser, Thomas J.)
  - Raton Basin, New Mexico; exploration frontier for fracture reservoirs in Cretaceous shales (Woodward, Lee A.)
  - Regional variation of vitrinite reflectance of the Pierre Shale (Upper Cretaceous) in mountain basins and along the eastern Rocky Mountain front, Colorado (Bostick, Neely H.)
  - Section of Pierre Shale measured in the Florence and Canon City quadrangles, Colorado (Gill, J. R., et al.)
  - Sedimentology of the Rocky Ridge Sandstone (Upper Cretaceous), Cheyenne Basin, Colorado (Vendetti, Michael J.)
  - Sedimentology of Upper Cretaceous and Tertiary siliciclastics and coals in the Raton Basin, New Mexico and Colorado (Flores, Romeo M.)
  - Seismic profile; North Park Basin (Lange, J. K.)
  - Shallow marine depositional environments in the Upper Cretaceous of northern Colorado (Kiteley, Louise W.)
  - Shallow oil fields of the Denver Basin, Colorado and Nebraska, U.S.A. (deChadenedes, J. F.)
  - Shallow shelf deposits in the Upper Cretaceous Pierre Shale of the northern Denver Basin and their relation to hydrocarbon accumulation (Kiteley, L. W.)
  - Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado (Pillmore, Charles L.)
  - Stratigraphy of the Trinidad Sandstone and Vermejo Formation (Upper Cretaceous), Canon City coal field, Fremont County, Colorado (Gaffke, Thresa M.)
  - Stratigraphy of the upper Pierre Shale, Fox Hills Sandstone, and lower Laramie Formation (Upper Cretaceous), Leyden Gulch area, Jefferson County, Jefferson County, Colorado (Camacho, Ricardo)
  - Structure of the Raton Basin from a regional seismic line (Applegate, James K.)
  - Temperature effects on kerogen and on molecular and isotopic composition of organic matter in Pierre Shale near an igneous dike (Clayton, J. L.)
  - The Garden of the Gods and basal Phanerozoic nonconformity in and near Colorado Springs, Colorado (Noblett, Jeffrey B., et al.)
  - The kinetics of smectite → illite reaction in contact metamorphic shales (Pytte, A. M.)
  - The onset of the Laramide Orogeny (Bryant, Bruce)
  - The Upper Cretaceous ammonite *Rhaeboceras Meek* in the Western Interior of the United States (Cobban, William A.)
  - Thermal maturity and hydrocarbon source-rock potential of the Eagle Basin, northwestern Colorado (Nuccio, Vito F.)
  - Thrust faulting; east flank Sangre de Cristo Mountains, Stonewall area, Colorado (Ericson, Eric K.)
  - Trioctahedral smectite as a thermal alteration product in contact metamorphosed shale from southwestern Colorado (Vergo, Norma)
  - Turbidite fans in Upper Cretaceous Pierre Shale, Eagle Basin, Colorado; a new reservoir facies (Krystinik, Lee F.)
  - Undrilled shallow giant trap in Denver Basin, Colorado; mountain-front thrust (Jacob, Arthur F.)
  - VSP interval velocities from travelttime inversion (Stewart, R. R.)
  - Wattenberg Field, Denver Basin, Colorado (Weimer, Robert J., et al.)
  - Wattenberg Field, Denver Basin, Colorado (Weimer, Robert J., et al.)
- pigments** *see under* organic materials
- Pikes Peak Batholith**  
 Chemical fractionation and evolution of the South Platte pegmatite suite, Jefferson County, Colorado (Simmons, W. B., et al.)  
 — Field trip; Colorado amazonite (Voynick, Steve)  
 — Geochemistry and evolution of the South Platte granite-pegmatite system, Jefferson County, Colorado (Simmons, W. B., et al.)  
 — Granite-tectonics of Pikes Peak composite batholith, Colorado (Hutchinson, Robert M.)  
 — Granite-tectonics of Pikes Peak intrusive center of Pikes Peak composite batholith and road log up Pikes Peak toll road (Hutchinson, Robert M.)  
 — Granite-tectonics of the Pikes Peak intrusive center of Pikes Peak composite batholith, Colorado (Hutchinson, Robert M.)  
 — Rare-earth-element zonation in the Pikes Peak Batholith (Simmons, William B., et al.)  
 — Recognition of tin-bearing granites by multivariate statistical analysis, Pikes Peak Batholith, Colorado (Erwin, Leslie Eugene)  
 — The distribution and chemistry of rare-earth minerals in the South Platte pegmatite district, Colorado, and their genetic implications (Brewster, Renee Harrison)  
 — Transect of northern part of Pikes Peak Batholith (Hutchinson, Robert M.)
- Pikes Peak Granite**  
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 — Field guide and road log to the Lake George intrusive center, Pikes Peak Batholith (Field Trip #1, Sunday, June 1) (Wobus, R. A.)  
 — Geology of the Steer Creek area northeast of Salida, Colorado (Thayer, James Bliss)  
 — Granite-tectonics of Pikes Peak composite batholith (Hutchinson, R. M.)  
 — Petrogenetic studies and precise age determinations using the K-Ca geochronometer (Marshall, Brian D.)  
 — Relationship between alteration and strength in South Table Mountain Lavas and Pikes Peak Granite, Jefferson County, Colorado (Borges, Cesar O.)  
 — The Florissant Fossil Beds National Monument, Teller County, Colorado (Hutchinson, Robert M.)  
 — The Garden of the Gods and basal Phanerozoic nonconformity in and near Colorado Springs, Colorado (Noblett, Jeffrey B., et al.)  
 — The Pikes Peak Batholith and associated plutons, Colorado (Wobus, Reinhard A.)

- Topaz in Pikes Peak Batholith (Michalski, Thomas C.)
- Pine Butte Member**  
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- Pine Gulch coal bed**  
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- Pinedale Till**  
Low-energy seismic survey of Quaternary materials, Rocky Mountain National Park, Colorado (Locke, William W.)
- Piney Creek Alluvium**  
Reinterpretation of Holocene alluvial chronology in major valleys of the northern Colorado piedmont (Madole, Richard F.)
- Pinkerton Trail Formation**  
Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)
- pipes** *see under* intrusions
- Pisces** *see fish*  
*see under* paleontology
- Pisces—Chondrichthyes**  
*Pennsylvanian*: Pennsylvanian predators: a preliminary report on some Carboniferous shark remains from Colorado (Lockley, Martin G.)
- Pisces—faunal studies**  
*Eocene*: Paleontology of the Green River Formation, with a review of the fish fauna; second edition (Grande, Lance)  
*Holocene*: Cranial osteology, functional morphology, systematics and paleoenvironment of *Limnoscelis paludis* Williston (Fracasso, Michael Anthony)
- Pisces—occurrence**  
*Tertiary*: Collecting fossils (Jones, Bob)
- Pisces—Osteichthyes**  
*Triassic*: A Triassic freshwater coelacanth from Colorado (Raines, T.)
- Pitkin County—areal geology**  
*Aspen region*: The geologic story of the Aspen region; mines, glaciers and rocks (Bryant, Bruce)  
*guidebook*: New interpretations of Northwest Colorado geology; road log (Pruss, Edward F.)  
*maps*: Geologic map and cross sections of the Carbondale 30' by 60' Quadrangle, west-central Colorado (Ellis, M. S.)  
— Geologic map of the Holy Cross Quadrangle, Eagle, Lake, Pitkin, and Summit counties, Colorado (Tweto, Ogden)  
— Geologic map of the Holy Cross Wilderness, Eagle, Pitkin, and Lake counties, Colorado (Wallace, A. R., et al.)  
— Reconnaissance geologic map of the Mount Elbert 15-minute Quadrangle, Lake Chaffee, and Pitkin counties, Colorado (Tweto, Ogden)  
*regional*: New interpretations of Northwest Colorado geology (Stone, Donald S.)
- The geology around the junction of the Roaring Fork and Frying Pan rivers, Eagle and Pitkin counties, Colorado (Hodgden, H. Jerry)  
*Thomasville-Woods Lake*: Geology of the Thomasville-Woods Lake area, Eagle and Pitkin counties, Colorado (Mackey, Ian H.)
- Pitkin County—economic geology**  
*barite deposits*: The origin of the Aspen District, Colorado, based on geochemistry and petrology of the Smuggler Mine manto ores (Stegen, Ralph J., et al.)  
*bibliography*: Leadville 1' by 2' Quadrangle, Colorado; a pre-assessment (Wallace, Alan R., et al.)  
*coal*: Cross sections showing correlation of coal beds and coal zones in the Mesaverde Formation in the Carbondale 30' by 60' Quadrangle, west-central Colorado (Ellis, Margaret S., et al.)  
— First annual report: evaluation of coking-coal deposits in Colorado (Jones, David C.)  
— Geology and coal deposits, Ragged-Chair Mountain area, Pitkin and Gunnison counties, Colorado (Hanks, Ted L.)  
— Maroon Bells-Snowmass Wilderness and additions, Colorado (Freeman, Val L.)  
— Petrography and programmed pyrolysis of coal and natural coke intruded by an igneous dike coal basin, Pitkin County, Colorado (Bostick, Neely H.)  
— Preliminary thermal-maturity map of the Cameo and Fairfield or equivalent coal zone in the Piceance Creek basin, Colorado (Nuccio, V. F.)  
*fuel resources*: Seismic interpretation in the Piceance Basin, Northwest Colorado (Wächter, Noel B.)  
— Summary of vitrinite reflectance and Rock-Eval pyrolysis data, Eagle Basin, northwestern Colorado (Nuccio, Vito F., et al.)  
— The Eagle Basin: a new exploration frontier (Dodge, Constance Nuss)  
— Thermal maturity and hydrocarbon source-rock potential of the Eagle Basin, northwestern Colorado (Nuccio, Vito F.)  
*gold ores*: Hunter-Fryingpan Wilderness and Porphyry Mountain Wilderness Study Area, Colorado (Ludington, Steve)  
*lead-zinc deposits*: Central Colorado karst-controlled lead-zinc-silver deposits (Leadville, Gilman, Aspen, and others); a late Paleozoic mississippi valley-type district (De Voto, R. H.)  
*maps*: Mineral investigation of the Eagle Mountain Wilderness Study Area, Pitkin County, Colorado (Kluender, Steven E.)  
— Mineral resource potential maps of the Maroon Bells-Snowmass Wilderness and additions, Gunnison and Pitkin counties, Colorado (Freeman, V. L., et al.)  
— Mineral resources of the Collegiate Peaks Wilderness, Chaffee, Gunnison, Lake, and Pitkin counties, Colorado (Baskin, G. David)  
— Mineral resources of the Holy Cross Wilderness Area, Eagle, Pitkin, and Lake counties, Colorado (Wallace, Alan R., et al.)  
— Mineral resources of the Holy Cross Wilderness, Eagle, Lake, and Pitkin counties, Colorado (Lundby, William)  
— Preliminary thermal-maturity map of the Cameo and Fairfield or equivalent coal zone in the Piceance Creek basin, Colorado (Nuccio, V. F.)
- metal ores*: Central Colorado karst-controlled lead-zinc-silver deposits (Leadville, Gilman, Aspen, and others); a late Paleozoic mississippi valley-type district (De Voto, R. H.)  
— Maroon Bells-Snowmass Wilderness and additions, Colorado (Freeman, Val L.)  
*mineral resources*: Analytical results and sample locality map of stream-sediment, soil, heavy-mineral-concentrate, and rock samples from the Maroon Bells-Snowmass Wilderness, Gunnison and Pitkin counties, Colorado (McHugh, J. B., et al.)  
— Geology and mineralization of the Paradise Pass area, Pitkin County, Colorado (Pillmore, Kathryn A.)  
— Hunter-Fryingpan Wilderness and Porphyry Mountain Wilderness Study Area, Colorado (Ludington, Steve)  
— Leadville 1' by 2' Quadrangle, Colorado; a pre-assessment (Wallace, Alan R., et al.)  
— Maroon Bells-Snowmass Wilderness and additions, Colorado (Freeman, Val L.)  
— Mineral investigation of the Eagle Mountain Wilderness Study Area, Pitkin County, Colorado (Kluender, Steven E.)  
— Mineral resource potential maps of the Maroon Bells-Snowmass Wilderness and additions, Gunnison and Pitkin counties, Colorado (Freeman, V. L., et al.)  
— Mineral resources of the Collegiate Peaks Wilderness, Chaffee, Gunnison, Lake, and Pitkin counties, Colorado (Baskin, G. David)  
— Mineral resources of the Eagle Mountain Wilderness Study Area, Pitkin County, Colorado (Soulliere, Sandra J., et al.)  
— Mineral resources of the Holy Cross Wilderness Area, Eagle, Pitkin, and Lake counties, Colorado (Wallace, Alan R., et al.)  
— Mineral resources of the Holy Cross Wilderness, Eagle, Lake, and Pitkin counties, Colorado (Lundby, William)
- molybdenum ores*: Trace metal geochemistry and hydrothermal alteration of three molybdenum-bearing stocks, Gunnison and Pitkin counties, Colorado (Perkins, R. A.)
- natural gas*: A geologic assessment of natural gas from coal seams in the Piceance Basin, Colorado; topical report (September 1985 - September 1986) (McFall, K. S., et al.)  
— Geology and overview of coalbed methane resources and activity in the Piceance Creek basin, Colorado (Larsen, Veryl E.)  
— Petrography, mineralogy, and reservoir characteristics of the Upper Cretaceous Mesaverde Group in the east-central Piceance Basin, Colorado (Pitman, Janet K., et al.)  
— Southern Piceance Basin model: Cozzette, Corcoran and Rollins sandstones (Brown, Charles A., et al.)  
— Variations in vitrinite reflectance values for the Upper Cretaceous Mesaverde Formation, southeastern Piceance Basin, northwestern Colorado; implications for burial history and potential hydrocarbon generation (Nuccio, Vito F.)
- silver ores*: Central Colorado karst-controlled lead-zinc-silver deposits (Leadville, Gilman, Aspen, and others); a late Paleozoic mississippi valley-type district (De Voto, R. H.)

## Pitkin County—environmental geology

- Hunter-Fryingpan Wilderness and Porphyry Mountain Wilderness Study Area, Colorado (Ludington, Steve)

## Pitkin County—environmental geology

- geologic hazards:* Landslides near Aspen, Colorado (Harden, Carol Patricia)
- impact statements:* Glenwood Springs resource management plan (U. S. Bureau of Land Management, Grand Junction District Office)
- land use:* Land use and land cover and associated maps for Leadville, Colorado (U. S. Geological Survey)
- maps:* Glenwood Springs resource management plan (U. S. Bureau of Land Management, Grand Junction District Office)
- Land use and land cover and associated maps for Leadville, Colorado (U. S. Geological Survey)
- pollution:* Use of a portable X-ray analyzer and geostatistical methods to detect and evaluate hazardous metals in mine/mill tailings (Mernitz, Scott, et al.)

## Pitkin County—geochemistry

- maps:* Analytical results and sample locality map of stream-sediment, soil, heavy-mineral-concentrate, and rock samples from the Maroon Bells-Snowmass Wilderness, Gunnison and Pitkin counties, Colorado (McHugh, J. B., et al.)
- Mineral resources of the Holy Cross Wilderness, Eagle, Lake, and Pitkin counties, Colorado (Lundby, William)

## Pitkin County—geochronology

- Proterozoic:* Evolution of the early Proterozoic Colorado Province; constraints from U-Pb geochronology; with Suppl. Data 87-31 (Reed, John C., Jr., et al.)

## Pitkin County—geophysical surveys

- magnetic surveys:* Aeromagnetic map of Mt. Massive and vicinity, Colorado (Godson, R. H., et al.)
- Aeromagnetic map of the Holy Cross Wilderness Area, Eagle, Lake, and Pitkin counties, Colorado (Campbell, D. L.)
- maps:* Aeromagnetic map of Mt. Massive and vicinity, Colorado (Godson, R. H., et al.)
- Aeromagnetic map of the Holy Cross Wilderness Area, Eagle, Lake, and Pitkin counties, Colorado (Campbell, D. L.)
- Gravity and aeromagnetic maps of the Maroon Bells-Snowmass Wilderness and additions, Pitkin and Gunnison counties, Colorado (Campbell, D. L.)
- seismic surveys:* Seismic and borehole evidence for important pre-Laramide faulting along the axial arch in Northwest Colorado (Stone, Donald S.)
- Seismic interpretation in the Piceance Basin, Northwest Colorado (Waechter, Noel B.)
- surveys:* Gravity and aeromagnetic maps of the Maroon Bells-Snowmass Wilderness and additions, Pitkin and Gunnison counties, Colorado (Campbell, D. L.)

## Pitkin County—hydrogeology

- ground water:* Hydrogeology of the Leadville Limestone and other Paleozoic Rocks in northwestern Colorado, with results of aquifer tests at Glenwood Springs (Geldon, Arthur L.)

- Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)

## Pitkin County—mineralogy

- nitrates:* Crystal structure of naturally occurring mercury(II) amidonitrate (Randall, C. J., et al.)

## Pitkin County—petrology

- intrusions:* Reverse zoning in the resurgent intrusions of the Grizzly Peak cauldron, Sawatch Range, Colorado (Fridrich, Christopher J.)

## Pitkin County—sedimentary petrology

- sedimentary rocks:* Evidence for multiple episodes and styles of brecciation, Smuggler Mine, Aspen, Colorado (Stegen, Ralph J., et al.)
- Significance of loessite in the Maroon Formation (Middle Pennsylvanian to Lower Permian), Eagle Basin, Northwest Colorado (Johnson, Samuel Y.)
- Variations in vitrinite reflectance values for the Upper Cretaceous Mesaverde Formation, southeastern Piceance Basin, northwestern Colorado; implications for burial history and potential hydrocarbon generation (Nuccio, Vito F.)

## Pitkin County—seismology

- earthquakes:* The Carbondale, Colorado, earthquake swarm of April-May, 1984 (Goter, Susan K., et al.)

## Pitkin County—stratigraphy

- Cretaceous:* Cross sections showing correlation of coal beds and coal zones in the Mesaverde Formation in the Carbondale 30' by 60' Quadrangle, west-central Colorado (Ellis, Margaret S., et al.)
- Structure contour map of the top of the Rollins Sandstone Member of the Mesaverde Formation and Trout Creek Sandstone Member of the Iles Formation, Piceance Creek basin, Colorado (Johnson, R. C.)
- Variations in vitrinite reflectance values for the Upper Cretaceous Mesaverde Formation, southeastern Piceance Basin, northwestern Colorado; implications for burial history and potential hydrocarbon generation (Nuccio, Vito F.)
- maps:* Structure contour map of the top of the Rollins Sandstone Member of the Mesaverde Formation and Trout Creek Sandstone Member of the Iles Formation, Piceance Creek basin, Colorado (Johnson, R. C.)

- Mississippian:* Paleomagnetism and rock magnetism of the Mississippian Leadville (carbonate) Formation and implications for the age of sub-regional dolomitization (Horton, Robert A., Jr.)

- Paleozoic:* Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado (Geldon, A. L.)

- Pennsylvanian:* Stratigraphic analysis of the Gothic Formation (Desmoinesian), Pitkin and Gunnison counties, Colorado (Levorsen, Mark K.)

- The Eagle Basin; a new exploration frontier (Dodge, Constance Nuss)

- Permian:* The Fryingpan Member of the Maroon Formation; a Lower Permian(?) basin-margin dune field in northwestern Colorado (Johnson, Samuel Y.)

- Triassic:* Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)

## Pitkin County—structural geology

- faults:* Seismic and borehole evidence for important pre-Laramide faulting along the axial arch in Northwest Colorado (Stone, Donald S.)
- tectonics:* Structural reinterpretation of Ruedi and Woody Creek quadrangles, Pitkin and Eagle counties, Colorado; a central Colorado overthrust belt (Zoerner, Frederick P.)

## placers—gold ores

- Grand County:* Mineral resources of the Black Ridge Canyons Wilderness Study Area, Mesa County, Colorado, and Grand County, Utah, and Westwater Canyon Wilderness Study Area, Grand County, Utah (Dickerson, Robert P., et al.)

- Mesa County:* Mineral resources of the Black Ridge Canyons Wilderness Study Area, Mesa County, Colorado, and Grand County, Utah, and Westwater Canyon Wilderness Study Area, Grand County, Utah (Dickerson, Robert P., et al.)

- Summit County:* Famous mineral localities; Breckenridge, Colorado (Raines, Ed)

## placers—production

- Clear Creek County:* Placer mining at Pauline Placer, Clear Creek Co., Colorado (Rom-bauer, Alfred B.)

## Plainview Sandstone Member

- Regional correlation of Dakota Group disconformities; Front Range, New Mexico to Wyoming (Mateer, Niall J.)
- The Dakota Group and the Kiowa-Skull Creek Cyclothem in the Canon City-Pueblo area, Colorado (Gustason, Edmund R.)
- The Dakota Group of northeastern New Mexico and southern Colorado (Mateer, Niall J.)

- Plantae see algae;* algal flora; angiosperm flora; angiosperms; bacteria; ferns; fungi; gymnosperms; ichnofossils; palynomorphs; problematic fossils; pteridophytes

## Plantae—fossilization

- fossil wood:* Gemstones; search for identity (Taylor, Raymond C.)
- Zeolites replacing plant fossils in the Denver Formation, Lakewood, Colorado (Modreski, Peter J., et al.)

## Plantae—occurrence

- Eocene:* Fossils from the Green River Formation, Douglas Pass area, Colorado (Dayvault, Richard)
- Holocene:* A Colorado-Wyoming border diatreme and a possible potential kimberlite indicator plant (Collins, Donna B.)
- Oligocene:* Collecting fossils (Jones, Bob)
- Florissant Fossil Beds National Monument (Anonymous)

## plants—biostratigraphy

- Cretaceous:* Cretaceous stratigraphy and paleontology in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Kues, Barry S.)
- Raton Basin magnetostratigraphy near Cretaceous-Tertiary boundary (Wolberg, Donald L., et al.)

*Oligocene*: The Florissant Fossil Beds National Monument, Teller County, Colorado (Hutchinson, Robert M.)

#### plants—paleoecology

*Holocene*: Archaeology of the Jurgens Site (Scott, Douglas D.)

*Quaternary*: Comparison of plant macrofossils in woodrat (*Neotoma* sp.) and porcupine (*Erethizon dorsatum*) middens from the western United States (Betancourt, Julio L., et al.)

**plasticity** *see under* rock mechanics

**plate tectonics** *see under* tectonophysics

*see under* tectonophysics *under* North America; Rocky Mountains; Southwestern U.S.; Western U.S.

**plate tectonics—movement**

*hot spots*: Hotspot tracks on continents and unconformities (Morgan, W. Jason)

#### Platoro Complex

Geochemical correlation of ash-flow tuffs from the Platoro volcanic complex, Southeast Colorado (Jackman, Toni Kay)

**Pleistocene** *see under* geochronology *under* Great Plains; Montezuma County

*see under* stratigraphy *under* Grand County; Great Plains; Gunnison County; Rocky Mountains; Western U.S.

**Pliocene** *see under* stratigraphy *under* Southwestern U.S.

**plutonic rocks** *see under* igneous rocks

#### plutonium—geochemistry

*soils*: Plutonium distribution in Rocky Flats soil (Little, C. A.)

— Size characteristics of plutonium particles in Rocky Flats soil (McDowell, L. M.)

#### plutonium—Isotopes

*ecology*: Ecological considerations of the behavior of plutonium in the environment (Hanson, Wayne C.)

*Pu-239*: Plutonium-239 contamination in the Denver area; reply (Poet, S. E.)

— Plutonium-239 contamination in the Denver area; discussion (Krey, Philip W.)

*Pu-240/Pu-239*: Remote plutonium contamination and total inventories from Rocky Flats; discussion (Merrill, G. L., Jr., et al.)

**plutons** *see under* intrusions

#### Point Lookout Sandstone

A preliminary interpretation of carbon and oxygen isotopic data from surface rocks, Southern Ute Indian Reservation, southwestern Colorado (Henry, Mitchell E.)

— Stratigraphic framework of Upper Cretaceous (Campanian) coal in western Colorado (Newman, Karl R.)

— Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

— The Ignacio Blanco gas field, northern San Juan Basin, Colorado (Harr, Clarence L.)

#### Polson Canyon Formation

Alteration zones related to igneous activity, Spanish Peaks area, Las Animas and Huerfano counties, Colorado (Hutchinson, Robert M.)

— Chemical interaction between major dissolved components in acidic uranium tailings

fluids and adjacent bedrock (Gerlitz, Carol Nan)

— Coal deposits in Cretaceous and Tertiary fluvial systems of the Rocky Mountain region (Flores, Romeo M.)

— Field guide and discussions of coal deposits, depositional environments and the Cretaceous-Tertiary boundary, southern Raton Basin (field trip 3) (Pillmore, Charles L.)

— Field guide to the continental Cretaceous-Tertiary boundary in the Raton Basin, Colorado and New Mexico (Pillmore, C. L., et al.)

— Geochemical interactions between acidic tailings fluid and bedrock; use of the computer model MINTEQ (Davis, Andy)

— Ground-water flow and quality near Canon City, Colorado (Hearne, Glenn A.)

— Sedimentology of Upper Cretaceous and Tertiary siliciclastics and coals in the Raton Basin, New Mexico and Colorado (Flores, Romeo M.)

— Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado (Pillmore, Charles L.)

— Tectonic control on alluvial paleoarchitecture of the Cretaceous and Tertiary Raton Basin, Colorado and New Mexico (Flores, Romeo M.)

— Tectonic framework of northeastern New Mexico and adjacent parts of Colorado, Oklahoma and Texas (Woodward, Lee A.)

— The effect of thermal metamorphism on quartz shape; Fourier-series analysis (Murray, David H., Jr.)

— The hydrogeochemical effects of past mining on the Raton Basin, Colorado (Howard, W. Brant)

**pollen** *see* palynomorphs

**pollution** *see under* engineering geology; environmental geology; ground water; isotopes *see* reclamation; waste disposal

*see under* applications *under* well-logging *see under* data processing *under* environmental geology

*see under* environmental geology *under* Adams County; Boulder County; data processing; Fremont County; Garfield County; Grand County; Great Basin; Great Plains; Jackson County; Lake County; Larimer County; Pitkin County; Rio Blanco County; Routt County; Southwestern U.S.; Summit County; symposia; United States; Weld County; Western U.S.; Yuma County *see under* radioactive waste *under* waste disposal *see under* soils

#### pollution—ground water

*abandoned wells*: Location of abandoned wells by magnetic surveys; acquisition and interpretation of aeromagnetic data for five test areas (Frischknecht, F. C., et al.)

— Location of abandoned wells by magnetic surveys; location maps and aeromagnetic contour maps (Frischknecht, F. C., et al.)

*controls*: Hydraulic gradient control for groundwater contaminant removal (Atwood, Dorothy Fisher)

#### pollution—pollutants

*radioactive isotopes*: Ecological considerations of the behavior of plutonium in the environment (Hanson, Wayne C.)

#### pollution—surface water

*acid mine drainage*: Oxygen and sulfur isotope variations in oxidation of sulfides during formation of acid mine drainage (Wheeler, Mark C.)

*transport*: The stability of rhodamine WT dye in trial studies of solute transport in an acidic and metal-rich stream (Bencala, Kenneth E., et al.)

#### pollution—waste disposal

*radioactive waste*: Geochemical interactions between acidic tailings fluid and bedrock; use of the computer model MINTEQ (Davis, Andy)

— Uranium mill tailings; radium geochemistry (Landa, Edward R.)

#### pollution—water

*transport*: Recalibration and predictive reliability of a solute-transport model of an irrigated stream-aquifer system (Person, Mark A.)

*water quality*: EPA, ASTM, and column leaching of processed oil shale; a comparative study (Sorini, S. S.)

#### polymetallic ores *see under* economic geology

*see* gold ores; paragenesis; silver ores *see under* economic geology *under* Chaffee County; Eagle County; Gilpin County; Hinsdale County; La Plata County; Mineral County; Rio Grande County; Summit County *see under* mineral deposits, genesis

#### Pony Express Limestone Member

Paleogeography and facies distribution of the Todilto Limestone and Pony Express Limestone Member of the Wanakah Formation, Colorado and New Mexico (Ridgley, Jennie L.)

#### Popo Agle Formation

Dinosaur tracksites of western Colorado and eastern Utah (Lockley, Martin G.)

— Dinosaur trackways (Lockley, Martin G.)

#### Post-Plney Creek Alluvium

Reinterpretation of Holocene alluvial chronology in major valleys of the northern Colorado piedmont (Madole, Richard F.)

#### potassium—geochemistry

*connate waters*: Geochemical techniques applied to the identification and disposal of connate coal water (Decker, A. D., et al.)

*igneous rocks*: Reconnaissance geologic mapping in north-central Colorado using multi-spectral gamma-ray data (Moll, Stanton H.)

— The concentration and transport of molybdenum in magmatic systems, experimental evidence (Tingle, Tracy N.)

*metasomatism*: Potash metasomatism in the La Plata Mountains, Colorado (Schultz, Leonard Gene)

*shale*: Gamma-ray spectrometry of marine shales in outcrop; a tool for petroleum exploration and basin analysis (Zelt, Frederick B.)

*weathering*: Dissolved mineral salts derived from Mancos Shale (Evangelou, V. P., et al.)

#### Powderhorn Granite

The carbonatite complex at Iron Hill, Powderhorn District, Gunnison County, Colorado (Armbrustmacher, Theodore J.)

— Titanium resource in Colorado equals all other US deposits (Thompson, James V.)

## Precambrian—petrology

**Precambrian** *see* Archean; Proterozoic  
*see under* stratigraphy *under* El Paso County; Grand County; Rocky Mountains; Routt County; San Juan County; United States

## Precambrian—petrology

*igneous rocks:* Fertile granites in the Archean and Apehbian fields of rare-element pegmatites; crustal environment, geochemistry and petrogenetic relationships (C#3/erny#2., P.)

**precious stones** *see* gems

## Price River Formation

Depositional control of diagenesis in tight gas sands, Corcoran and Cozette Sandstone members of Price River Formation (Upper Cretaceous), Book Cliffs of western Colorado (Palmer, Beth A.)

— Depositional systems of a tight gas-productive barrier-strandplain sequence; Corcoran and Cozette sandstones, Northwest Colorado (Finley, Robert J.)

— Geologic overview, coal deposits, and potential methane recovery from coalbeds of the Uinta Basin; Utah and Colorado (Adams, M. A.)

— Preliminary thermal-maturity map of the Cameo and Fairfield or equivalent coal zone in the Piceance Creek basin, Colorado (Nuccio, V. F.)

— Production strategies for tight gas sands; a case study of the upper Cozette blanket sand (Bezilla, M., et al.)

— Reservoir properties and gas productivity of the Corcoran and Cozette tight sandstones, Colorado (Finley, R. J.)

**Primates** *see under* Mammalia

**problematic fossils** *see under* paleontology

## problematic fossils—morphology

*ultrastructure:* Cambrian vertebrates; are they arthropods? (Thompson, Diane)

## problematic fossils—problematic microfossils

*Ordovician:* The enigmatic Middle Ordovician fossil *Archeognathus* and its relations to conodonts and vertebrates (Klapper, Gilbert)

**problematic microfossils** *see* problematic fossils

**Proboscidea** *see under* Mammalia

## Proterozoic *see* Precambrian

*see under* geochronology *under* Boulder County; Chaffee County; Clear Creek County; Custer County; Eagle County; Fremont County; Gilpin County; Grand County; Gunnison County; Jefferson County; Lake County; Larimer County; Park County; Pitkin County; Rocky Mountains; Saguache County; Southwestern U.S.; Summit County; Teller County; United States

*see under* stratigraphy *under* Chaffee County; Gunnison County; Hinsdale County; La Plata County; Saguache County; San Juan County

## Proterozoic—economic geology

*uranium ores:* Uraniferous Proterozoic marginal marine sediments; precursors to major uranium deposits in metamorphic rocks (Nash, J. Thomas)

## Prowers County—economic geology

*fuel resources:* Aeromagnetic mapping of basement faults; relationship to potential & actual oil-bearing structures in southeastern Colorado and adjacent areas (Hiserodt, Edwin K.)

*natural gas:* Oil and gas plays of the Las Animas Arch, southeastern Colorado (Merewether, E. A.)

*petroleum:* Oil and gas plays of the Las Animas Arch, southeastern Colorado (Merewether, E. A.)

## Prowers County—geophysical surveys

*magnetic surveys:* Aeromagnetic mapping of basement faults; relationship to potential & actual oil-bearing structures in southeastern Colorado and adjacent areas (Hiserodt, Edwin K.)

## Prowers County—hydrogeology

*ground water:* Water-level records for the northern High Plains of Colorado, 1970-86 (Reed, Raymond L.)

*hydrology:* Assessment of long-term salinity changes in an irrigated stream-aquifer system (Konikow, Leonard F.)

— Calibration and use of an interactive-accounting model to simulate dissolved solids, streamflow, and water-supply operations in the Arkansas River basin, Colorado (Burns, Alan W.)

— Geohydrology of Baca and southern Prowers counties, southeastern Colorado (Hershey, L. A.)

— Quality of the Arkansas River and irrigation-return flows in the lower Arkansas River valley, Colorado (Cain, Doug)

*maps:* Geology, altitude, and depth of the bedrock surface; altitude of the water table in 1980; and saturated thickness of the Ogallala Aquifer in 1980 in the southern High Plains of Colorado (Borman, R. G., et al.)

— Relations of specific conductance to streamflow and selected water-quality characteristics of the Arkansas River basin, Colorado (Cain, Doug)

## Prowers County—stratigraphy

*Cretaceous:* *Texigryphaea* in the Glencairn Formation near Two Buttes, Colorado, with notes on an assemblage of *Texigryphaea* from the Kiowa Formation of southern Kansas (Kues, Barry S.)

**pteridophytes** *see* ferns

## pteridophytes—Lycopsidea

*Pennsylvanian:* *Lycospora* from Pennsylvanian-age *Lepidostrobus* compressions of Euramerica (Willard, Debra A.)

— Stigmarian petrifications from the Pennsylvanian of Colorado (Jennings, James R.)

**Pterosauria** *see under* Reptilia

## Pueblo County—areal geology

*Beulah:* Geology of the Beulah area, Colorado (Franks, Paul C.)

*Beulah Colorado:* Geology of the Beulah area, Pueblo County, Colorado (Schwarzbach, Theodore Jeremiah)

*maps:* Geologic map of the Trinidad Quadrangle, south-central Colorado (Johnson, R. B.)

*Rye Quadrangle:* Geology of the Rye Quadrangle, Pueblo and Huerfano counties, Colorado (McGuire, Emily)

## Pueblo County—economic geology

*ceramic materials:* Fire clay deposits of eastern Fremont, western Pueblo and adjacent counties, Colorado (Waage, K. M.)

*fuel resources:* Stratigraphy of upper Morrison and lower Dakota Group of Front Range, Colorado: new play in central Denver Basin? (Wyatt, Danny J.)

*maps:* Problems of using rock volume data in predictive resource studies (Howarth, Richard J.)

*mineral resources:* Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

— Greenhorn Mountain Wilderness Study Area, Colorado (Toth, Margo Irene)

— Mineral resource potential of the Greenhorn Mountain Wilderness Study Area, Huerfano and Pueblo counties, Colorado (Toth, M. L., et al.)

*petroleum:* High resolution stratigraphy and interpretation of the depositional environments of the Greenhorn Cyclothem regression (Turonian; Cretaceous), Colorado Front Range (Glenister, Linda Marie)

*tungsten ores:* Greenhorn Mountain Wilderness Study Area, Colorado (Toth, Margo Irene)

*uranium ores:* Problems of using rock volume data in predictive resource studies (Howarth, Richard J.)

*water resources:* Water-resources appraisal of the upper Arkansas River basin from Leadville to Pueblo, Colorado (Crouch, Thomas M., et al.)

## Pueblo County—engineering geology

*waterways:* Pilot study for collection of bridge-scour data (Jarrett, Robert D.)

## Pueblo County—environmental geology

*land use:* Land use and land cover and associated maps for Pueblo, Colorado (U. S. Geological Survey)

*maps:* Land use and land cover and associated maps for Pueblo, Colorado (U. S. Geological Survey)

## Pueblo County—geochemistry

*maps:* Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

*trace elements:* A reconnaissance water-quality appraisal of the Fountain Creek alluvial aquifer between Colorado Springs and Pueblo, Colorado, including trace elements and organic constituents (Cain, Doug)

## Pueblo County—hydrogeology

*ground water:* Groundwater flow patterns in the Dakota Group Aquifer in an area near Pueblo, Colorado (Banta, Edward R.)

— The Dakota Aquifer near Pueblo, Colorado; faults and flow patterns (Banta, Edward R.)

*hydrology:* Assessment of long-term salinity changes in an irrigated stream-aquifer system (Konikow, Leonard F.)

— Calibration and use of an interactive-accounting model to simulate dissolved solids, streamflow, and water-supply operations in the Arkansas River basin, Colorado (Burns, Alan W.)

— Methods to determine transit losses for return flows of transmountain water in Fountain

Creek between Colorado Springs and the Arkansas River, Colorado (Kuhn, Gerhard)

— Quality of the Arkansas River and irrigation-return flows in the lower Arkansas River valley, Colorado (Cain, Doug)

— Selected hydrologic data for Fountain Creek and Monument Creek basins, east-central Colorado (Kuhn, Gerhard)

*maps*: Relations of specific conductance to streamflow and selected water-quality characteristics of the Arkansas River basin, Colorado (Cain, Doug)

#### **Pueblo County—paleontology**

*faunal studies*: A faunal study of the Harding Sandstone in the Canon City Embayment, Colorado (Pollack, Jerome Marvin)

#### **Pueblo County—sedimentary petrology**

*sedimentary rocks*: A petrologic study of some Jurassic (?) sediments located at North Creek, Custer and Pueblo counties, Colorado (Metz, Jerry P.)

*sedimentary structures*: Effects of climate, tectonics, and sea-level changes on rhythmic bedding patterns in the Niobrara Formation (Upper Cretaceous), U.S. Western Interior (Laferriere, Alan P., et al.)

*sedimentation*: The depositional environments of the Entrada Sandstone (Jurassic) from Beulah, Pueblo County, Colorado, to the Cimarron River canyon, Union County, New Mexico (Williams, Jack Edward)

#### **Pueblo County—stratigraphy**

*Cretaceous*: A field guide to the stratigraphy, geochemistry, and depositional environments of the Kiowa-Skull Creek, Greenhorn, and Niobrara marine cycles in the Pueblo-Canon City area, Colorado (Kauffman, Erle G., et al.)

— Ammonites in clasts of the Juana Lopez Member of the Carlile Shale (Upper Cretaceous) near Pueblo, Colorado (Cobban, William A.)

— Codell and Juana Lopez in south-central Colorado (McLane, Michael)

— Geologic and biostratigraphic map of the Pierre Shale in the Colorado Springs-Pueblo area, Colorado (Scott, Glenn R.)

— High resolution stratigraphy and interpretation of the depositional environments of the Greenhorn Cyclothem regression (Turonian; Cretaceous), Colorado Front Range (Glenister, Linda Marie)

— Iridium abundance maxima in the upper Cenomanian extinction interval (Orth, C. J., et al.)

— Oxygen-deficient biofacies of the Western Interior seaway; evidence from the Hartland Shale Member of the Greenhorn Formation (Sageman, B. B.)

— Stratigraphy of the Codell Sandstone and Juana Lopez members of the Carlile Formation (Upper Cretaceous), El Paso and Fremont counties, Colorado (Aulia, Karsani)

— Stratigraphy of the upper Carlile Shale and lower Niobrara Formation (Upper Cretaceous), Fremont and Pueblo counties, Colorado (Pinel, Mark J.)

*guidebook*: A field guide to the stratigraphy, geochemistry, and depositional environments of the Kiowa-Skull Creek, Greenhorn, and Niobrara marine cycles in the Pueblo-Canon

City area, Colorado (Kauffman, Erle G., et al.)

*Holocene*: Application of a Holocene model to the depositional environment of the Tepee Zone of the Pierre Shale, Pueblo County, Colorado (Petta, Timothy Joseph)

*Jurassic*: Stratigraphy of upper Morrison and lower Dakota Group of Front Range, Colorado; new play in central Denver Basin? (Wyatt, Danny J.)

*maps*: Geologic and biostratigraphic map of the Pierre Shale in the Colorado Springs-Pueblo area, Colorado (Scott, Glenn R.)

*Mesozoic*: Stratigraphy of upper Morrison and lower Dakota Group of Front Range, Colorado; new play in central Denver Basin? (Wyatt, Danny J.)

#### **Purgatoire Formation**

An ammonoid fauna from the Glencairn Shale Member of the Lower Cretaceous Purgatoire Formation, Baca County, Colorado (Cobban, William A.)

— Biogeographic influences on Early Cretaceous paleocommunities, Western Interior (Scott, R. W.)

— Black Mesa mining district (Lucas, Spencer G.)

— Geomorphological and geoarcheological investigations at the U.S. Army Fort Carson-Pinon Canyon maneuver site, Las Animas County, Colorado (Schuldenrein, Joseph)

— Investigation of the Rampart Range Fault at the Air Force Academy Trench Site, Colorado Springs, Colorado (Dickson, Peter A.)

— The Dakota Aquifer near Pueblo, Colorado; faults and flow patterns (Banta, Edward R.)

— The Garden of the Gods and basal Phanerozoic nonconformity in and near Colorado Springs, Colorado (Noble, Jeffrey B., et al.)

— The Triassic System in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Lucas, Spencer G., et al.)

#### **Puye Formation**

Volcaniclastic alluvial fan sedimentation, northern Rio Grande Rift (McPherson, John G., et al.)

*pyrite* *see under* minerals *under* weathering *see under* sulfides *under* minerals

*pyrite ores* *see under* economic geology *under* Grand County

*pyroclastics* *see under* igneous rocks

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*quartz* *see under* framework silicates, silica minerals *under* crystal growth; crystal structure; minerals

*see under* geologic thermometry *under* fluid inclusions

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*quartzites* *see under* metamorphic rocks

*Quaternary* *see under* geochronology *see* Holocene; Pleistocene *see under* stratigraphy

#### **Quaternary—stratigraphy**

*archaeology*: Contemporary archaeomagnetic results and the accuracy of archaeomagnetic dates (Eighmy, Jeffrey L.)

#### **Quetta Granite**

The concentration and transport of molybdenum in magmatic systems, experimental evidence (Tingle, Tracy N.)

*quicksilver* *see* mercury

## R

#### **Ra Jadero Member**

Cyclical ash-flow tuff volcanism, Platoro-Summitville caldera complex, Southeast San Juan volcanic field, south-central Colorado (Dungan, M. A.)

— Magnetostratigraphy of the Treasure Mountain Tuff, Platoro-Summitville caldera complex, San Juan volcanic field, Colorado (Brown, Laurie L.)

— Oligocene volcanic rocks in the La Veta Pass area, northern Sangre De Cristo Mountains, south-central Colorado (Kearney, Barbara Cowles)

*racemization* *see under* geochronology

*radar methods* *see under* electromagnetic logging *under* well-logging

#### **Radichal Kimberlite**

Exploration for diamonds in Wyoming and Colorado (Hausel, W. Dan)

*radioactive dating* *see* absolute age

*radioactivity* *see under* geochemistry; well-logging

*see under* geochemistry *under* Larimer County *see under* heat sources *under* heat flow *see under* properties *under* minerals

*radioactivity methods* *see under* geophysical methods

*see under* geophysical methods *under* mineral exploration

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*radiocarbon dating* *see* absolute age

*Radiolaria* *see under* paleontology

#### **Radiolaria—faunal studies**

*Cretaceous*: Radiolaria from the Upper Cretaceous Pierre Shale, Colorado, Kansas, Wyoming (Bergstresser, Thomas J.)

#### **radiolarians—biostratigraphy**

*Cretaceous*: Anoxic events, a comparison of Cretaceous regimes (Fischer, Alfred G., et al.)

— Quantified assemblage zones; a case study in nearshore facies from the Lower Cretaceous of the Western United States (Metzger, Ellen P.)

#### **radium—geochemistry**

*tailings*: Uranium mill tailings; radium geochemistry (Landa, Edward R.)

#### **radium—isotopes**

*Ra-226*: Excess unsupported  $^{210}\text{Pb}$  in lake sediment from Rocky Mountain lakes; a



- groundwater effect (Norton, Stephen A., et al.)
- Releases of radium and uranium into Ralston Creek and Reservoir, Colorado, from uranium mining (Yang, I. C.)
- Uptake of radium-226 by plants at inactive uranium mill sites in the southwestern USA (Marple, M. L.)
- Uranium-series nuclides in the Golden Fault, Colorado, U.S.A., dating latest fault displacement and measuring recent uptake of radionuclides by fault-zone materials (Szabo, B. J.)

radon *see under* geochemistry

## radon—geochemistry

- crust*: Seasonal and short-term variations in gas emission from the Earth (Klusman, R. W.)
- soil gas*: Environmental influences upon mercury, radon and helium concentrations in soil gases at a site near Denver, Colorado (Klusman, Ronald W.)
- soils*: Radon in earth-sheltered structures (Landa, Edward R.)
- Track etch radon ratios to soil uranium and a new uranium abundance estimate (Alter, H. Ward)
- Using geology to map and understand radon hazards in the United States (Otton, James K.)
- surface water*: Surface water hydrology considerations in predicting radon releases from water-covered areas of uranium tailings ponds (Nielson, Kirk K.)
- uranium ores*: Gaseous emanations associated with sandstone-type uranium deposits (Reimer, G. M.)

radon—*isotopes*

- Rn-222*: Analysis of groundwater and surface water supply interrelationships in the Upper Colorado River basin using natural radon-222 as a tracer (Jacoby, Gordon C., Jr., et al.)
- Colorado; the legacy of uranium mining (Hazle, Albert J.)
- Field measurements of in situ <sup>222</sup>Rn concentrations in soil based on the prompt decay of the <sup>214</sup>Bi counting rate (Stieff, L. R., et al.)

## Ralston Creek Formation

- An analysis of the sedimentary geology of the Jurassic Ralston Creek Formation as it is exposed in the vicinity of Canon City, Colorado (Richardson, Jennifer Lynn)
- Lacustrine environments in the Jurassic Morrison Formation; a carbonate record in the Canon City area, Colorado (Sweet, Rebecca G.)
- Middle Jurassic age of the fish-bearing horizon in the Cañon City Embayment, Colorado (Schultze, Hans-Peter)
- Paleoenvironmental analysis of the Ralston Creek Formation within the Canon City Embayment, Canon City, Colorado (Carter, Michael Howard)
- Paleozoic-Mesozoic section: Red Rocks Park, I-70 road cut, and Rooney Road, Morrison area, Jefferson County, Colorado (Weimer, Robert J.)
- The Jurassic Ralston Formation in the southern Colorado Front Range (Cramer, John A., Jr.)

- The record of an evaporating lake system in the lower part of the Jurassic Ralston Creek Formation, Colorado (Donovan, R. Nowell)

rare earth deposits *see under* mineral deposits, genesis

- see under* economic geology *under* Custer County; Fremont County; Jefferson County; North America; Routt County; Teller County

rare earths *see* cerium; europium; lanthanum; neodymium; samarium; ytterbium; yttrium

## rare earths—analysis

- chemical analysis*: Radioactive minerals in pegmatites of Colorado and New Mexico (Modreski, Peter J.)

## rare earths—geochemistry

- amphibolites*: Tectonic setting and petrogenesis of early Proterozoic amphibolites from west-central Colorado (Knoper, Michael W.)
- basalts*: A regional Rb/Sr isotopic and REE study of basalts from the Rio Grande Rift, N. Mex. and Colo. (Crowley, J. C.)
- carbonatites*: Spectral characteristics of carbonatites; a potential exploration tool (Kingston, M. J.)
- The carbonatite complex at Iron Hill, Powderhorn District, Gunnison County, Colorado (Armbrustmacher, Theodore J.)
- copper ores*: Petrogenesis of the A.O. porphyry copper complex in Jackson and Grand Counties, northwestern Colorado (Karimpour, M. H.)
- disseminated deposits*: Application of trace elements and isotopes for discriminating between porphyry molybdenum, copper, and tin systems and the implications for predicting the grade (Karimpour, M. H.)
- eclogite*: Trace element, isotopic and seismic velocity characteristics of eclogites and other inclusions derived from the lower crust of southern Australia and the Colorado Plateau (Arculus, R. J., et al.)
- granites*: Genetic traits of climax-type granites and molybdenum mineralization, Colorado mineral belt (Stein, Holly J.)
- Proterozoic anorogenic two-mica granites; Silver Plume and St. Vrain batholiths of Colorado (Anderson, J. Lawford)
- heavy minerals*: Characteristics of rare earth elements in the heavy minerals of the sediments in San Luis Valley, Colorado (Thomas, Robert B., et al.)
- Rare-earth element (REE) and mineralogic changes in size fractions of soils and sediment during weathering of the San Isabel Batholith, Wet Mountains, USA (Cullers, Robert L., et al.)
- igneous rocks*: A modified crustal source for the Colorado mineral belt: implications for REE buffering in CO<sub>2</sub>-rich fluids (Musselman, Thomas E.)
- Petrogenesis of the Spanish Peaks igneous complex, Colo.; major element, rare earth element, and strontium isotopic data (Arnold, B.)
- Strontium isotope and rare earth element analyses of Rio Grande Rift basalts; implications for magmagenesis in continental rifts (Crowley, Julia Coolidge)
- intrusive rocks*: Alkaline rock complexes in the Wet Mountains area, Custer and Fremont coun-

- ties, Colorado (Armbrustmacher, Theodore J.)

*metavolcanic rocks*: Early Proterozoic bimodal volcanic rocks in central Colorado, U.S.A.; Part II, Geochemistry, petrogenesis and tectonic setting (Boardman, Shelby J.)

*minette*: Silicic magmas derived by fractional crystallization from Miocene minette, Elkhead Mountains, Colorado (Leat, P. T., et al.)

*oxides*: Zinc- and Y-group-bearing senaite from St Peters Dome, and new data on senaite from Dattas, Minas Gerais, Brazil (Foord, E. E., et al.)

*pegmatite*: Electron microprobe analysis of rare-earth-element-bearing phases from the White Cloud Pegmatite, South Platte District, Jefferson County, Colorado (Wayne, David Matthew)

- Rare earth-element mineralogy of the White Cloud Pegmatite, Jefferson County, Colorado (Wayne, David Matthew)

- The distribution and chemistry of allanite and samarskite in the South Platte pegmatite district and their genetic implications (Brewster, Renee Harrison)

- The distribution and chemistry of rare-earth minerals in the South Platte pegmatite district, Colorado, and their genetic implications (Brewster, Renee Harrison)

- The South Platte pegmatite district revisited (Simmons, William B.)

*radioactive waste*: Radwaste storage in crystalline rocks; a natural analog (Brookins, Douglas G., et al.)

*ratios*: Genetic traits of climax-type granites and molybdenum mineralization, Colorado mineral belt (Stein, Holly J.)

*stream sediments*: Rare-earth element and mineralogic changes in Holocene soil and stream sediment; a case study in the Wet Mountains, Colorado, U.S.A. (Cullers, Robert L., et al.)

*trace elements*: Geochemistry and evolution of the South Platte granite-pegmatite system, Jefferson County, Colorado (Simmons, W. B., et al.)

- Petrology of flecked gneisses in the northern Wet Mountains, Fremont County, Colorado (Trumbull, Robert B.)

- Searching land and sea for the dinosaur killer (Kerr, Richard A.)

*volcanic rocks*: Compositionally-diverse Miocene-Recent rift-related magmatism in NW Colorado; partial melting, and mixing of mafic magmas from three different asthenospheric and lithospheric mantle sources (Leat, P. T., et al.)

- Rare-earth-element compositions of Cenozoic volcanic rocks in the Southern Rocky Mountains and adjacent areas (Lipman, Peter W.)

*volcaniclastics*: Stratigraphy and geochemistry of early Proterozoic bimodal volcanogenic rocks near Salida, Colorado (Boardman, S. J.)

rare gases *see* noble gases

## Rat Creek Tuff

Common-Pb isotopic characteristics of central San Juan ash flow tuffs (Matty, David J., et al.)

- Correlation of late crystal-rich tuffs from the central San Juan caldera cluster, Colorado (Sawyer, D. A., et al.)
- High-resolution  $^{40}\text{Ar}/^{39}\text{Ar}$  chronology of Oligocene volcanic rocks, San Juan Mountains, Colorado (Lanphere, Marvin A.)
- High-resolution  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology, central San Juan caldera complex, Colorado (Lanphere, Marvin A.)
- Mineralogy, petrology, and magmatic conditions from the Fish Canyon Tuff, central San Juan volcanic field, Colorado (Whitney, James A.)
- Paleomagnetism of Oligocene ash-flow tuffs, central San Juan Mountains, Colorado (Rosenbaum, J. G., et al.)

#### Raton Formation

- Chemical analyses of coal samples from the Raton Mesa region and the Canon City Field (Khalsa, Nirbho S.)
- Coal bed methane desorption data (Tremain, Carol M.)
- Coal deposits in Cretaceous and Tertiary fluvial systems of the Rocky Mountain region (Flores, Romeo M.)
- Comparative analysis of coal accumulation in Cretaceous alluvial deposits, southern United States Rocky Mountain basins (Flores, Romeo M.)
- Disruption of the terrestrial plant ecosystem at the Cretaceous-Tertiary boundary, Western Interior (Tschudy, R. H., et al.)
- Field guide and discussions of coal deposits, depositional environments and the Cretaceous-Tertiary boundary, southern Raton Basin (field trip 3) (Pillmore, Charles L.)
- Field guide to the continental Cretaceous-Tertiary boundary in the Raton Basin, Colorado and New Mexico (Pillmore, C. L., et al.)
- Fluorescent spectral types of selected Colorado bituminous coals (Pasley, Mark A.)
- Fossil *Scenedesmus* (Chlorococcales) from the Raton Formation, Colorado and New Mexico, U.S.A. (Fleming, R. Farley)
- Geologic framework of nonmarine Cretaceous-Tertiary boundary sites, Raton Basin, New Mexico and Colorado (Pillmore, C. L., et al.)
- Interpretation of vitrinite reflectance data for the Raton Basin, southern Colorado-northern New Mexico (Close, Jay C.)
- Iridium abundance anomalies at the palynological Cretaceous/Tertiary boundary in coal beds of the Raton Formation, Raton Basin, New Mexico and Colorado (Pillmore, C. L., et al.)
- Mineralogy and petrology of the Cretaceous-Tertiary boundary clay bed and adjacent clay-rich rocks, Raton Basin, New Mexico and Colorado (Pollastro, Richard M.)
- More drilling heating up Raton Basin play (McCaslin, John C.)
- Paleoenvironmental significance of fossil chlorococcalean algae from the Raton Formation, Colorado and New Mexico (Fleming, R. Farley)
- Palynology of Upper Cretaceous and lower Tertiary strata from the northern Raton Basin, south-central Colorado (Williams, Carol Alvis)
- Raton Basin magnetostratigraphy near Cretaceous-Tertiary boundary (Wolberg, Donald L., et al.)

- Sedimentology of Upper Cretaceous and Tertiary siliciclastics and coals in the Raton Basin, New Mexico and Colorado (Flores, Romeo M.)
- Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado (Pillmore, Charles L.)
- Stratigraphy of the Cretaceous-Tertiary boundary in the southern Raton Basin, New Mexico and Colorado (Pillmore, C. L., et al.)
- Structure of the Raton Basin from a regional seismic line (Applegate, James K.)
- Tectonic control on alluvial paleoarchitecture of the Cretaceous and Tertiary Raton Basin, Colorado and New Mexico (Flores, Romeo M.)
- Tectonic framework of northeastern New Mexico and adjacent parts of Colorado, Oklahoma and Texas (Woodward, Lee A.)
- The hydrogeochemical effects of past mining on the Raton Basin, Colorado (Howard, W. Brant)
- Trace element patterns at a non-marine Cretaceous-Tertiary boundary (Gillmore, J. S., et al.)

#### Rawah Batholith

- Interpretation of aeromagnetic data over the northern Front Range of Colorado (Moll, S. H.)
- Petrology and U-Th potential of the eastern portion of the Precambrian Rawah Batholith, Larimer County, Colorado (Burch, Alvin L.)

#### Rawley Andesite

- Evolution of the early Oligocene Bonanza Caldera, Northeast San Juan volcanic field, Colorado (Varga, Robert J.)
- Halogens in biotite, sericite, and apatite in relation to alteration and mineralization in the vicinity of Mount Manitou, Bonanza mining district, Saguache County, Colorado (Woodland, Alan Butler)
- K/Ar geochronology of the composite volcano and trap-door caldera at Bonanza, NE San Juan Mountains, and implications for mid-Tertiary volcanism in Colorado (Smith, Brian M.)
- Meteoric hydrothermal circulation along the Trapdoor Ring Fault system of the Bonanza Caldera, N.E. San Juan volcanic field, Colorado (Smith, Brian M.)
- Paleohydrology of the Bonanza trapdoor caldera, N.E. San Juan volcanic field, Colorado; oxygen isotopes and hydrothermal metamorphism of Rawley Andesite (Smith, Brian M., et al.)

- reclamation** *see* conservation; land use; pollution *see under* environmental geology *under* Boulder County; Mesa County; Moffat County; Routt County; United States *see under* environmental geology *see under* mining geology

#### Red Cliff Member

- Field Trip No. 6: Sedimentology, dolomitization, mineralization and karstification of the Leadville Limestone (Mississippian), central Colorado (De Voto, Richard H.)
- Stratigraphy of the Leadville Dolomite (Beaty, David W.)

#### Red Creek Quartzite

- A model for the tectonic evolution of the PC-X (?) Red Creek Quartzite, Utah and Colorado (Sears, James W., et al.)
- Basement in the Uintas: an enigma? (Ritzma, Howard R.)
- Precambrian geochronology of northern Utah (Hedge, Carl E.)
- The Uinta and Belt basins; Proterozoic rifts, Phanerozoic ramps (Sears, Jim)

#### Red Mountain Rhyolite

- I, An  $^{18}\text{O}/^{16}\text{O}$  investigation of the Lake City Caldera, San Juan Mountains, Colorado; II,  $^{18}\text{O}/^{16}\text{O}$  relationships in Tertiary ash-flow tuffs from complex caldera structures in central Nevada and San Juan Mountains, Colorado (Larson, Peter Brennan)
- Paleomagnetism and tectonic setting of the Red Mountain intrusive complex (Henderson molybdenum deposit); Clear Creek County, Colorado (Graaskamp, Garret)
- Paleomagnetism of the Red Mountain intrusive complex (Henderson molybdenum deposit), Empire, Colorado (Graaskamp, G. W., et al.)

#### Redskin Granite

- Topaz in Pikes Peak Batholith (Michalski, Thomas C.)

#### refractory materials *see* ceramic materials

- remote sensing** *see* geophysical methods *see under* cartography *under* maps *see under* classification *under* land use *see under* geophysical surveys *under* Alamosa County; Boulder County; Cheyenne County; Colorado Plateau; Costilla County; data processing; Delta County; Douglas County; Fremont County; Gilpin County; Grand County; Great Plains; Huerfano County; Jefferson County; Kit Carson County; Larimer County; Lincoln County; Mesa County; Montrose County; Park County; Rio Blanco County; Rocky Mountains; Saguache County; San Juan County; San Miguel County; Sedgwick County; Summit County; Teller County; United States; Western U.S. *see under* mineral exploration *under* mineral resources *see under* observations *under* ecology *see under* geophysical surveys *see under* mineral exploration

#### remote sensing—aerial photography

- applications*: Quantitative linear analysis in mineral exploration (Fowler, Phillip M.)

#### remote sensing—applications

- exploration*: A teledetective study of kimberlite regions in N. America, E. Africa, and Siberia (Woodzick, Thomas L.)
- fuel resources*: Delineating structural and stratigraphic traps using photogeologic-geomorphic methods (Urban, Stephanie B.)
- land use*: Wildland classification with multivariate analysis and remote sensing techniques (Radloff, David Lee)

#### remote sensing—methods

- imagery*: Characterizing spatial patterns in remotely sensed data (Woodcock, Curtis E.)
- magnetic methods*: A new variable-magnetization terrain correction method for aeromagnetic data (Grauch, V. J. S.)

*radioactivity methods*: Spectral characteristics of carbonates; a potential exploration tool (Kingston, M. J.)

**reptiles—biostratigraphy**

*Cretaceous*: Alamosaurus and the sauropod hiatus in the Cretaceous of the North American Western Interior (Lucas, Spencer G.)  
 — The Ojo Alamo Sandstone and the Cretaceous-Tertiary boundary, San Juan Basin, New Mexico and Colorado (Fassett, James E.)

**reptiles—dinosaurs**

*Cretaceous*: Searching land and sea for the dinosaur killer (Kerr, Richard A.)  
*Jurassic*: Late Jurassic dinosaur trackways from S.E. Colorado (Prince, Nancy K.)  
 — North America's largest dinosaur trackway site; implications for Morrison Formation paleoecology (Lockley, Martin G., et al.)  
 — Paleocology of the dinosaur-bearing Morrison Formation (Dodson, Peter, et al.)  
 — Reconstruction of a Late Jurassic lacustrine ecosystem (Lockley, M. G., et al.)  
 — The land of the terrible lizards (Keith, Sandra L.)  
 — The Purgatoire Valley dinosaur tracksite region, Southeast Colorado (Lockley, Martin G.)  
 — Tiny dinosaurs; are they fully grown? (Callison, George)  
*Mesozoic*: Dinosaurs near Denver (Lockley, Martin G.)  
 — In the footsteps of dinosaurs?; discussion (Farlow, James O.)  
 — The paleobiological and paleoenvironmental importance of dinosaur footprints (Lockley, Martin G.)  
 — The sedimentology of the Purgatoire tracksite region, Morrison Formation of southeastern Colorado (Prince, Nancy K.)  
*Triassic*: Dinosaur trackways from the Triassic of western Colorado (Parrish, J. Michael)

**Reptilia see under paleontology**

**Reptilia—Crocodylia**

*Eocene*: Fossil crocodylian eggs from the Eocene of Colorado (Hirsch, Karl F.)  
*Paleogene*: Osteology and systematic affinities of the horned alligator *Ceratosuchus* (Reptilia, Crocodylia) (Bartels, William S.)

**Reptilia—dinosaurs**

*collections*: The Museum of Western Colorado and its Dinosaur Valley exhibit (Prosser, Judy)  
*Cretaceous*: Cretaceous rocks of the Dinosaur Triangle (Cole, R. D.)  
 — Dinosaur footprints from the Dakota Group of eastern Colorado (Lockley, Martin G.)  
 — Remains of ancient life in Cretaceous rocks of the Dinosaur Triangle (Young, Robert G.)  
*Jurassic*: Fertile fossil field (Averett, Walter R.)  
 — Stratigraphic correlation of dinosaur quarries near Grand Junction, Colorado (Armstrong, Harley J.)  
 — Textural and mineralogical analysis of a *Stegosaurus* (Reptilia; Ornithischia) plate (Brinkman, Daniel L.)  
 — The great dinosaur discoveries, Dry Mesa, Colorado (Chenoweth, William L.)  
 — The second Jurassic dinosaur rush (McIntosh, John S.)

*Mesozoic*: Dinosaur tracksites of western Colorado and eastern Utah (Lockley, Martin G.)  
 — Dinosaur Valley; Colorado's new paleontological museum, Grand Junction, Colorado (Averett, Walter R.)  
 — Fruita; a place for wee fossils (Callison, George)  
 — Mid-Mesozoic paleontology of the Rabbit Valley area; western Colorado (Armstrong, Harley J., et al.)  
 — Paleontological significance of the Dinosaur Triangle (Armstrong, Harley J.)  
 — *Stegosaurus* named Colorado's state fossil (Sawdo, Ruth)  
 — The Riggs Hill and Dinosaur Hill sites, Mesa County, Colorado (Chenoweth, William L.)  
 — Triassic and Jurassic rocks in the Dinosaur Triangle (Young, Robert G.)  
*morphology*: Dinosaur trackways (Lockley, Martin G.)  
*Triassic*: A guide to dinosaur tracksites of the Colorado Plateau and American Southwest (Lockley, Martin)

**Reptilia—faunal studies**

*Pleistocene*: Pleistocene high altitude amphibians and reptiles from Colorado (Alamosa local fauna; Pleistocene, Irvingtonian) (Rogers, Karel L.)

**Reptilia—occurrence**

*Jurassic*: Eggshell fragments from the Jurassic Morrison Formation of Colorado (Hirsch, Karl F., et al.)

**Reptilia—Ornithischia**

*Cretaceous*: Dinosaur footprints from the Dakota Group of Colorado and implications for iguanodontid-hadrosaurid evolution (Lockley, Martin G.)  
 — Latest Cretaceous occurrence of nodosaurid ankylosaurs (Dinosauria, Ornithischia) in western North America and the gradual extinction of the dinosaurs (Carpenter, Kenneth)  
*Jurassic*: *Dryosaurus*, a hysilophodontid dinosaur from the Upper Jurassic of North America and Africa; postcranial skeleton (Galton, P. M.)

**Reptilia—Pterosauria**

*Jurassic*: Small pterosaurs and dinosaurs from the Uncompahgre fauna (Brushy Basin Member, Morrison Formation: ?Tithonian), Late Jurassic, western Colorado (Jensen, James A.)

**Reptilia—Saurischia**

*Jurassic*: A new species of sauropod dinosaur, *Haplocanthosaurus delfsi* sp. nov., from the Upper Jurassic Morrison Fm. of Colorado (McIntosh, John S.)  
 — The oldest (?) Morrison Formation dinosaur, Gunnison, Colorado (Bartleson, Bruce L.)

**Reptilia—Squamata**

*Cretaceous*: *Mosasaur* remains from the Lewis Shale (Upper Cretaceous), southwestern Colorado (Kues, Barry S.)  
*Eocene*: The fossil snake *Cheilophis huerfanoensis* Gilmore, 1938, from Eocene of Colorado; redescription and reappraisal of relationships (Rage, Jean-Claude)  
*Oligocene*: *Texasophis galbreathi*, new species, the earliest New World colubrid snake (Holman, J. Alan)

**reservoir rocks see under acoustical logging under well-logging**

*see under carbonate rocks under sedimentary rocks*  
*see under clastic rocks under sedimentary rocks*  
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*see under economic geology under data processing*  
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**reservoirs see dams**

*see under engineering geology under Garfield County; Grand County; Great Plains; Jefferson County; Mesa County; Routt County*

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**rhyodacites see under igneous rocks**

**Rhyolite Hill Group**

Felsic rocks of the central Thirtynine Mile volcanic field (Johnson, David A.)

**rhyolites see under igneous rocks**

**Richard Sandstone Member**

A new crab, *Eomunidopsis cobbani* n. sp. (Crustacea, Decapoda), from the Pierre Shale (early Maastrichtian) of Colorado (Bishop, Gale A.)  
 — The Upper Cretaceous ammonite *Rhaeboceras* Meek in the Western Interior of the United States (Cobban, William A.)

**Rico Formation**

Conditions favourable for the formation of warm-climate aeolian sand sheets (Kocurek, Gary)  
 — Discovery of the Silver Creek molybdenum deposit, Rico, Colorado (Cameron, D. E., et al.)

**Ridgway Conglomerate**

The Tertiary Ridgway and Gunnison conglomerates of southwestern Colorado (Hambrey, M. J.)

**rift zones see under molybdenum ores under mineral deposits, genesis**  
*see under systems under faults*

**ring complexes see under intrusions**

**ring silicates see under minerals**

**Rio Blanco County—areal geology**

*guidebook*: Field guide and road log; Pennsylvanian and Permian depositional systems and cycles in the Eagle Basin, northwestern Colorado (Schenk, Christopher J., et al.)  
 — New interpretations of Northwest Colorado geology; road log (Pruss, Edward F.)  
*maps*: Geologic map and coal sections of the Sawmill Mountain Quadrangle, Rio Blanco County, Colorado (Reheis, Marith Cady C.)  
 — Geologic map and coal sections of the Thornburgh Quadrangle, Moffat and Rio Blanco counties, Colorado (Reheis, Marith Cady C.)

- Geologic map index of the Meeker 1' by 1/2' Quadrangle, Garfield, Moffat, Rio Blanco, and Routt counties, Colorado (Brownfield, M. E.)
  - Geologic map of the Barcus Creek Quadrangle, Rio Blanco County, Colorado (Hail, W. J., Jr.)
  - Geologic map of the Barcus Creek SE Quadrangle, Rio Blanco County, Colorado (Hail, W. J., Jr.)
  - Geologic map of the Roan Plateau area, northwestern Colorado (Hail, W. J., Jr., et al.)
  - Preliminary geologic map of the Davis Canyon Quadrangle, Uintah County, Utah and Garfield and Rio Blanco counties, Colorado (Pantea, M. P.)
  - Preliminary geologic map of the Dragon Quadrangle, Uintah County, Utah, and Rio Blanco County, Colorado (Scott, R. W., Jr.)
  - Preliminary geologic map of the Indian Valley Quadrangle, Rio Blanco and Moffat counties, Colorado (Pipiringos, G. N.)
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**Rio Grande County—engineering geology**

*mining geology:* Summitville gold (Voynick, Steve)

*waterways:* Pilot study for collection of bridge-scour data (Jarrett, Robert D.)

**Rio Grande County—environmental geology**

*geologic hazards:* Flood plain management study; Rio Grande near Del Norte (U. S. Department of Agriculture, Soil Conservation Service)

*land use:* Land use and land cover and associated maps for Durango, Colorado (U. S. Geological Survey)

*maps:* Land use and land cover and associated maps for Durango, Colorado (U. S. Geological Survey)

**Rio Grande County—geochronology**

*Oligocene:* K-Ar geochronology of the Bonanza Caldera, NE San Juan Mountains, Colorado; the oldest known San Juan Caldera (Varga, Robert J.)

**Rio Grande County—geophysical surveys**

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*ground water:* Quality of ground water in agricultural areas of the San Luis Valley, south-central Colorado (Edelmann, Patrick)

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**Rio Grande County—mineralogy**

*miscellaneous minerals:* Classic Colorado minerals; a portfolio (Muntyan, Barbara L.)

**Rio Grande County—petrology**

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*volcanism:* The geology of Summer Coon Volcano near Del Norte, Colorado (Noblett, Jeffrey B.)

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*rivers see hydrology*

*see under fluvial features under geomorphology*

**Robinson Limestone Member**

Booth Creek rockfall hazard area (Stover, Bruce K.)

— Stratigraphic analysis of the Gothic Formation (Desmoinesian), Pitkin and Gunnison counties, Colorado (Levorsen, Mark K.)

*rock bursts see under effects under earthquakes*

*rock crystal see quartz crystal*

*rock mechanics see under engineering geology see soil mechanics; underground installations*

**rock mechanics—applications**

*blasting:* Analysis of decoupling effect on particle velocity in underground blasting (Han, Soong Soo)

*waste disposal:* Ultrasonic crosshole assessment of crystalline rock (Fry, Michael F.)

**rock mechanics—case studies**

*exploration:* Exploration strategy and technology; update and review (Sinha, Raghupati S.)

*hydraulic conductivity:* Chemical interaction between major dissolved components in acidic uranium tailings fluids and adjacent bedrock (Gerlitz, Carol Nan)

*slope stability:* The stability of discontinuously jointed rock slopes (Coffin, D. Todd)

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*hydraulic fracturing:* Determination of in situ stress from anelastic strain recovery measurements of oriented core; comparison to hydraulic fracture stress measurements in the Rollins Sandstone, Piceance Basin, Colorado (Teufel, Lawrence W.)

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— Projection of joints from surface to tunnel level; a case study (Brown, L. A.)

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— Reinforcement of large pillars by bolting (Mitchell, S. J., et al.)

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*coal seams:* Geologic characterization of a field laboratory for coalbed methane exploration and development (Wiman, Stephen K., et al.)

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*claystone:* Preliminary data report conducted for the Colorado State Geological Survey on the Superconducting, Supercollider study (Collins, Donley S.)

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- tensile strength*: Stratigraphic variations in fracture properties (Young, Chapman, et al.)
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- Front Range*: AGU, 2d annual Front Range regional meeting (Harthill, Norman)
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- regional*: Utility of Seasat SAR imagery for geologic analysis in Colorado, Wyoming, and Utah (Lundy, Gerald W.)
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  - Gravimetric evidence for thrusting and hydrocarbon potential of the east flank of the Front Range, Colorado (Bieber, David W.)
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  - Mid-Cretaceous Codell Sandstone Member of Carlile Shale, eastern Colorado (Merewether, E. A.)
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- Proterozoic*: Tectonic implications from U-Pb dating of detrital zircons from the early Proterozoic terrane of the Central Rocky Mountains (Aleinikoff, John N., et al.)
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- gravity surveys*: Geothermal studies in Wyoming, Colorado, and Montana (Heasler, H. P., et al.)
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- hydrology*: Comparative water chemistry of four lakes in Rocky Mountain National Park (Baron, Jill)
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- Cretaceous*: Clay petrology of the conformable Cretaceous/Tertiary boundary interval, Raton Basin, New Mexico and Colorado (Pollastro, Richard M., et al.)
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- Rocky Mountains—structural geology**
- faults*: Acoustic velocities, synthetic seismograms, and lithologies of thrust Precambrian rocks, Rocky Mountain foreland (Ray, R. Randy, et al.)
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- Paleogene paleotectonics and paleogeography along the Rocky Mountain corridor (USA) (Dickinson, William R.)
- Paleomagnetic assessment of basement rotation along the eastern flank of the Front Range near Boulder, Colorado (Davis, John Wesley)
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- Splinter blocks; an important aspect of block tectonics (Couples, Gary D.)
- Structural features in the Huerfano Park area, east flank, Sangre de Cristo Range, Colorado (Schavran, Gabrielle)
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— Sedimentology of the Rocky Ridge Sandstone (Upper Cretaceous), Cheyenne Basin, Colorado (Vendetti, Michael J.)

**Rodentia see under Mammalia**

**Rollins Sandstone Member**

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— Book Cliffs coal field, western Colorado (Young, Robert G.)

— Coal-bed methane and tight gas sands interrelationships (Rightmire, Craig T.)

- Determination of in situ stress from anelastic strain recovery measurements of oriented core; comparison to hydraulic fracture stress measurements in the Rollins Sandstone, Piceance Basin, Colorado (Teufel, Lawrence W.)
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- Late Cretaceous Mesaverde Group outcrops at Rifle Gap, Piceance Creek basin, northwestern Colorado (Lorenz, J. C.)
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*regional:* Colorado-Wyoming line to Steamboat Springs (Petta, Timothy J.)

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*maps*: Land use and land cover and associated maps for Durango, Colorado (U. S. Geological Survey)

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*maps*: Deformational and metamorphic history of a Precambrian terrane in Gunnison and Saguache counties, Colorado (Cummings, David O.)

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— Structural study of an area surrounding the Tertiary Biedell volcanic center, Saguache County, Colorado (Hendrix, Bill)

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— Early Eocene artiodactyls from the San Juan Basin, New Mexico and the Piceance Basin, Colorado (Krishtalka, Leonard)

— Early Tertiary paleogeography and paleotectonics of the San Juan Basin area, New Mexico and Colorado (Fassett, James E.)

— Preliminary report on potential sites suitable for relocation and/or reprocessing of the Durango uranium mill tailings pile (Colorado Geological Survey)

### San Juan County—*areal geology*

*Engineer Mountain Quadrangle*: Geology of the eastern half of the Engineer Mountain Quadrangle, San Juan and La Plata counties, Colorado (Williams, Wilbur S.)

*guidebook*: Field trip guidebook; paleotectonics; San Juan Mountains; Dolores Formation; Paleosols and depositional systems; Jurassic depositional systems; San Juan Basin; Quaternary deposits and soils; Durango area (Brew, Douglas C.)

— First day, road log from Durango, Colorado around north-west rim of San Juan Basin via Cedar Hill, Aztec and La Plata, New Mexico and Soda Springs, Marvel, and Breen, Colorado (Fassett, James E.)

*maps*: Geologic and geochemical maps of the West Needle Wilderness Study Area, San Juan and La Plata counties, Colorado (Van Loenen, R. E.)

— Geologic map of the Aztec 1' by 2' Quadrangle, northwestern New Mexico and southern Colorado (Manley, Kim, et al.)

— Geologic map of the Durango Quadrangle, southwestern Colorado (Steven, T. A., et al.)

— Geologic map of the Handies Peak Quadrangle, San Juan, Hinsdale, and Ouray counties, Colorado (Luedke, R. G.)

— Preliminary geologic map of the Hermosa Peak Quadrangle, Dolores, San Juan, La Plata, and Montezuma counties, Colorado (Pratt, W. P.)

*San Juan Mountains*: Geology of the western San Juan Mountains (Baars, Don L.)

### San Juan County—*economic geology*

*base metals*: Epithermal mineralization related to caldera development, Pride of the West Mine, San Juan Co., Colorado (Hardwick, James F.)

— Mineralization characteristics of the Scotia-Vanderbilt vein system, Silverton, Colorado (Standen, Allan Richard)

*coal*: Identification and importance of coal bed gas, San Juan Basin, southwestern Colorado and northwestern New Mexico (Rice, Dudley D., et al.)

*copper ores*: Chemical and thermal evolution of diagenetic fluids and the genesis of uranium and copper ore in and adjacent to the Paradox Basin with emphasis on the Lisbon Valley and Temple Mountain areas, Utah and Colorado (Morrison, Stan Jay)

*fuel resources*: New activity rejuvenating Paradox Basin (McCaslin, John C.)

— Seismic exploration for Pennsylvanian algal mounds of the Paradox Basin (Moriarty, Bruce J.)

— Weminuche Wilderness, Colorado (Steven, Thomas A.)

*lead-zinc deposits*: Epithermal vein and carbonate replacement mineralization related to caldera development, Cunningham Gulch, Silverton, Colorado (Hardwick, James Fredrick, Jr.)

*maps*: Geology, structure, and uranium deposits of the Moab Quadrangle, Colorado and Utah (Williams, P. L.)

— Mineral investigation of the Weminuche Wilderness Additions, Hinsdale, La Plata, Mineral, and San Juan counties, Colorado (Korzeb, Stanley L.)

— Mineral resource potential map of the West Needle Wilderness Study Area, San Juan and La Plata counties, Colorado (Van Loenen, R. E.)

*metal ores*: Episodic metallization in the western San Juan Caldera complex, Colorado (Grauch, R. I., et al.)

— Geologic map of the Handies Peak Quadrangle, San Juan, Hinsdale, and Ouray counties, Colorado (Luedke, R. G.)

— Stable isotopic composition of fluid inclusions in a porphyry-style hydrothermal system near Silverton, San Juan Mountains, Colorado (Ringrose, C. R., et al.)

— Study areas contiguous to the Uncompahgre Primitive Area, Colorado (Steven, Thomas A.)

— The Sunnyside Mine, Eureka mining district, San Juan County, Colorado (Rosemeyer, Tom)

— Uncompahgre Primitive Area, Colorado (Luedke, R. G.)

— Weminuche Wilderness, Colorado (Steven, Thomas A.)

— West Needle Wilderness Study Area, Colorado (Van Loenen, R. E.)

*mineral resources*: Geochemical data, Red Mountains mining district, San Juan Mountains, Colorado (Fisher, Frederick S.)

— Mineral investigation of the Weminuche Wilderness Additions, Hinsdale, La Plata, Mineral, and San Juan counties, Colorado (Korzeb, Stanley L.)

— Mineral resource potential map of the West Needle Wilderness Study Area, San Juan and La Plata counties, Colorado (Van Loenen, R. E.)

— Remote sensing study in support of mineral resource appraisal of wilderness study areas near Moab, Utah; Dolores River Canyon

- Wilderness Study Area, Montrose and San Miguel counties, Colorado; Lost Spring Canyon Wilderness Study Area, Grand County, Utah; Behind the Rocks Wilderness Study Area, Grand and San Juan counties, Utah; and Butler Wash Wilderness Study Area, San Juan County, Utah (Lee, Keenan)
- Study areas contiguous to the Uncompahgre Primitive Area, Colorado (Steven, Thomas A.)
- Uncompahgre Primitive Area, Colorado (Luedke, R. G.)
- Weminuche Wilderness, Colorado (Steven, Thomas A.)
- West Needle Wilderness Study Area, Colorado (Van Loenen, E.)
- natural gas*: Coalbed gas sparks drilling in San Juan Basin (Petzet, G. Alan)
- Geometry and depositional environment of Fruitland Formation coal beds, San Juan Basin, New Mexico and Colorado; anatomy of a giant coal-bed methane deposit (Fassett, James E.)
- History of gas produced from coal seams in the San Juan Basin (Dugan, Thomas A.)
- oil and gas fields*: Sentinel Peak (oil) (Nicolais, Steve M.)
- petroleum*: Petroleum geology and hydrocarbon plays of the San Juan Basin petroleum province (Huffman, A. Curtis, Jr.)
- silver ores*: Mineralization characteristics of the Scotia-Vanderbilt vein system, Silverton, Colorado (Standen, Allan Richard)
- uranium ores*: Chemical and thermal evolution of diagenetic fluids and the genesis of uranium and copper ore in and adjacent to the Paradox Basin with emphasis on the Lisbon Valley and Temple Mountain areas, Utah and Colorado (Morrison, Stan Jay)
- Geology, structure, and uranium deposits of the Moab Quadrangle, Colorado and Utah (Williams, P. L.)
- West Needle Wilderness Study Area, Colorado (Van Loenen, E.)
- San Juan County—engineering geology**
- waste disposal*: Disposal of production waters from oil and gas wells in the northern San Juan Basin, Colorado (Zimpfer, Gerald L., et al.)
- Gravity studies of the Paradox Basin (Aiken, Carlos L. V., et al.)
- Paradox Basin, Utah; hydrology (Wilson, William E.)
- San Juan County—environmental geology**
- conservation*: A vibration study of the archaeological ruins, Hovenweep National Monument, Utah-Colorado (King, Kenneth W.)
- geologic hazards*: Avalanche atlas; San Juan County, Colorado (Miller, Len, et al.)
- Avalanche release and snow characteristics, San Juan Mountains, Colorado; Final Report 1971-1975 (Armstrong, Richard L.)
- Century of struggle against snow; a history of avalanche hazard in San Juan County, Colorado (Armstrong, Betsy R.)
- Seismic signals from avalanches (Harrison, J. C.)
- impact statements*: Proposed resource management plan and environmental impact statement for the San Juan/San Miguel planning area (U. S. Bureau of Land Management, Montrose District)
- Resource Management Plan for the San Juan and Uncompahgre resource areas (U. S. Bureau of Land Management, Montrose District)
- San Juan-San Miguel Planning Area (U. S. Bureau of Land Management, Uncompahgre Resource Area)
- land use*: Land use and land cover and associated maps for Durango, Colorado (U. S. Geological Survey)
- Land use and land cover and associated maps for Moab, Utah; Colorado (U. S. Geological Survey)
- Remote sensing in cultural resource management: the San Juan Basin Project (Drager, Dwight L.)
- maps*: Land use and land cover and associated maps for Durango, Colorado (U. S. Geological Survey)
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- waste disposal*: Regional hydrology of the Blanding-Durango area, southern Paradox Basin, Utah and Colorado (Whitfield, M. S., et al.)
- San Juan County—geochemistry**
- isotopes*: An oxygen-isotope study of water-rock interaction in the granite of Cataract Gulch, western San Juan Mountains, Colorado (Larson, Peter B.)
- maps*: Geochemical data, Red Mountains mining district, San Juan Mountains, Colorado (Fisher, Frederick S.)
- trace elements*: Geochemical data from the West Needle and West Needle Contiguous Wilderness Study Areas, San Juan and La Plata counties, Colorado (Birmingham, Scott D.)
- San Juan County—geochronology**
- Tertiary*: Compilation of revised ages of volcanic units in the San Juan Mountains, Colorado; recalculated K-Ar age determinations using IUGS constants (Hon, Ken)
- San Juan County—geomorphology**
- landform description*: Summits to reach; an annotated edition of Franklin Rhoda's "Report on the topography of the San Juan Country" (Rhoda, Frankin)
- San Juan County—geophysical surveys**
- gravity surveys*: Gravity studies of the Paradox Basin (Aiken, Carlos L. V., et al.)
- Principal facts for gravity stations in the La Sal Mountains area, Grand and San Juan counties, Utah, and Mesa and Montrose counties, Colo. (Joesting, H. R.)
- Principal facts for gravity stations in the Moab-Needles area, Grand and San Juan counties, Utah; and for the Lisbon Valley area, San Juan County, Utah, and Montrose and San Miguel counties, Colo. (Joesting, H. R., et al.)
- remote sensing*: Remote sensing study in support of mineral resource appraisal of wilderness study areas near Moab, Utah; Dolores River Canyon Wilderness Study Area, Montrose and San Miguel counties, Colorado; Lost Spring Canyon Wilderness Study Area, Grand County, Utah; Behind the Rocks Wilderness Study Area, Grand and San Juan counties, Utah; and Butler Wash Wilderness Study Area, San Juan County, Utah (Lee, Keenan)
- seismic surveys*: Seismic exploration for Pennsylvanian algal mounds of the Paradox Basin (Moriarty, Bruce J.)
- San Juan County—hydrogeology**
- ground water*: Estimates of vertical hydraulic conductivity and regional ground-water flow rates in rocks of Jurassic and Cretaceous age, San Juan Basin, New Mexico and Colorado (Frenzel, Peter F.)
- Plan of study for the regional aquifer-system analysis of the San Juan structural basin, New Mexico, Colorado, Arizona, and Utah (Welder, G. E.)
- Using a geographic information system to assist in numerical analysis and to prepare cartographic products for the San Juan Basin Regional Aquifer-System Analysis, New Mexico and Colorado (Kernodle, J. M.)
- hydrology*: Adequacy of NASQAN data to describe areal and temporal variability of water quality of the San Juan River drainage basin upstream from Shiprock, New Mexico (Goetz, C. L.)
- Application of techniques to identify coal-mine and power-generation effects on surface-water quality, San Juan River basin, New Mexico and Colorado (Goetz, C. L., et al.)
- San Juan County—mineralogy**
- chain silicates*: Field trip; Rhodonite at the Gold Prince Mine (Kappele, William A.)
- miscellaneous minerals*: Classic Colorado minerals; a portfolio (Muntyan, Barbara L.)
- Mineralogy of the Bandora Mine, South Mineral Creek, San Juan County, Colorado (Jensen, Martin)
- Recent collecting activity in San Juan County, Colorado (Muntyan, Barbara L.)
- Through the 'scope; microminerals of the San Juan Mountains, southwestern Colorado (Rosemeyer, Tom)
- sheet silicates, clay minerals*: Ostwald ripening and interparticle-diffraction effects for illite crystals (Eberl, Dennis D.)
- sheet silicates, mica group*: Sericite from the Silverton Caldera, Colorado; discussion and reply (Altaner, Stephen P., et al.)
- Sericite from the Silverton Caldera, Colorado; correlation among structure, composition, origin, and particle thickness (Eberl, Dennis D., et al.)
- sorosilicates*: Near-infrared reflectance of zunyite; implications for field mapping and remote-sensing detection of hydrothermally altered high alumina rocks (Crowley, James K.)
- sulfates*: Stalking the blue stalactites (Jones, Bob)
- San Juan County—paleontology**
- Vertebrata*: Continuing study of new Jurassic/Cretaceous vertebrate faunas from Colorado and Utah (Jensen, James A.)
- San Juan County—petrology**
- igneous rocks*: Observations on the Precambrian evolution of northern New Mexico and adjacent regions (Silver, Leon T.)
- intrusions*: Chemical and mineralogical variations in the radial dikes of Difficulty Creek intrusive center, San Juan Mountains, Colorado (Foss, Ted Harry)



**San Juan County—sedimentary petrology**

*reefs*: Platy algal reef mounds, Paradox Basin (Choquette, Philip W.)

*sediments*: Quaternary alluvial deposits and soil formation, lower Animas River area, Colorado and New Mexico (Gillam, Mary L.)

**San Juan County—stratigraphy**

*Cretaceous*: Geometry and depositional environment of Fruitland Formation coal beds, San Juan Basin, New Mexico and Colorado; anatomy of a giant coal-bed methane deposit (Fassett, James E.)

— Isopach map of interval between top of the Pictured Cliffs Sandstone and the Huerfano Bentonite Bed of the Lewis Shale, La Plata County, Colorado, and Rio Arriba and San Juan counties, New Mexico (Sandberg, D. T.)

— The ages of the continental, Upper Cretaceous, Fruitland Formation and Kirtland Shale based on a projection of ammonite zones from the Lewis Shale, San Juan Basin, New Mexico and Colorado (Fassett, James E.)

*Holocene*: Higher early Holocene treeline in the San Juan Mountains, Colorado (Carrara, P. E.)

*maps*: Isopach map of interval between top of the Pictured Cliffs Sandstone and the Huerfano Bentonite Bed of the Lewis Shale, La Plata County, Colorado, and Rio Arriba and San Juan counties, New Mexico (Sandberg, D. T.)

*Paleocene*: Lithofacies relationships and depositional environment of the Tertiary Ojo Alamo Sandstone and related strata, San Juan Basin, New Mexico and Colorado (Sikkink, Pamela G. L.)

*Paleozoic*: Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)

*Pennsylvanian*: Sedimentary petrology and paleontology of part of the Hermosa Group (Pennsylvanian) between Durango and Silverton, Colorado (McDonald, David Wilson)

*Precambrian*: Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)

*Proterozoic*: Revised interpretation of the age of allochthonous rocks of the Uncompahgre Formation, Needle Mountains, Colorado (Tewksbury, B. J.)

*Quaternary*: Quaternary deposits and soils in the Durango area, southwestern Colorado (Gillam, Mary L., et al.)

— Road Log; Quaternary deposits and soils in the Durango area, southwestern Colorado (Moore, David W.)

*Tertiary*: Early Tertiary paleogeography and paleotectonics of the San Juan Basin area, New Mexico and Colorado (Fassett, James E.)

*Triassic*: Nonmarine depositional environments and Paleosol development in the Upper Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)

**San Juan County—structural geology**

*faults*: Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)

*folds*: Proterozoic cusped basement-cover structure, Needle Mountains, Colorado (Harris, C. W., et al.)

*structural analysis*: Proterozoic polydeformation in basement rocks of the Needle Mountains, Colorado (Gibson, Richard G.)

*tectonics*: Revised interpretation of the age of allochthonous rocks of the Uncompahgre Formation, Needle Mountains, Colorado (Tewksbury, B. J.)

**San Juan Formation**

Anatase on quartz from Ouray County, Colorado (Rosemeyer, Tom, et al.)

— Epithermal vein and carbonate replacement mineralization in Cunningham Gulch, Silverton, Colorado (Hardwick, James F.)

— Epithermal vein and carbonate replacement mineralization related to caldera development, Cunningham Gulch, Silverton, Colorado (Hardwick, James Fredrick, Jr.)

— Hydrothermal alteration and oil show at the Summer Coon intrusive center, Saguache County, Colorado (Loken, Trygve)

— Seismic imaging of the Creede epithermal system; a feasibility study (Mayrand, I. J., et al.)

— Studies of stress and deformation in the Earth's crust; I, Determining the state of stress in the Earth from earthquake focal mechanism data, II, Deformation around the Creede Caldera, San Juan volcanic field, Southwest Colorado; implications for caldera mechanics (Gephart, John Wesley)

— The geology of Summer Coon Volcano near Del Norte, Colorado (Noblett, Jeffrey B.)

— The significance of the Fisher Quartz Latite to the history of the Creede Caldera, southwestern Colorado (Ritch, Kurt D.)

**San Miguel County—areal geology**

*guidebook*: Field trip guidebook; paleotectonics; San Juan Mountains; Dolores Formation; Paleosols and depositional systems; Jurassic depositional systems; San Juan Basin; Quaternary deposits and soils; Durango area (Brew, Douglas C.)

— Road log from Trout Lake to Dunton and Rico areas, San Miguel, Dolores, and Montezuma counties, Colorado (Anonymous)

*maps*: Geologic reconnaissance map of the Log Hill Mesa area, Ouray, Montrose, and San Miguel counties, Colorado (Hail, W. J., Jr.)

— Reconnaissance geologic map of the Horsely Peak Quadrangle, Ouray, Montrose, and San Miguel counties, Colorado (Hail, W. J., Jr.)

**San Miguel County—economic geology**

*coal*: First annual report; evaluation of coking-coal deposits in Colorado (Jones, David C.)

*copper ores*: Wilson Mountains Wilderness, Colorado (Bromfield, Calvin S.)

*fuel resources*: Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Uravan to Telluride in southwestern Colorado (O'Sullivan, R. B.)

— Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)

*maps*: Geology, structure, and uranium deposits of the Moab Quadrangle, Colorado and Utah (Williams, P. L.)

— Mineral investigation of the Dolores River Canyon Wilderness Study Area (CO-030-290) and a part of the Sewemup Mesa Wilderness Study Area (CO-070-176), Mesa, Montrose, and San Miguel counties, Colorado (Martin, Clay M.)

— Mineral resources of the Dolores River Canyon Wilderness Study Area, Montrose and San Miguel counties, Colorado (Gerlitz, Carol N., et al.)

*metal ores*: Relationship of authigenic minerals to the V-U and Cu mineralization of the Salt Wash Member of the Morrison Formation, San Miguel County, Colorado (Breit, G. N.)

— Study areas contiguous to the Uncompahgre Primitive Area, Colorado (Steven, Thomas A.)

— Uncompahgre Primitive Area, Colorado (Luedke, R. G.)

— Wilson Mountains Wilderness, Colorado (Bromfield, Calvin S.)

*mineral resources*: Analytical results and sample locality maps of stream-sediment and heavy-mineral-concentrate samples from Dolores River Canyon Wilderness Study Area (CO-030-290), Montrose and San Miguel counties, Colorado (Bullock, John H., Jr., et al.)

— Geochemical data, Red Mountains mining district, San Juan Mountains, Colorado (Fisher, Frederick S.)

— Mineral investigation of the Dolores River Canyon Wilderness Study Area (CO-030-290) and a part of the Sewemup Mesa Wilderness Study Area (CO-070-176), Mesa, Montrose, and San Miguel counties, Colorado (Martin, Clay M.)

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— Study areas contiguous to the Uncompahgre Primitive Area, Colorado (Steven, Thomas A.)

— Uncompahgre Primitive Area, Colorado (Luedke, R. G.)

— Wilson Mountains Wilderness, Colorado (Bromfield, Calvin S.)

*oil and gas fields*: Hamm Canyon (gas) (Lister, James C.)

— Nicholas Wash (gas) (Belak, Ronald)

*uranium ores*: Geochemistry of the Frenchy Incline uranium deposits, San Miguel County, Colorado (Miesch, Alfred Thomas)

— Geology, structure, and uranium deposits of the Moab Quadrangle, Colorado and Utah (Williams, P. L.)

— Preliminary report on and measured sections of the Middle Jurassic Entrada Sandstone and Wanakah Formation near Placerville, southwestern Colorado (Steele, Brenda A.)

*vanadium ores*: Notes on vanadium deposits near Placerville, Colorado (Hess, F. L.)

— Preliminary report on and measured sections of the Middle Jurassic Entrada Sandstone and Wanakah Formation near Placerville, southwestern Colorado (Steele, Brenda A.)

- San Miguel County—engineering geology**  
*waste disposal:* Paradox Basin, Utah; hydrology (Wilson, William E.)
- San Miguel County—environmental geology**  
*geologic hazards:* Regional hydrology of the Dolores River basin, eastern Paradox Basin, Colorado and Utah (Weir, J. E., Jr., et al.)  
*impact statements:* Proposed resource management plan and environmental impact statement for the San Juan/San Miguel planning area (U. S. Bureau of Land Management, Montrose District)  
 — Resource Management Plan for the San Juan and Uncompahgre resource areas (U. S. Bureau of Land Management, Montrose District)  
*land use:* Land use and land cover and associated maps for Moab, Utah; Colorado (U. S. Geological Survey)  
*maps:* Land use and land cover and associated maps for Moab, Utah; Colorado (U. S. Geological Survey)  
*waste disposal:* Hydrogeologic reconnaissance of the San Miguel River basin, southwestern Colorado (Ackerman, D. J.)  
 — Regional hydrology of the Blanding-Durango area, southern Paradox Basin, Utah and Colorado (Whitfield, M. S., et al.)
- San Miguel County—geochemistry**  
*maps:* Analytical results and sample locality maps of stream-sediment and heavy-mineral-concentrate samples from Dolores River Canyon Wilderness Study Area (CO-030-290), Montrose and San Miguel counties, Colorado (Bullock, John H., Jr., et al.)  
 — Geochemical data, Red Mountains mining district, San Juan Mountains, Colorado (Fisher, Frederick S.)
- San Miguel County—geomorphology**  
*fluvial features:* A heuristic method for measurement and characterization of river meander wavelength (Sinnock, Scott)
- San Miguel County—geophysical surveys**  
*gravity surveys:* Principal facts for gravity stations in the Moab-Needles area, Grand and San Juan counties, Utah; and for the Lisbon Valley area, San Juan County, Utah, and Montrose and San Miguel counties, Colo. (Joesting, H. R., et al.)  
 — Principal facts for gravity stations in the Uravan area, Mesa, Montrose, and San Miguel counties, Colo. (Joesting, H. R.)  
*remote sensing:* Remote sensing study in support of mineral resource appraisal of wilderness study areas near Moab, Utah; Dolores River Canyon Wilderness Study Area, Montrose and San Miguel counties, Colorado; Lost Spring Canyon Wilderness Study Area, Grand County, Utah; Behind the Rocks Wilderness Study Area, Grand and San Juan counties, Utah; and Butler Wash Wilderness Study Area, San Juan County, Utah (Lee, Keenan)
- San Miguel County—hydrogeology**  
*springs:* Ground-water data from the San Miguel River basin, southwestern Colorado (Ackerman, D. J.)
- San Miguel County—mineralogy**  
*miscellaneous minerals:* Classic Colorado minerals; a portfolio (Muntyan, Barbara L.)
- Through the 'scope; microminerals of the San Juan Mountains, southwestern Colorado (Rosemeyer, Tom)
- San Miguel County—sedimentary petrology**  
*diagenesis:* Geochemical study of authigenic minerals in the Salt Wash Member of the Morrison Formation, Slick Rock District, San Miguel County, Colorado (Breit, George Nicholas)
- San Miguel County—soils**  
*Paleosols:* Calcareous Paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)
- San Miguel County—stratigraphy**  
*Cretaceous:* Palynological evaluation of Cedar Mountain and Burro Canyon formations, Colorado Plateau (Tschudy, R. H., et al.)  
*Jurassic:* Preliminary report on and measured sections of the Middle Jurassic Entrada Sandstone and Wanakah Formation near Placerville, southwestern Colorado (Steele, Brenda A.)  
 — Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Slick Rock to Uravan in southwestern Colorado (O'Sullivan, R. B.)  
 — Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Uravan to Telluride in southwestern Colorado (O'Sullivan, R. B.)  
*Mesozoic:* Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)  
*Paleozoic:* Stratigraphy and oil and gas production of Southwest Colorado (Irwin, C. Dennis)  
*Quaternary:* Quaternary deposits and soils in the Durango area, southwestern Colorado (Gillam, Mary L., et al.)  
 — Road Log; Quaternary deposits and soils in the Durango area, southwestern Colorado (Moore, David W.)  
*Triassic:* Calcareous Paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)  
 — Nonmarine depositional environments and Paleosol development in the Upper Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)
- San Rafael Group**  
 General hydrogeology of the aquifers of Mesozoic age, upper Colorado River basin; excluding the San Juan Basin: Colorado, Utah, Wyoming, and Arizona (Freethey, Geoffrey W., et al.)  
 — Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Dewey Bridge, Utah, to Uravan, Colorado (O'Sullivan, R. B.)  
 — Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Slick Rock to Uravan in southwestern Colorado (O'Sullivan, R. B.)  
 — Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Uravan to Telluride in southwestern Colorado (O'Sullivan, R. B.)  
 — The correlation of the Jurassic Bluff and Junction Creek sandstones in southeastern Utah and southwestern Colorado (Cadigan, R. A.)
- Sangre de Cristo Formation**  
 Minturn and Sangre de Cristo formations of southern Colorado; a prograding fan delta and alluvial fan sequence shed from the ancestral Rocky Mountains (Lindsey, David A., et al.)  
 — Minturn and Sangre de Cristo formations of southern Colorado; prograding fan-delta and alluvial-fan sequence shed from ancestral Rocky Mountains (Lindsey, David A., et al.)  
 — Principal reference section for the Sangre de Cristo Formation (Pennsylvanian and Permian), northern Sangre de Cristo Range, Saguache County, Colorado (Lindsey, D. A.)  
 — San Luis Uplift; fact or fiction (Baars, D. L.)  
 — Sedimentation model for the Crestone Conglomerate Member of the Sangre de Cristo Formation (Pennsylvanian-Permian), south-central Colorado (Flores, Richard J.)  
 — Sedimentology of a prograding alluvial fan sequence (Flores, Richard J.)  
 — VSP interval velocities from traveltimes inversion (Stewart, R. R.)
- Santa Fe Group**  
 A paleontological analysis of the Alamosa Formation (south-central Colorado; Pleistocene, Irvingtonian) (Rogers, Karel L.)  
 — Geology and hydrology of the Rio Grande Rift area (Wilkins, David W.)  
 — Oligocene volcanic rocks in the La Veta Pass area, northern Sangre de Cristo Mountains, south-central Colorado (Kearney, Barbara Cowles)
- Santa Rosa Sandstone**  
 Water-bearing characteristics of geologic formations in northeastern New Mexico-southeastern Colorado (Kilmer, L. Clay)
- Sapinero Mesa Tuff**  
 Epithermal mineralization related to caldera development, Pride of the West Mine, San Juan Co., Colorado (Hardwick, James F.)  
 — Epithermal vein and carbonate replacement mineralization related to caldera development, Cunningham Gulch, Silverton, Colorado (Hardwick, James Fredrick, Jr.)  
 — Geological and geochemical controls of metal precipitation in epithermal systems, western San Juans, Colorado (Kyle, J. Richard, et al.)  
 — Geology, mineralogy and paragenesis of the Pride of America Mine, Lake City, Hinsdale County, Colorado (Sanford, Richard F., et al.)  
 — Origin of Haystack Cave: an archeologic site near Gunnison, Colo. (Burns, Lary K., et al.)
- Satanka Shale**  
 The Pierce Field structure (Sonnenberg, Stephen A.)
- satellite methods** *see under* remote sensing *under* mineral exploration
- Sawatch Quartzite**  
 Dynamic analysis of quartzites from the Sawatch and Parting formations, White River Uplift, Northwest Colorado (Dula, William F., Jr.)  
 — Genetic model for the Gilman District (Colo.), based on fluid inclusion, stable isotope, geologic, and fission-track time/temperature studies (Beaty, David W., et al.)

## Schoolhouse Tongue

- Lower Paleozoic of Northwest Colorado; a summary (Ross, Reuben J., Jr.)
- Mineralogy and geochemistry of gold-silver veins at the Hock Hocking Mine, Alma, Colorado (Raabe, Kenneth Charles)
- Paleomagnetic and petrographic study of sandstone dikes and the Cambrian Sawatch Sandstone, eastern flank of the southern Front Range, Colorado (Kost, Linda Suzanne)
- Reassessment of post-Laramide uplift and tectonic history of the Front Range, Colorado (Bilodeau, William L.)
- The Garden of the Gods and basal Phanerozoic nonconformity in and near Colorado Springs, Colorado (Noblett, Jeffrey B., et al.)

**schistosity** *see under* foliation *under* structural analysis

**schists** *see under* metamorphic rocks

## Schoolhouse Tongue

- Field guide and road log; Pennsylvanian and Permian depositional systems and cycles in the Eagle Basin, northwestern Colorado (Schenk, Christopher J., et al.)
- Sedimentology of and petroleum occurrence in the Lower Permian Schoolhouse Tongue of the Weber Sandstone, Northwest Colorado (Johnson, Samuel Y., et al.)
- Stratigraphic and sedimentologic studies of late Paleozoic strata in the Eagle Basin and northern Aspen Sub-basin, Northwest Colorado (Johnson, Samuel Y.)

**sea-floor spreading** *see* plate tectonics

## Sedgwick County—areal geology

- maps:** Historic trail maps of the Sterling 1' by 2' Quadrangle, northeastern Colorado (Scott, Glenn R.)

## Sedgwick County—economic geology

- petroleum:** Core porosity, permeability, and vitrinite reflectance data from the Lower Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)
- water resources:** Conjunctive use of groundwater and surface water for irrigated agriculture; risk aversion (Bredehoeft, John D.)

## Sedgwick County—geophysical surveys

- remote sensing:** Seismic expression of structural features on Landsat lineaments; an example from Denver Basin (Shurr, George W., et al.)

## Sedgwick County—hydrogeology

- ground water:** Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)
- Water-level records for the northern High Plains of Colorado, 1970-86 (Reed, Raymond L.)
- hydrology:** A discrete kernel simulation model for conjunctive management of a stream-aquifer system (Illangasekare, Tissa H.)
- maps:** Generalized altitude and configuration of the water table in parts of Larimer, Logan, Sedgwick, and Weld counties, Colorado (Borman, R. G.)
- Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)

- Potential well yields from the Ogallala Aquifer in the northern High Plains of Colorado (Lindner-Lunsford, Juli B.)

## Sedgwick County—structural geology

- tectonics:** Seismic expression of structural features on Landsat lineaments; an example from Denver Basin (Shurr, George W., et al.)

## sedimentary petrology

- clay mineralogy:** Bentonite illitization in two contrasting cases: the Denver Basin and the southern Appalachian Basin (Elliott, William Crawford)
- Clay mineralogy of the Green River Formation (Dyini, John R.)
- Clay petrology of the conformable Cretaceous/Tertiary boundary interval, Raton Basin, New Mexico and Colorado (Pollastro, Richard M., et al.)
- Clay-mineral diagenesis within a fine-grained, marine, hydrocarbon-bearing, carbonate sequence; evidence from the Cretaceous Niobrara Formation (Pollastro, Richard M.)
- Clays and clay minerals, western Colorado and eastern and central Utah; field trip guidebook (Hall, Robert B.)
- Illitic material (sericite) from the San Juan Mountains, Colorado, U.S.A. (Srodon, Jan)
- Mineralogy and genesis of the clay minerals of the Codell Sandstone, Denver Basin, Colorado (Henninggaard, Jeffrey, et al.)
- Mixed-layered illite-smectite in a contact-metamorphic environment (Reynolds, R. C.)
- Origin of kaolinite in the Dakota Group (Cretaceous age), northern Front Range foothills, Colorado (Mozley, Peter Snow)
- Problems in interpretation of clay fabrics (Reynolds, Suzanne)
- Role of feldspar in determining the nature of authigenic minerals in burial diagenesis (Dutta, Prodip K.)
- The formation of illite at the expense of illite/smectite; mineralogical and morphological support for a hypothesis (Pollastro, Richard M.)
- Trioctahedral smectite as a thermal alteration product in contact metamorphosed shale from southwestern Colorado (Vergo, Norma)
- Whole-rock, insoluble residue, and clay mineralogies of marl, chalk, and bentonite, Smoky Hill Shale Member, Niobrara Formation near Pueblo, Colorado; depositional and diagenetic implications (Pollastro, Richard M.)
- diagenesis:** 1984 SEPM presidential address; Diagenetic albitization of potassium feldspar in arkosic sandstones (Walker, Theodore R.)
- Albitization in the Upper Cretaceous Terry Sandstone, Denver Basin, Colorado (Pitman, Edward D.)
- Calcareous paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)
- Clay-mineral relationships in some low-permeability hydrocarbon reservoirs and their use as predictive resource tools (Pollastro, Richard M.)
- Deep-burial diagenetic iron oxides and problems of cement stratigraphy; discussion of alluvial sandstone composition and paleoclimate; II. Authigenic mineralogy; discussion and reply (Bjorlykke, Knut, et al.)

- Deposition and diagenesis of Middle Pennsylvanian (Desmoinesian) phylloid algal banks, Paradox Formation, Ismay Zone, Ismay Field and San Juan Canyon, Paradox Basin, Utah and Colorado (Brinton, Lise)
- Depositional and diagenetic history of a carbonate unit within the lower member of the Honaker Trail Formation (Pennsylvanian), San Juan Mountains, Colorado (Reich, Matthew A.)
- Diagenesis in the Terry Sandstone Member of the Pierre Shale, Denver Basin, Colorado (Hays, Phillip D.)
- Diagenesis of feldspar in the Minturn Formation (Pennsylvanian) of Colorado (Childers, David W.)
- Diagenetic aspects of Morgan Formation (Pennsylvanian) shelf carbonates, northern Utah and Colorado (Driese, Steven G.)
- Diagenetic facies of the Sharon Springs Member of the Pierre Shale (Cretaceous), Denver Basin (Gautier, Donald L.)
- Dolomitization and diagenesis of the Leadville Limestone (Mississippian), central Colorado (Horton, Robert A., Jr.)
- Geologic implications of coal dewatering (Law, B. E., et al.)
- Impact of early diagenesis of eolian reservoirs, Great Sand Dunes National Monument, Colorado (Krystinik, Lee F., et al.)
- Ismay reservoirs, Paradox Basin: diagenesis and porosity development (Dawson, William C.)
- Seismic interpretation of Permian salt dissolution features, northeastern Colorado (Squires, Stewart G.)
- The Dakota Sandstone; a diagenetic quartz arenite (Anderhalt, Robert)
- The nature and origin of dolomite in the upper Fountain Formation (Pennsylvanian), east flank of Colorado Front Range, central Colorado (Kindred, Valerie Prescott)
- The significance of botryoidal aragonite in the early diagenetic history of phylloid algal mounds in Bug and Papoose Canyon fields, southeastern Utah and southwestern Colorado (Roylance, Michael H.)
- maps:** Median-porosity contour maps of the J Sandstone, Dakota Group, in the Denver Basin, Colorado, Nebraska, and Wyoming (Higley, D. K.)
- sedimentary rocks:** "Mancos B" interval of Upper Cretaceous Mancos Shale, Douglas Creek Arch, Northwest Colorado; a "shelf-sand" complex (Cole, Rex D.)
- A lithofacies study of the San Rafael Group (Jurassic) in the San Juan Basin area (Cumella, Ronald)
- A petrologic study of the Permo-Pennsylvanian red beds of central Colorado with special reference to the development of red color (Thein, Maung)
- Airfall tuff in the Browns Park Formation, northwestern Colorado and northeastern Utah (Luft, Stanley J.)
- Arid land studies of E. A. McKee (Gutschick, Raymond)
- Authigenic hematite; a scavenger for elements mobilized during bleaching of red beds (Zielinski, Robert A., et al.)
- Authigenic kaolinite and associated pyrite in the Cretaceous Smoky Hill chalk member of

- the Niobrara Formation, eastern Colorado (Pollastro, Richard M.)
- Chemical and mineralogical differences of marine and non-marine shales of the Dakota Sandstone and adjacent units, southwestern Colorado (Winsten, Miriam S.)
  - Comparison between immature vitrinite and solid bitumen, Green River Formation, Piceance Creek basin, Colorado (Nuccio, Vito F.)
  - Creede Formation moat rocks and post-collapse history of Creede Caldera, CO (Heiken, Grant)
  - Depositional environment of the Codell Sandstone in the northern Denver-Julesburg Basin, Colorado (Caraway, Donna C.)
  - Depositional environments of the Cambrian Ignacio Formation and Devonian pre-Elbert conglomerate, San Juan Mountains, southwestern Colorado (Wiggin, Roger Clay)
  - Depositional environments of the Dakota Sandstone and adjacent units in the San Juan Basin utilizing discriminant analysis of trace elements in shales (Walters, Lester J., Jr., et al.)
  - Determination of widths of meander-belt sandstone reservoirs from vertical downhole data (Lorenz, John C.)
  - Dolomites and Early Mississippian bioherms, Leadville Formation, Molas Lake, Colorado (Young, Leonard M.)
  - Field Trip 4: Guide to the field study of alluvial fan and fan-delta deposits in the Fountain Formation (Pennsylvanian-Permian), Colorado (Suttner, L. J., et al.)
  - Fluorescent spectral types of the liptinite macerals from selected Colorado bituminous coals (Pasley, Mark A.)
  - Influence of paleoenvironmental factors on preservation of organic matter in Middle Cretaceous Greenhorn Formation, Pueblo, Colorado (Pratt, Lisa M.)
  - Interdune pond carbonates, Weber Sandstone (Pennsylvanian-Permian), northern Utah and Colorado (Driese, Steven G.)
  - Interpretation of early diagenesis in ancient marine sediments (Gautier, Donald L.)
  - Interpretation of vitrinite reflectance data for the Raton Basin, southern Colorado-northern New Mexico (Close, Jay C.)
  - Microlithotype analysis of three coals from the Upper Cretaceous Menefee Formation near Durango, Colorado (Pawlewicz, Mark J.)
  - Mineral, chemical and textural relationships in rhythmic-bedded, hydrocarbon-productive chalk of the Niobrara Formation, Denver Basin, Colorado (Pollastro, Richard M.)
  - Mixed layer clay in the Mancos Shale (Hall, Robert B.)
  - Model for sandstone-carbonate "cyclothem" based on upper member of Morgan Formation (Middle Pennsylvanian) of northern Utah and Colorado (Driese, Steven G.)
  - Nahcolite analyses of seven drill cores from the saline facies of the Green River Formation in Northwest Colorado (Dyini, J. R.)
  - Occurrence and distribution of fluorescent macerals in coals from three coal basins of the United States (Cardott, Brian J.)
  - Oil shale petrology of the Mahogany zone, Green River Formation, Colorado (Chen, Pei-Yuan)
  - Origin of zebra texture in dolomite; evidence from the Leadville Dolomite (Mississippian), central Colorado (Horton, Robert A., Jr.)
  - Origin of zebra texture in the Leadville Formation (Mississippian), of central Colorado (Dorward, Rebecca C.)
  - Paleotectonic and paleoenvironmental influence on the origin of early Tertiary coals in some Rocky Mountain basins, U.S.A. (Flores, Romeo M.)
  - Paleotemperatures based on vitrinite reflectance of shales and limestones in igneous dike aureoles in the Upper Cretaceous Pierre Shale, Walsenburg, Colorado (Bostick, Neely H.)
  - Petrography, porosity, and depositional environments of the Burro Canyon Formation and Dakota Sandstone of Southwest Colorado (Regli, Robert)
  - Petrology of the Leadville Limestone (Mississippian) White River Plateau, Colorado (Conley, C. D.)
  - Porosity, permeability, and pore structure of the tight Mesaverde Sandstone, Piceance Basin, Colorado (Soeder, D. J.)
  - Quantitative mineral distributions in Green River and Rundle oil shales (Bronson, G., et al.)
  - Reservoir characterization for numerical simulation of Mesaverde meanderbelt sandstone, northwestern Colorado (Jones, Jon Rex, Jr.)
  - Root control on the development of nodular calcrete in Upper Triassic Paleosols, Dolores Fm., S.W. Colorado, U.S.A. (Blodgett, Robert H.)
  - Seam profiling of three coals from the Upper Cretaceous Menefee Formation near Durango, Colorado (Pawlewicz, Mark J.)
  - Sedimentology of a Precambrian quartz-pebble conglomerate, Southwest Colorado (Ethridge, Frank G., et al.)
  - Sedimentology of a Precambrian quartz-pebble conglomerate; Southwest Colorado (Ethridge, Frank G., et al.)
  - Sedimentology of Gilbert-type fan-delta systems, Honaker Trail Formation, southwestern Colorado (Wood, Maria L.)
  - Sedimentology of interdune carbonates, Weber Sandstone (Pennsylvanian-Permian), northern Utah and Colorado (Driese, S. G.)
  - Sedimentology of the Entrada Sandstone (Jurassic), northeastern Utah and northwestern Colorado (Otto, Ernest Paul)
  - The Carter Sandstone Member of the Pierre Shale; a Cretaceous shoreline (Mieras, Barbara L.)
  - The influence of exudatinites on the carbonization behavior of a medium volatile coal from Colorado (Valia, Hardarshan S.)
  - The non-transferability of a Cretaceous coal model in the San Juan Basin of New Mexico and Colorado (Fassett, James E.)
  - Variations in vitrinite reflectance and clay-mineral composition within vertical sections of Belden Shale, Eagle Basin, Colorado: problems in determining thermal maturity (Nuccio, Vito F., et al.)
  - Variations in vitrinite reflectance values for the Upper Cretaceous Mesaverde Formation, southeastern Piceance Basin, northwestern Colorado: implications for burial history and potential hydrocarbon generation and The Frypan Member of the Maroon Formation: a Lower Permian(?) basin-margin dune field in northwestern Colorado (Nuccio, Vito F., et al.)
  - Well-log determination of ash content in Fruitland Formation coals, Southern Ute Indian Reservation, southwestern Colorado (Prensky, Stephen E.)
- sedimentary structures:* Biogenic sedimentary structures as indicators of paleo-bottom-water redox conditions (Savrdra, Charles Edward)
- Climbing zibars of the Algodones (Nielson, Jamie)
  - Coarse- and medium-grained wind ripples and avalanches in modern and ancient eolian dunes (Langford, Richard P.)
  - High resolution stratigraphy and depositional history of the Greenhorn regressive hemicyclothem, Rock Canyon Anticline, Pueblo, Colorado (Glenister, Linda M.)
  - Intrusion of clastic dikes during diagenesis and fracture of oil shales (Grout, Marilyn A.)
  - Mechanical deformation controlled by amount of organic matter, Green River Formation, Colorado (Grabowski, George J., Jr.)
  - Medano Creek, Colorado, a model for upper-flow-regime fluvial deposition (Langford, Richard P.)
  - Petrography and geochemistry of Early Permian calcareous nodules of the Abo and Cutler formations, south-central New Mexico and southwestern Colorado (Schaal, William Conrad)
  - Recognizing organic mats in deep water environments (Williams, L. A.)
  - Reservoir characterization of Mesaverde (Campanian) bedload fluvial meanderbelt sandstones, northwestern Colorado (Jones, Jon R., Jr.)
  - Seismic character study, Ismay Cycle, Paradox Formation, Paradox Basin, Southwest Colorado (Bergeon, Thomas C.)
  - Superscoops: their significance and utility in analyzing ancient eolian deposits (Blakey, Ronald C.)
  - The Dakota Group and the Kiowa-Skull Creek Cyclothem in the Canon City-Pueblo area, Colorado (Gustason, Edmund R.)
  - The Niobrara transgressive hemicyclothem in central and eastern Colorado; the anatomy of a multiple disconformity (Fisher, Cynthia G., et al.)
  - Trace fossils in Upper Cretaceous argillaceous marine facies of the U. S. Western Interior (Archer, Allen W.)
- sedimentation:* A study in sediment transportation by the Arkansas River in Colorado and Kansas (Collins, Donald N.)
- Anastomosing and meandering fluvial systems, Mesaverde Group, (Campanian), northwestern Colorado (Payne, John Beckwith)
  - Changes in fluvial style from the Lytle Formation (Lower Cretaceous) of Middle Park Basin, north-central Colorado (Wineteer, Craig Brian)
  - Controls on late Paleozoic and early Mesozoic eolian deposition of the Western United States (Marzolf, John E.)
  - Correlation between the  $\delta^{34}\text{S}$  of pyritic and organic sulfur in coal and oil shale (Price, Fred T.)
  - Depositional cycles in the Niobrara Formation, Colorado Front Range (Barlow, Lisa K.)

- Depositional environments of the Fox Hills Sandstone (Upper Cretaceous), Cheyenne Basin, Colorado (Nibbelink, Kenneth A.)
- Depositional history and petrography of the Todilto Formation (Jurassic), New Mexico and Colorado (McCrary, Megan Marie)
- Depositional history and sedimentology of Upper Cretaceous Mancos Shale and lower Mesaverde Group, northwestern Colorado; migrating shelf-bar and wave-dominated shoreline deposits (Boyles, Joseph Michael)
- Depositional history of the Graneros Shale (Cenomanian), Rock Canyon Anticline (Kauffman, Erle G.)
- Depositional model for a muddy shelf-sand complex and their relationship to reservoir development; "Mancos B" interval of Late Cretaceous Mancos Shale, Northwest Colorado and Northeast Utah (Cole, R. D.)
- Depositional styles of lakes near Estes Park, Colorado; a study of contrasts (Hoyt, William H.)
- Depositional systems and geologic history of the lower part of the Fountain Formation, Manitou Embayment, Colorado (Langford, Richard P.)
- Determination of textural signature and their relation to paleoenvironment for nine fluvial channel sequences from the Upper Cretaceous Mesaverde Group of Piceance Creek Basin, northwestern, Colorado (North, Robert)
- Early joints within penecontemporaneous slump blocks of the Eocene Uinta Formation, Piceance Creek basin, northwestern Colorado (Grout, Marilyn A.)
- Evidence for playa sedimentation in the Morrison Formation, Canon City, Colorado (Sweet, Rebecca G.)
- Fan-delta variations and associated shelf-bars, lower member of the Honaker Trail Formation (Desmoinesian), southwestern Colorado (Millberry, Kimberlee Whitney)
- Flood sedimentation in bedrock fluvial systems (Baker, Victor R.)
- Influence of eolian sediments on Alpine soil development (Burns, Scott F.)
- Marine-shelf bar sand/channelized sand shingled couplet, Terry Sandstone Member of Pierre Shale, Denver Basin, Colorado (Siemers, C. T.)
- Modern and ancient fluvial-eolian interactions (Langford, Richard Parker)
- Petrology and sedimentation of significant Paradox shales (Pennsylvanian) (Merrell, Harvey Webb)
- Petrology, provenance, and tectonic significance of Upper Cretaceous Ohio Creek Member, Williams Fork Formation, Piceance Creek basin, Colorado (Whited, Joseph Michael)
- Pre-Quaternary desert loess; significance of an example from the Maroon Formation (Pennsylvanian and Permian) in Eagle Basin, Northwest Colorado (Johnson, Samuel Y.)
- Sedimentology of a prograding alluvial fan sequence (Flores, Richard J.)
- Siliciclastic influence on carbonate deposition in the Hermosa Formation, San Juan County, Colorado (Karnes, Kerri A.)
- Source areas and paleotectonic implications of Upper Cretaceous Ohio Creek Member of Mesaverde Group, Piceance Basin, Colorado (Whited, Mike)

- Tectonic and climatic controls on alluvial fan sedimentation of the Cutler Formation (Permian-Pennsylvanian) in southwestern Colorado (Rasmussen, Keith A.)
  - Tectonic and sedimentation model for D sandstone deposition, Zenith field area, Denver Basin, Colorado (Sonnenberg, Stephen A.)
  - Tectonic control on alluvial paleoarchitecture of the Cretaceous and Tertiary Raton Basin, Colorado and New Mexico (Flores, Romeo M.)
  - The effects of bedrock lithology on sediment production in small drainage basins in south-central Colorado (Armbruster, John David)
  - Vertically accreted foreshore to shoreface deposits of Sego Sandstone (Campanian), Northwest Colorado (Stancliffe, Richard)
- sediments*: Depositional history of a vertebrate fossil locality near Lyons, Colo. (Clark, Peter)
- Determination of roundness and mineralogical maturity of quartz grains from six environments (Reid-Green, John Douglas)
  - Estes Park Flood; sedimentary and hydraulic character of an alluvial fan flood deposit (Hoyt, William H.)
  - Geochemistry of heavy minerals in provenance studies (Thomas, Robert B., et al.)
  - Quantitative relationships between lithology and clastic sediment production in small drainage basins in West Colorado (Armbruster, John David)
  - Zonation of clay minerals in a Jurassic playalake setting; a case for low-temperature formation of illite (Turner-Peterson, Christine E., et al.)
- weathering*: Chemical weathering of late Quaternary cirque deposits in the Colorado Front Range (Dixon, John Charles)
- Insolation-talus relationships, San Juan Mountains, Colorado (Hyers, Albert D.)
  - The effects of weathering on the petrographic and fluorescent properties of sub-bituminous coal from the Fort Union Formation, Colorado (Babcock, Douglas L.)
  - Weathering at the Precambrian Paleozoic contact along the east side of the Front Range, Colorado (Reno, Duane H.)

**sedimentary petrology—catalogs**

- cores*: Catalog of thin sections available at the USGS Core Research Center, Denver, Colorado (Richards, Diana L.)

**sedimentary rocks** *see under* geochemistry; sedimentary petrology  
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**sedimentary rocks—carbonate rocks**

- caliche*: Caliche in the late Paleozoic Fountain Formation; rediscovery and implications (Loope, David B.)
- chalk*: Diagenetic relationships in a hydrocarbon-productive chalk; the Cretaceous Niobrara Formation (Pollastro, Richard M.)
- Hydrocarbons exploration, development from low-permeability chalks; Upper Cretaceous Niobrara Formation, Rocky Mountains region (Pollastro, Richard M.)
- Indigenous biogenic gas in Upper Cretaceous chalks, eastern Denver Basin (Rice, Dudley D.)

- Mineral, chemical and textural relationships in rhythmic-bedded, hydrocarbon-productive chalk of the Niobrara Formation, Denver Basin, Colorado (Pollastro, Richard M.)
- Occurrence of indigenous biogenic gas in organic-rich, immature chalks of Late Cretaceous age, eastern Denver Basin (Rice, Dudley D.)
- Relation of hydrocarbon type to maturity of organic matter in Upper Cretaceous chalks, eastern Denver Basin (Rice, Dudley D.)
- Shallow gas fields in high porosity chalk: an independent's exploration strategy (Lockridge, John P.)
- Shallow Upper Cretaceous Niobrara gas fields in the eastern Denver Basin (Lockridge, John P.)
- diagenesis*: Dolomites and Early Mississippian bioherms, Leadville Formation, Molas Lake, Colorado (Young, Leonard M.)
- Pennsylvanian (Minturn Formation) algal-mound facies, Rio Blanco County, Colorado (Brinton, L.)
- dolostone*: Interdune pond carbonates, Weber Sandstone (Pennsylvanian-Permian), northern Utah and Colorado (Driese, Steven G.)
- Sedimentology and petrology of profundal lacustrine sediments, Mahogany Zone of the Green River Formation, Piceance Creek basin, Northwest Colorado (Grabowski, George J., Jr.)
- environmental analysis*: Platy algal reef mounds, Paradox Basin (Choquette, Philip W.)
- limestone*: Algal limestones within the Minturn Formation, Meeker to Dotsero area, western Colorado (Irtem, Oguz)
- Carbonate petrology of the Fort Hays Members, Cretaceous Niobrara Formation, Colorado (Billo, Saleh M.)
- Field Trip No. 4; Pennsylvanian algal carbonates and associated facies, central Colorado (Wray, John L.)
- Isotopic studies of organic matter and carbonate in rocks of the Greenhorn marine cycle (Pratt, Lisa M.)
- Petrology of the Leadville Limestone (Mississippian) White River Plateau, Colorado (Conley, C. D.)
- Porosity development in the Cretaceous Niobrara Formation, Colorado (Billo, Saleh M.)
- Stratigraphy and depositional environments of the Bridge Creek Limestone Member of the Greenhorn Limestone at Rock Canyon Anticline near Pueblo, Colorado (Elder, William P.)
- lithofacies*: Paleogeography and facies distribution of the Todilto Limestone and Pony Express Limestone Member of the Wanakah Formation, Colorado and New Mexico (Ridgley, Jennie L.)
- magnetic properties*: Paleomagnetism and rock magnetism of the Mississippian Leadville (carbonate) Formation and implications for the age of sub-regional dolomitization (Horton, Robert A., Jr.)
- petrology*: Carbonate petrology of the Green River Formation (Eocene), Uinta Basin, Utah and Colorado (Williamson, Charles Ross)
- reservoir properties*: Ismay reservoirs, Paradox Basin; diagenesis and porosity development (Dawson, William C.)

- Overview; carbonate reservoirs of the Paradox Basin (Stevenson, G. M.)
  - Upper Mississippian grainstone reservoirs in the Ladder Creek Field area, Cheyenne County, Colorado (Canter, Karen Lyn)
  - reservoir rocks*: Exploration and development of hydrocarbons from low-permeability chalks: an example from the Upper Cretaceous Niobrara Formation, Rocky Mountain region (Pollastro, Richard M.)
- sedimentary rocks—chemically precipitated rocks**
- evaporites*: Early salt dissolution; Pennsylvanian of Paradox Basin, Colorado and Utah (Kendall, Alan C.)
  - Evaporitic environments as a source of petroleum (Evans, Robert)
  - salt*: Geologic nuclear waste repository site selection studies in the Paradox Basin, Utah—Colorado (Grant, Terry A.)
- sedimentary rocks—clastic rocks**
- arenite*: Paleotectonic, stratigraphic, and diagenetic history of Weber Sandstone, Rangely area, Colorado (Koelmel, Mark)
  - arkose*: Early diagenesis in arkose and paleoclimate (Sutner, Lee J.)
  - arkosic sandstone*: Analytical data for some minor elements in arkosic sandstones of the Fountain Formation, Colorado (Havens, R. G.)
  - black shale*: Burial reconstruction of the Early and Middle Pennsylvanian Belden Formation, Gilman area, Eagle Basin, Northwest Colorado (Nuccio, Vito F.)
  - Depletion of  $^{13}\text{C}$  in Cretaceous marine organic matter; source, diagenetic, or environmental signal? (Dean, Walter E., et al.)
  - Geochemical imprint of depositional conditions on organic matter in laminated-bioturbated interbeds from fine-grained marine sequences (Pratt, Lisa M., et al.)
  - Petrology and sedimentation of significant Paradox shales (Pennsylvanian) (Merrell, Harvey Webb)
  - breccia*: Geology and hydrothermal alteration of the Red Mountain alunite deposit, Lake City, Colorado (Bove, Dana J.)
  - chemical composition*: Petrography and geochemistry of feldspathic and mafic sediments of the northeastern Pacific margin (van de Kamp, Peter C.)
  - claystone*: Goyazite in kaolinitic altered tuff beds of Cretaceous age near Denver, Colorado (Triplehorn, Don M.)
  - conglomerate*: Favorability of Precambrian quartz-pebble conglomerates in the United States as uranium hosts (Anderson, J. R., et al.)
  - Neogene tectonics and geomorphology of the eastern Uinta Mountains in Utah, Colorado, and Wyoming (Hansen, Wallace R.)
  - Sedimentation model for the Crestone Conglomerate Member of the Sangre de Cristo Formation (Pennsylvanian-Permian), south-central Colorado (Flores, Richard J.)
  - Sedimentology of a Precambrian quartz-pebble conglomerate, Southwest Colorado (Ethridge, Frank G., et al.)
  - Sedimentology of a Precambrian quartz-pebble conglomerate; Southwest Colorado (Ethridge, Frank G., et al.)
  - The Tertiary Ridgway and Gunnison conglomerates of southwestern Colorado (Hambrey, M. J.)
  - deposition*: Estuarine and fluvial systems, lower Mesaverde Group (Campanian), northwestern Colorado (Nelson, Katherine)
  - Regional stratigraphic and depositional study of rock units in upper Garden Gulch and Parachute Creek members of Green River Formation, Piceance Creek Basin, Colorado (Pitman, Janet K.)
  - environmental analysis*: Measured sections and environmental reconstructions of uppermost Jurassic to lowermost Upper Cretaceous rocks on the northern side of the San Juan Basin, southwestern Colorado (Aubrey, W. M.)
  - Minturn and Sangre de Cristo formations of southern Colorado; prograding fan-delta and alluvial-fan sequence shed from ancestral Rocky Mountains (Lindsey, David A., et al.)
  - Studies of sedimentary environments in the Cretaceous Dakota Sandstone in northwestern Colorado (Lane, Donald Wilson)
  - lithofacies*: A regionally extensive altered air-fall ash for use in correlation of lithofacies in the Upper Cretaceous Williams Fork Formation, northeastern Piceance Creek and southern Sand Wash basins, Colorado (Brownfield, Michael E.)
  - Climatic influence on Fountain sedimentation in the Manitou Embayment (Sutner, Lee J.)
  - Evolving parallel tectonic styles in adjacent Proterozoic crustal provinces of the southwestern United States (Condie, Kent C.)
  - Facies relationships in Campanian wave-dominated coastal deposits in Sand Wash Basin (Siepmann, Bret R.)
  - Facies relationships, reservoir potential of Ohio Creek interval across the Piceance Creek basin (Lorenz, John C.)
  - Fluvial sedimentology of the Mesaverde Formation as revealed in continuous subsurface core (Lorenz, John C.)
  - Lithofacies relationships and depositional environment of the Tertiary Ojo Alamo Sandstone and related strata, San Juan Basin, New Mexico and Colorado (Sikkink, Pamela G. L.)
  - Provenance and sedimentology of the Fountain Formation near Canon City, Colorado (Shultz, Albert W.)
  - Reservoir characteristics of ancient fluvial deposits with emphasis on Rocky Mountain and Midcontinent regions (Ethridge, Frank G.)
  - Sedimentology of a prograding alluvial fan sequence (Flores, Richard J.)
  - Sedimentology of the Fountain fan-delta complex near Manitou Springs and Canon City, Colorado (Sutner, Lee J., et al.)
  - Sedimentology of the Fountain fan-delta complex near Manitou Springs, Colorado (Langford, Richard P.)
  - Shallow marine depositional environments in the Upper Cretaceous of northern Colorado (Kiteley, Louise W.)
  - Tectonic, sedimentary, and seismic models for D sandstone, Zenith Field area, Denver Basin, Colorado (Sonnenberg, Stephen A.)
  - lithostratigraphy*: Stratigraphic cross section showing Upper Cretaceous rocks across the San Juan Basin, New Mexico and Colorado (Molenaar, C. M.)
  - loessite*: Significance of loessite in the Maroon Formation (Middle Pennsylvanian to Lower Permian), Eagle Basin, Northwest Colorado (Johnson, Samuel Y.)
  - marl*: Anoxic events, a comparison of Cretaceous regimes (Fischer, Alfred G., et al.)
  - orthoquartzite*: Evidence for Laramide compression from a small drape fold in central Colorado (Wright, Stephen F.)
  - Pennsylvanian repetitive orthoquartzite-carbonate suite of Western United States; sedimentology and paleogeography (Dott, Robert H., Jr., et al.)
  - Paleosols*: Nonmarine depositional environments and Paleosol development in the Upper Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)
  - physical properties*: Chemical interaction between major dissolved components in acidic uranium tailings fluids and adjacent bedrock (Gerlitz, Carol Nan)
  - porosity*: Development of a pore interaction model for hydrodynamic dispersion during flow through porous media (Baker, Fred G.)
  - properties*: Paleohydraulic parameters of a Morrowan point-bar complex, Salt Lake and Haswell fields, Kiowa County, Colorado (Wingate, Thomas P.)
  - pyroclastics*: Geochemistry and petroctectonic setting of bimodal volcanic and volcanoclastic rocks, Cochetopa Canyon area, central Colorado (Bennett, Gregory S., et al.)
  - U-Pb zircon chronology of early and middle Proterozoic igneous events in the Gunnison, Salida, and Wet Mountains areas, Colorado (Bickford, M. E., et al.)
  - red beds*: A petrologic study of the Permo-Pennsylvanian red beds of central Colorado with special reference to the development of red color (Thein, Maung)
  - Authigenic hematite; a scavenger for elements mobilized during bleaching of red beds (Zielinski, Robert A., et al.)
  - reservoir properties*: Determination of widths of meander-belt sandstone reservoirs from vertical downhole data (Lorenz, John C.)
  - Reservoir characterization of Mesaverde (Campanian) bedload fluvial meanderbelt sandstones, northwestern Colorado (Jones, Jon R., Jr.)
  - reservoir rocks*: Coal-bed methane and tight gas sands interrelationships (Rightmire, Craig T.)
  - Geologic and engineering implications of production history from five Mesaverde wells in central Piceance Creek basin, Northwest Colorado (Chancellor, R. E.)
  - Geologic characterization of low permeability gas reservoirs in selected wells, greater Green River basin, Wyoming, Colorado, and Utah (Law, Ben E., et al.)
  - Investigation of stratigraphic and paleostructural controls on hydrocarbon migration and entrapment in Cretaceous D and J sandstones of the Denver Basin (Tainter, Patrick A.)
  - Origin and distribution of fractures in lower Tertiary and Upper Cretaceous rocks, Piceance Basin, Colorado, and their relation to the occurrence of hydrocarbons (Pitman, Janet K.)

- Potential basin-centered gas accumulation in Cretaceous Trinidad Sandstone, Raton Basin, Colorado (Rose, Peter R., et al.)
- Reservoir characterization for numerical simulation of Mesaverde meanderbelt sandstone, northwestern Colorado (Jones, Jon Rex, Jr.)
- San Juan Sag; Cretaceous rocks in a volcanic-covered basin, south central Colorado (Gries, Robbie Rice)
- Southern Piceance Basin model; Cozzette, Corcoran and Rollins sandstones (Brown, Charles A., et al.)
- Structural and thermal history of the Piceance Creek basin, western Colorado, in relation to hydrocarbon occurrence in the Mesaverde Group (Johnson, Ronald C.)
- Wattenberg Field, Denver Basin, Colorado (Weimer, Robert J., et al.)
- sandstone*: "Mancos B" interval of Upper Cretaceous Mancos Shale, Douglas Creek Arch, Northwest Colorado; a "shelf-sand" complex (Cole, Rex D.)
- 1984 SEPM presidential address; Diagenetic albitization of potassium feldspar in arkosic sandstones (Walker, Theodore R.)
- Alluvial sandstone composition and paleoclimate; I, Framework mineralogy (Suttner, Lee J.)
- Alluvial sandstone composition and paleoclimate; II, Authigenic mineralogy (Dutta, Prodip K.)
- Anisotropic permeability, colian Lyons Sandstone (Shepherd, R. G.)
- Architectural elements and bounding surfaces in fluvial deposits; anatomy of the Kayenta Formation (Lower Jurassic), Southwest Colorado (Miall, Andrew D.)
- Calcareous paleosols in the Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)
- Changing wind and hydrologic regimes during deposition of the Navajo and Aztec sandstones, Jurassic (?), Southwestern United States (Marzolf, J. E.)
- Codell Sandstone, D-J Basin's new objective (Anonymous)
- Core porosity, permeability, and vitrinite reflectance data from the Lower Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)
- Cretaceous wave dominated delta, barrier island, and submarine fan depositional systems of the Rocky Mountains; clastic models for hydrocarbon exploration (Balsley, John K.)
- Depositional control of diagenesis in tight gas sands, Corcoran and Cozzette Sandstone members of Price River Formation (Upper Cretaceous), Book Cliffs of western Colorado (Palmer, Beth A.)
- Depositional environment of Upper Cretaceous Lewis sandstones of the Lewis Shale, Sand Wash Basin, Colorado (Cain, Mary Reinarts)
- Depositional environments and diagenesis of D Sandstone, Wild Horse Field, Weld County, Colorado (Wilson, Kevin M.)
- Depositional environments and diagenetic features of a Cretaceous clastic sequence, Fox Hills Sandstone of northern Great Plains Province (Wilde, Edith M.)
- Determination of widths of meander-belt sandstone reservoirs from vertical downhole data, Mesaverde Group, Piceance Creek basin, Colorado (Lorenz, John C., et al.)
- Effect of sediment supply on embayed shoreline deposits, Cretaceous (Campanian), northwestern Colorado (Stancliffe, R.)
- Field trip guide, Codell Sandstone, northern Front Range (Sonnenberg, Stephen A.)
- Fluvial architecture of Jurassic uranium-bearing sandstones, Colorado Plateau, western United States (Tyler, Noel)
- Fountain Formation near Canon City, Colorado; atypical stratigraphy and sedimentation (Shultz, Albert W.)
- Geologic characteristics of low-permeability gas reservoirs in greater Green River basin of Wyoming, Colorado, and Utah (Law, Ben E.)
- Hummocky cross-stratification and associated erosional features; description and depositional processes (Boyles, J. Michael)
- Marine-shelf bar sand/channelized sand shingled couplet, Terry Sandstone Member of Pierre Shale, Denver Basin, Colorado (Siemers, C. T.)
- Mid-Cretaceous Codell Sandstone Member of Carlile Shale, eastern Colorado (Merewether, E. A.)
- Mineralogy and genesis of the clay minerals of the Codell Sandstone, Denver Basin, Colorado (Henningsgaard, Jeffrey, et al.)
- Mineralogy of selected sandstone/shale pairs and sandstones from the Multiwell Experiment; interpretations from X-ray diffraction and scanning electron microscopy analyses (Pollastro, Richard M.)
- Morrow fluvial and deltaic sandstones of Anadarko Basin in southeastern and east-central Colorado (Patterson, Earl)
- Neutronic properties of Mesaverde sands; I, Calibration of the Advanced Reactivity Measurement Facility (Lysne, P.)
- Neutronic properties of Mesaverde sands; II, Results (Lysne, P.)
- Oligocene volcanic rocks as a uranium source for sandstone-type uranium deposits in central Colorado (Dickinson, Kendell A.)
- Paleofluids in the copper and uranium bearing sandstones, central Colorado Plateau; fluid inclusion and isotopic evidence in calcite (Meunier, J. D.)
- Petrology and diagenesis of Trinidad Sandstone (Upper Cretaceous), Huerfano and Las Animas counties, Colorado (Dunaway, Sabrina G.)
- Petrology of lower Eocene sandstones in south central Colorado compared to their time equivalents in Texas (Boggs, Ann S.)
- Petrology of selected sandstones in the MWX wells (Northwest Colorado) and its relationship to borehole geophysical-log analysis and reservoir quality (Pitman, Janet K.)
- Porosity, permeability, and pore structure of the tight Mesaverde Sandstone, Piceance Basin, Colorado (Soeder, D. J.)
- Post-Mississippian paleotectonic, stratigraphic, and diagenetic history of the Weber Sandstone in the Rangely Field area, Colorado (Koelmel, Mark H.)
- Recycled immature kerogens; basis for "ancestors" principle (=provenance) in evaluating petroleum-generating capacity of a terrigenous sandstone (Sanders, John E.)
- Regional trends in porosity and permeability of J Sandstone in Denver Basin; controls of burial history (Higley, D. K.)
- Reservoir sedimentology of Mesaverde rocks at the MWX site (Lorenz, John C.)
- Sedimentology and paleogeographic significance of six fluvial sandstone bodies in the Maroon Formation, Eagle Basin, Northwest Colorado (Johnson, Samuel Y.)
- Sedimentology of an colian sandstone from the Middle Pennsylvanian Eagle Valley Evaporite, Eagle Basin, Northwest Colorado (Schenk, Christopher J.)
- Sedimentology of interdune carbonates, Weber Sandstone (Pennsylvanian-Permian), northern Utah and Colorado (Driese, S. G.)
- Sedimentology of the Entrada Sandstone (Jurassic), northeastern Utah and northwestern Colorado (Otto, Ernest Paul)
- Sedimentology of the Rocky Ridge Sandstone (Upper Cretaceous), Cheyenne Basin, Colorado (Vendetti, Michael J.)
- Source areas and paleotectonic implications of Upper Cretaceous Ohio Creek Member of Mesaverde Group, Piceance Basin, Colorado (Whited, Mike)
- Storm-dominated shoreface deposits, Sego Sandstone (Campanian), northwestern Colorado (Noe, David C.)
- Stratigraphy and petrology of the Lower Cretaceous J Sandstone, Wattenberg Gas Field, Weld County, Colorado (Young, Genevieve B. C.)
- Tectonic and sedimentation model for Morrow sandstone deposition, Sorrento Field area, Denver Basin, Colorado (Sonnenberg, S. A.)
- Tectonic and sedimentation model for Morrow Sandstone deposition, Sorrento Field area, Denver Basin, Colorado (Sonnenberg, Stephen A.)
- The Dakota Sandstone; a diagenetic quartz arenite (Anderhalt, Robert)
- The effects of depositional environment on petrophysical properties of Mesaverde reservoirs, northwestern Colorado (Lorenz, J. C., et al.)
- The Fryingpan Member of the Maroon Formation; a Lower Permian(?) basin-margin dune field in northwestern Colorado (Johnson, Samuel Y.)
- The stratigraphy of the Nugget Sandstone (Doelger, Nancy M.)
- Tidal influences on Cretaceous Fox Hills barrier-strandplain sandstone geometries (Horne, John C., et al.)
- Variations in shoreline sandstones from a Late Cretaceous interdeltic embayment, Sego Sandstone (Campanian), northwestern Colorado (Noe, David Charles)
- Vertically accreted foreshore to shoreface deposits of Sego Sandstone (Campanian), Northwest Colorado (Stancliffe, Richard)
- shale*: A comparison and analysis of seismic land source energy relationships and radiation patterns (Janak, Peter M.)
- Chemical and mineralogical differences of marine and non-marine shales of the Dakota Sandstone and adjacent units, southwestern Colorado (Winsten, Miriam S.)
- Comparison and analysis of downgoing waveforms from land seismic sources (Sitta, David P.)

- Cretaceous shales from the Western Interior of North America; sulfur/carbon ratios and sulfur-isotope composition (Gautier, Donald L.)
- Gamma-ray spectrometry of marine shales in outcrop; a tool for petroleum exploration and basin analysis (Zelt, Frederick B.)
- Geologic field evidence suggesting membrane properties of shales (Berry Frederick, A. F.)
- Geology and petrography of Crested Butte Laccolith, Gunnison County, Colorado (Bevier, Mary Lou)
- Isotopic composition of pyrite; relationship to organic matter type and iron availability in some North American Cretaceous shales (Gautier, Donald L.)
- Mixed layer clay in the Mancos Shale (Hall, Robert B.)
- Sedimentological, mineralogical and geochemical definition of oil-shale facies in the lower Parachute Creek Member of Green River Formation, Colorado (Cole, R. D.)
- Stable carbon isotopic analysis of sedimentary organic matter by stepped combustion (Gilmour, I.)
- Sulfur/carbon ratios and sulfur isotope composition of some Cretaceous shales from the Western Interior of North America (Gautier, Donald L.)
- Temperature effects on kerogen and on molecular and isotopic composition of organic matter in Pierre Shale near an igneous dike (Clayton, J. L.)
- The kinetics of smectite → illite reaction in contact metamorphic shales (Pytte, A. M.)
- textures*: Authigenic "spherules" in K-T boundary sediments at Caravaca, Spain, and Raton Basin, Colorado and New Mexico, may not be impact derived (Izett, Glen A.)
- tonstein*: Mineralogical and textural features of some altered volcanic ash (tonstein) layers in coal-bearing facies of the Rocky Mountain region (Bohor, Bruce F.)
- turbidite*: Measured sections and discussion of the Main Turbidite Member, Middle Pennsylvanian Minturn Formation, northern Sangre de Cristo Range, Custer and Saguache counties, Colorado (Soulliere, S. J., et al.)
- Precambrian geology of the Iris area, Gunnison and Saguache counties, Colorado (Affi, Abdulkader M.)
- Turbidite fans in Upper Cretaceous Pierre Shale, Eagle Basin, Colorado; a new reservoir facies (Krystinik, Lee F.)
- Turbidites in the lower part of the Eagle Valley Evaporite, Eagle County, Colorado, and implications for Desmoinesian paleogeography (Schenk, Christopher J.)
- volcanic breccia*: A study of the West Elk Breccia in the vicinity of Gunnison, Colorado (Ford, Russell James)
- volcaniclastics*: Diagenesis in the Creede Formation, San Juan Mountains, Creede, Colorado (McCrink, Marie Taaffe)
- Stratigraphy and geochemistry of early Proterozoic bimodal volcanogenic rocks near Salida, Colorado (Boardman, S. J.)
- Trace element mobility in tephra from three diagenetic environments (Summa, Lori L., et al.)
- Volcaniclastic alluvial fan sedimentation, northern Rio Grande Rift (McPherson, John G., et al.)

### sedimentary rocks—composition

- chemical composition*: Mineralogy and geochemistry of Green River Formation oil shales, C-A Tract, Colorado (Meddaugh, W. Scott)
- Nahcolite analyses of seven drill cores from the saline facies of the Green River Formation in Northwest Colorado (Dyini, J. R.)
- clay minerals*: Clay mineralogy of the Green River Formation (Dyini, John R.)
- kaolinite*: Authigenic kaolinite and associated pyrite in the Cretaceous Smoky Hill chalk member of the Niobrara Formation, eastern Colorado (Pollastro, Richard M.)
- mineral composition*: Investigation and evaluation of satellite and airborne remotely sensed data for geologic mapping in the Uinta and Piceance basins, Utah and Colorado (Bailey, G. Bryan)
- Mineralogy of the Mahogany marker tuff of the Green River Formation, Piceance Creek basin, Colorado (Mason, Glenn M.)
- Quantitative mineral distributions in Green River and Rundle oil shales (Brons, G., et al.)
- The Cretaceous-Tertiary (K-T) boundary interval, Raton Basin, Colorado and New Mexico, and its content of shock-metamorphosed minerals; implication concerning the K-T boundary impact-extinction theory (Izett, Glen A.)
- volcaniclastics*: Airfall tuff in the Browns Park Formation, northwestern Colorado and northeastern Utah (Luft, Stanley J.)

### sedimentary rocks—diagenesis

- clay mineralogy*: The formation of illite at the expense of illite/smectite; mineralogical and morphological support for a hypothesis (Pollastro, Richard M.)

### sedimentary rocks—environmental analysis

- cyclic processes*: Model for sandstone-carbonate "cyclothem" based on upper member of Morgan Formation (Middle Pennsylvanian) of northern Utah and Colorado (Driese, Steven G.)
- fluvial environment*: Alluvial-fan sedimentation of the Cutler Formation (Permo-Pennsylvanian), near Gateway, Colorado (Mack, Greg H.)
- Tectonic and autocyclic controls on sedimentation of the Cutler Formation (Permo-Pennsylvanian), Gateway, Colorado (Mack, Greg H.)
- lacustrine environment*: Interpretations of some depositional environments and paleoecology in the Morrison Formation of southeastern Colorado (Frazier, F., et al.)
- North America's largest dinosaur trackway site; implications for Morrison Formation paleoecology (Lockley, Martin G., et al.)
- Stages of Eocene Lake Uinta, Piceance Creek basin, Colorado (Johnson, R. C.)
- paleoenvironment*: Paleoenvironmental analysis of the Morrison Formation (Late Jurassic) in the Canon City, Colorado, area (Enciso, Gonzalo)
- Paleosols*: Linking impacts in plant extinctions (Leahy, Guy D., et al.)
- sedimentary structures*: Early joints within penecontemporaneous slump blocks of the Eocene Uinta Formation, Piceance Creek basin, northwestern Colorado (Grout, Marilyn A.)

- shelf environment*: Depositional environment and tectonic significance of the Permo-Triassic Lykins Formation, Golden-Morrison area, Jefferson County, Colorado (Wiggs, Calvin R.)
- Depositional environments of the Upper Ordovician Fremont Formation, northern Canon City Embayment, Colorado (BeVier, Laura M.)
- tidal flats*: Field Trip No. 6; Sedimentology, dolomitization, mineralization and karstification of the Leadville Limestone (Mississippian), central Colorado (De Voto, Richard H.)

### sedimentary rocks—geochemistry

- carbon dioxide*: McElmo Dome Leadville carbon dioxide field, Colorado (Gerling, C. R.)
- Sheep Mountain and Dike Mountain fields, Huerfano County, Colorado; a source of CO<sub>2</sub> for enhanced oil recovery (Roth, George)
- diagenesis*: Gamma-ray spectrometry of the Sharon Springs Member of the Pierre Shale near Canon City, Colorado (Zelt, F. B.)
- Interpretation of early diagenesis in ancient marine sediments (Gautier, Donald L.)
- iridium*: Raton Basin magnetostratigraphy near Cretaceous-Tertiary boundary (Wolberg, Donald L., et al.)
- isotopes*: Character and origin of natural gases from Wattenberg area, Denver Basin, Colorado (Rice, Dudley D.)
- Oxygen isotope analyses of early authigenic clays in sandstone; a new approach to paleoclimate interpretation (Dutta, Prodip K.)
- kerogen*: Comparison of the general chemical nature of various kerogens based on their reactivities towards bromine (Pfundt, Petar A.)
- Kerogen characterisation by <sup>13</sup>C NMR spectroscopy and pyrolysis-mass spectrometry (Barwise, A. J. G., et al.)
- organic materials*: Character and origin of natural gas from Upper Cretaceous Codell Sandstone, Denver Basin, Colorado (Rice, Dudley D.)
- Clastic and carbonate lacustrine systems; an organic geochemical comparison (Green River Formation and East African lake sediments) (Katz, B. J.)
- Comparison between immature vitrinite and solid bitumen, Green River Formation, Piceance Creek basin, Colorado (Nuccio, Vito F.)
- Influence of paleoenvironmental factors on preservation of organic matter in Middle Cretaceous Greenhorn Formation, Pueblo, Colorado (Pratt, Lisa M.)
- Mechanical deformation controlled by amount of organic matter, Green River Formation, Colorado (Grabowski, George J., Jr.)
- Organic geochemistry of Pennsylvanian-Permian oils and black shales, northern Denver Basin (Clayton, Jerry L.)
- Petroleum source-rock and temperature-history studies in sparsely tested exploration areas (Harrison, William E.)
- Role of minerals in production of gas and condensate hydrocarbons during pyrolysis of organic matter (Tannenbaum, Eli)
- Root control on the development of nodular calcrete in Upper Triassic Paleosols, Dolores Fm., S.W. Colorado, U.S.A. (Blodgett, Robert H.)



- Thermal maturity and hydrocarbon source-rock potential of the Eagle Basin, northwestern Colorado (Nuccio, Vito F.)
- oxidation*: Improvement of kerogen structural interpretations based on oxidation products isolated from aqueous solutions (Vitorovic, D., et al.)
- trace elements*: Clay petrology of the conformable Cretaceous/Tertiary boundary interval, Raton Basin, New Mexico and Colorado (Pollastro, Richard M., et al.)
- Depositional environments of the Dakota Sandstone and adjacent units in the San Juan Basin utilizing discriminant analysis of trace elements in shales (Walters, Lester J., Jr., et al.)
- Iridium abundance maxima in the upper Cenomanian extinction interval (Orth, C. J., et al.)
- Rangely Field summary; 2, Seismic profile, structural cross section, and geochemical comparisons (Stone, Donald S.)
- Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado (Pillmore, Charles L.)
- Trace and minor elements in Green River oil shale (Colorado, U.S.A.), concentrated by differential density centrifugation (Saether, Ola M., et al.)
- Trace element distribution and oil yield data from the Parachute Creek Member of the Green River Formation, Colorado (Sullivan, Patrick J.)

**sedimentary rocks—lithofacies**

- biofacies*: Foraminifera of the Storm King Mountain Shale Member, Mancos Shale, western Colorado (Von Holdt, Laura Lynn)
- correlation*: Stratigraphic analysis of the Gothic Formation (Desmoinesian), Pitkin and Gunnison counties, Colorado (Levorsen, Mark K.)
- environmental analysis*: An analysis of the sedimentary geology of the Jurassic Ralston Creek Formation as it is exposed in the vicinity of Canon City, Colorado (Richardson, Jennifer Lynn)
- Depositional environments of the Cambrian Ignacio Formation and Devonian pre-Elbert conglomerate, San Juan Mountains, southwestern Colorado (Wiggin, Roger Clay)
- Depositional environments of the Fox Hills Sandstone (Upper Cretaceous), Cheyenne Basin, Colorado (Nibbelink, Kenneth A.)
- Depositional systems and geologic history of the lower part of the Fountain Formation, Manitou Embayment, Colorado (Langford, Richard P.)
- Depositional systems of Fountain Formation and its basinal equivalents, northwestern Denver Basin, Colorado (Napp, Kenneth F.)
- Evolution of sedimentary basins; Uinta and Piceance basins (Johnson, Samuel Y., et al.)
- Facies analysis of the lower cycles of the Mesaverde Group (Upper Cretaceous) in northwestern Colorado (Kiteley, Louise W.)
- Facies relationships of the Ingleside Formation in northern Colorado and southeastern Wyoming (Rhoads, Holly)
- Field guide and road log; Pennsylvanian and Permian depositional systems and cycles in the Eagle Basin, northwestern Colorado (Schenk, Christopher J., et al.)

- Field Trip 4; Guide to the field study of alluvial fan and fan-delta deposits in the Fountain Formation (Pennsylvania-Permian), Colorado (Suttner, L. J., et al.)
- Geometry and depositional environment of Fruitland Formation coal beds, San Juan Basin, New Mexico and Colorado; anatomy of a giant coal-bed methane deposit (Fassett, James E.)
- Petrography, porosity, and depositional environments of the Burro Canyon Formation and Dakota Sandstone of Southwest Colorado (Regli, Robert)
- Stratigraphy and depositional environments of the Muddy Sandstone in North and Middle Parks basin, Jackson and Grand counties, Colorado (Murphy, W. Dale)
- Stratigraphy of the Codell Sandstone and Juana Lopez members of the Carlile Formation (Upper Cretaceous), El Paso and Fremont counties, Colorado (Aulia, Karsani)
- Stratigraphy of the Trinidad Sandstone and Vermejo Formation (Upper Cretaceous), Canon City coal field, Fremont County, Colorado (Gaffke, Thresa M.)
- Stratigraphy, depositional environments and petroleum-reservoir potential of the Lyons Sandstone (Permian), east-central Colorado (Phillips, Kent D.)
- Tectonic and climatic controls on alluvial fan sedimentation of the Cutler Formation (Permo-Pennsylvanian) in southwestern Colorado (Rasmussen, Keith A.)
- Zeolites replacing plant fossils in the Denver Formation, Lakewood, Colorado (Modreski, Peter J., et al.)
- evaluation*: A lithofacies study of the San Rafael Group (Jurassic) in the San Juan Basin area (Cumella, Ronald)
- genesis*: Facies in the Morrison Formation near Canon City, Colorado (Sweet, Rebecca G.)
- interpretation*: Carbonate-anhydrite facies determination by quantitative seismic stratigraphy in Paradox Basin (Wadleigh, Richard F., Jr.)
- Repetitive Pennsylvanian (Upper Carboniferous) eolian quartz sandstone and shallow marine carbonate deposition, northern Utah and northwestern Colorado, U.S.A. (Driese, S. G., et al.)
- models*: Seismic lithologic modelling (Gelfand, Valery A.)
- tectonic controls*: Stratigraphy and sedimentology of the Pennsylvanian Gothic Formation in the Crested Butte area, Colorado (Leighton, Cheryl D.)

**sedimentary rocks—lithostratigraphy**

- Cretaceous*: Cretaceous stratigraphy and paleontology in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Kues, Barry S.)
- Cross section showing correlations of Upper Cretaceous Fox Hills Sandstone and Lance Formation, and lower Tertiary Fort Union and Wasatch formations, southeastern Washakie Basin, Wyoming, and eastern Sand Wash Basin, Colorado (Honey, J. G.)
- Cross sections showing stratigraphic framework of Upper Cretaceous Dakota Sandstone, Mancos Shale, Mesaverde Group, and Mesaverde Formation, and lower Tertiary Wasatch Formation, west-central Piceance Basin, Garfield County, Colorado (Ellis, M. S.)

- Effects of climate, tectonics, and sea-level changes on rhythmic bedding patterns in the Niobrara Formation (Upper Cretaceous), U.S. Western Interior (Laferriere, Alan P., et al.)
- Geology of the Chama-Southern San Juan Mountains Wilderness Study Area, Colorado (Brock, Maurice R.)
- High-resolution stratigraphic correlations and geochemical analyses, Cretaceous Niobrara Formation, northwestern Denver-Julesburg Basin (Rodriguez, T. E.)
- Isopach map of interval between top of the Pictured Cliffs Sandstone and the Huerfano Bentonite Bed of the Lewis Shale, La Plata County, Colorado, and Rio Arriba and San Juan counties, New Mexico (Sandberg, D. T.)
- North-south stratigraphic cross sections of Upper Cretaceous rocks, northern San Juan Basin, southwestern Colorado (Molenaar, C. M.)
- Preservation of ancient delta platform peripheral growth faults and gravity slumps, near Golden, Colorado (Vinckier, Thomas A., et al.)
- Sedimentological aspects of stratigraphic correlations in the Upper Cretaceous Ericson Sandstone, Greater Green River basin, Wyoming, Colorado, and Utah (Law, B. E., et al.)
- Sedimentology of Upper Cretaceous and Tertiary siliciclastics and coals in the Raton Basin, New Mexico and Colorado (Flores, Romeo M.)
- Stratigraphy of some of the Carlile Shale and Niobrara Formation near Morrison, Colorado (Pinel, Mark J.)
- Stratigraphy of the Ohio Creek Member of the Williams Fork Formation, Piceance Creek Gap to Rifle Gap, Garfield and Rio Blanco counties, Colorado (Valasek, David W.)
- Stratigraphy of the upper Carlile Shale and lower Niobrara Formation (Upper Cretaceous), Fremont and Pueblo counties, Colorado (Pinel, Mark J.)
- Stratigraphy, depositional environments, and paleogeography of coal-bearing strata in the Upper Cretaceous Mesaverde Group, central Grand Hogback, Garfield County, Colorado (Madden, Dawn J.)
- Surface and subsurface correlations showing depositional environments of the Upper Cretaceous Mesaverde Group and associated formations, Cow Creek in Southwest Wyoming to Mount Harris in Northwest Colorado (Roehler, H. W.)
- Surface-subsurface correlations of the Mesaverde Group and associated Upper Cretaceous formations, Rock Springs, Wyoming, to Mount Harris, Colorado (Roehler, H. W.)
- Devonian*: Stratigraphy of the Devonian Chaffee Formation of northeastern Gunnison County, Colorado (Thomas, William Andrew)
- Eocene*: Chart showing correlation of selected parts of the Eocene Uinta and Green River formations, southeastern Piceance Creek basin, Colorado (O'Sullivan, R. B.)
- Correlation of surface sections of the inter-tongued Eocene Wasatch and Green River formations across the central part of the Sand Wash Basin, Northwest Colorado, and eastern part of the Washakie Basin, Southwest Wyoming (Roehler, H. W.)

- Correlation of surface sections of the inter-tongued Eocene Wasatch and Green River formations along the western margins of the Sand Wash Basin, Northwest Colorado, and Washakie Basin, Southwest Wyoming (Roehler, H. W.)
  - New names for units in the lower part of the Green River Formation, Piceance Creek basin, Colorado (Johnson, Ronald C.)
  - Jurassic*: Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Dewey Bridge, Utah, to Uravan, Colorado (O'Sullivan, R. B.)
  - Stratigraphic sections of Middle Jurassic San Rafael Group and related rocks from Slick Rock to Uravan in southwestern Colorado (O'Sullivan, R. B.)
  - Mesozoic*: Stratigraphy of upper Morrison and lower Dakota Group of Front Range, Colorado; new play in central Denver Basin? (Wyatt, Danny J.)
  - Mississippian*: Mississippian Williams Canyon Limestone Member of the Leadville Limestone, south-central Colorado (Hill, Virginia S.)
  - Stratigraphy of the Leadville Dolomite (Beaty, David W.)
  - Neogene*: Generalized geologic map showing distribution and basal configuration of the Browns Park Formation and Bishop Conglomerate in northwestern Colorado, northeastern Utah, and southern Wyoming (Luft, S. J.)
  - Paleocene*: Unconformity-bounded Paleocene conglomerate sequence, southeastern Uinta Basin (Franczyk, Karen J.)
  - Paleozoic*: Manitou, Harding, Fremont and Leadville formations of northeastern Gunnison County, Colorado (Eldridge, Charles A.)
  - Stratigraphic and sedimentologic studies of late Paleozoic strata in the Eagle Basin and northern Aspen Sub-basin, Northwest Colorado (Johnson, Samuel Y.)
  - Stratigraphy and sedimentology of Devonian and Mississippian strata flanking the Homestake shear zone, northeastern Sawatch Uplift, Eagle County, Colorado (Smith, Patricia Gould)
  - Pennsylvanian*: New interpretation of the stratigraphic relationship between the Fountain Formation (Pennsylvanian) and its Glen Eyrie Member near Colorado Springs (Suttner, Lee J., et al.)
  - New interpretation of the stratigraphic relationship between the Fountain Formation and its Glen Eyrie Member (Suttner, Lee J., et al.)
  - Reference section for the Minturn Formation (Middle Pennsylvanian), northern Sangre de Cristo Range, Custer County, Colorado (Lindsey, D. A., et al.)
  - Sedimentary rocks of the Eagle Basin (Mallory, William W.)
  - Sedimentology and architecture of Gilbert and mouth bar-type fan deltas, Paradox Basin, Colorado (Wood, Maria L.)
  - Stratigraphic sections, depositional environment, and metal content of the upper part of the Middle Pennsylvanian Minturn Formation, northern Sangre de Cristo Range, Custer and Saguache counties, Colorado (Clark, R. F.)
  - Proterozoic*: Proterozoic geology of the Middle Mountain area, Needle Mountains, Colorado (Gonzales, David A.)
  - Triassic*: Stratigraphic and sedimentologic studies of the Upper Triassic Chinle Formation, western Colorado (Dubiel, Russell F.)
- sedimentary rocks—organic residues**
- bituminous coal*: Occurrence and distribution of fluorescent macerals in coals from three coal basins of the United States (Cardott, Brian J.)
  - coal*: A depositional model for middle Mesaverde coals, Yampa Field, northwestern Colorado (Penske, John M., Jr.)
  - Appropriate stratigraphic nomenclature for coal reservoirs in Piceance Basin, Colorado (Decker, David)
  - Characterization of coal-derived hydrocarbons and source-rock potential of coal beds, San Juan Basin, New Mexico and Colorado, U.S.A. (Rice, Dudley D., et al.)
  - Coal bed methane desorption data (Tremain, Carol M.)
  - Coal geology and coal, oil, and gas resources of the Erie and Frederick quadrangles, Boulder and Weld counties, Colorado (Spencer, Frank D.)
  - Coal-bed methane (Law, Ben E.)
  - Comparative analysis of coal accumulation in Cretaceous alluvial deposits, southern United States Rocky Mountain basins (Flores, Romeo M.)
  - Comparison of physical and chemical properties of maceral groups separated by density gradient centrifugation (Karas, Jirina, et al.)
  - Correlation between the  $\delta^{34}\text{S}$  of pyritic and organic sulfur in coal and oil shale (Price, Fred T.)
  - Cretaceous and lower Tertiary coals as sources for gas accumulations in the Rocky Mountain area (Meissner, Fred F.)
  - Cross sections showing correlation of coal beds and coal zones in the Mesaverde Formation in the Carbondale 30' by 60' Quadrangle, west-central Colorado (Ellis, Margaret S., et al.)
  - Depositional environments of some Upper Cretaceous coal-bearing strata at Trapper Mine, Craig, Colorado (Massoth, Terry Wayne)
  - Distribution of coal beds in the Fruitland Formation, Southern Ute Indian Reservation, Archuleta and La Plata counties, southwestern Colorado (Sandberg, Dorothy T.)
  - Fluorescent spectral types of selected Colorado bituminous coals (Pasley, Mark A.)
  - Geologic map and coal sections of the Lay Se Quadrangle, Moffat County, Colorado (Brownfield, M. E.)
  - Geologic map and coal stratigraphic framework of the Paonia area, Delta and Gunnison counties, Colorado (Dunrud, C. R.)
  - Late Cretaceous coal deposition in the San Juan Basin, New Mexico and Colorado (Fassett, James E.)
  - Microlithotype analysis of three coals from the Upper Cretaceous Menefee Formation near Durango, Colorado (Pawlewicz, Mark J.)
  - Organic geochemistry and organic petrography (Bostick, Neely H., et al.)
  - Origin and production implications of abnormal coal reservoir pressure (Decker, A. D.)
  - Petrology of selected coal seams of the Williams Fork Formation, Moffat County, Colorado (Joliat, Steven A.)
  - Preliminary thermal-maturity map of the Cameo and Fairfield or equivalent coal zone in the Piceance Creek basin, Colorado (Nuccio, V. F.)
  - Regional correlation of the middle coal group of the Upper Cretaceous Mesaverde Group, Yampa coal field, Moffat and Routt counties, Colorado (Johnson, E. A.)
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  - Seam profiling of three coals from Upper Cretaceous Menefee Formation near Durango, Colorado (Pawlewicz, Mark J.)
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  - Vitrinite reflectance and temperature gradient models applied at a site in Piceance Basin, Colorado (Bostick, Neely H.)
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*environmental analysis*: Determination of textural signature and their relation to paleoenvironment for nine fluvial channel sequences from the Upper Cretaceous Mesaverde Group of Piceance Creek Basin, northwestern, Colorado (North, Robert)

*interpretation*: Diagenesis of the mid-Middle Park Formation, central Grand County, Colorado (Remy, Robert Reginald)

*zebra texture*: Origin of zebra texture in the Leadville Formation (Mississippian), of central Colo. (Dorward, Rebecca C.)

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*dune structures*: The Fryingpan Member of the Maroon Formation; a Lower Permian(?) basin-margin dune field in northwestern Colorado (Johnson, Samuel Y.)

*environmental analysis*: Depositional environments and origin of bounding surfaces in the

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*ergs*: Controls on late Paleozoic and early Mesozoic eolian deposition of the Western United States (Marzolf, John E.)

*frost features*: Mysteries in mud; ancient frost crystal impressions and other curiosities in Cave of the Winds (Davis, Donald G.)

*ripple marks*: Interpretations of some depositional environments and paleoecology in the Morrison Formation of southeastern Colorado (Frazier, F., et al.)

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*algal mats*: Recognizing organic mats in deep water environments (Williams, L. A.)

— Sedimentology of interturbid carbonates, Weber Sandstone (Pennsylvanian-Permian), northern Utah and Colorado (Driese, S. G.)

*algal mounds*: Paleoecology of phylloid algal mud mounds, Honaker Trail Formation (Pennsylvanian), Southwest Colorado (Soar, Linda Katherine)

— Pennsylvanian (Minturn Formation) algal-mound facies, Rio Blanco County, Colorado (Brinton, L.)

— Platy algal reef mounds, Paradox Basin (Choquette, Philip W.)

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*algal structures*: Algal limestones within the Minturn Formation, Meeker to Dotsero area, western Colorado (Irtan, Oguz)

*bioherms*: Dolomites and Early Mississippian bioherms, Leadville Formation, Molas Lake, Colorado (Young, Leonard M.)

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*bioturbation*: Late Cretaceous (Campanian) estuarine and fluvial systems associated with rapid subsidence, northwestern Colorado (Nelson, K.)

*burrows*: Biogenic sedimentary structures as indicators of paleo-bottom-water redox conditions (Savrda, Charles Edward)

*environmental analysis*: Stratigraphy of the upper Carlile Shale and lower Niobrara Formation (Upper Cretaceous), Fremont and Pueblo counties, Colorado (Pinef, Mark J.)

*gastroliths*: Not every "egg" is an egg (Hirsch, Karl F.)

*lebensspuren*: The paleoenvironmental significance of the nearshore *Curvolithus* ichnofacies (Lockley, Martin G., et al.)

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*tracks*: Dinosaurs near Denver (Lockley, Martin G.)

— The Purgatoire Valley dinosaur tracksite region, Southeast Colorado (Lockley, Martin G.)

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*coastal environment*: Depositional environments of the upper Fountain and Ingleside formations between Lyons and Loveland, Colorado (Schatz, Barry Allen)

— Storm-dominated shoreface deposits, Sego Sandstone (Campanian), northwestern Colorado (Noc, David C.)

*cyclic processes*: Model for sandstone-carbonate "cyclothem" based on upper member of Morgan Formation (Middle Pennsylvanian) of northern Utah and Colorado (Driese, Steven G.)

*deltaic environment*: Preservation of ancient delta platform peripheral growth faults and gravity slumps, near Golden, Colorado (Vinckier, Thomas A., et al.)

— Tectonic control of Pennsylvanian fan delta deposition, southwestern Colorado (Millberry, Kimberlee W.)

*estuarine environment*: Estuarine and fluvial systems, lower Mesaverde Group (Campanian), northwestern Colorado (Nelson, Katherine)

*fluvial environment*: Alluvial-fan sedimentation of the Cutler Formation (Permo-Pennsylvanian), near Gateway, Colorado (Mack, Greg H.)

— Changes in fluvial style from the Lytle Formation (Lower Cretaceous) of Middle Park Basin, north-central Colorado (Wineteer, Craig Brian)

— Reservoir characteristics of ancient fluvial deposits with emphasis on Rocky Mountain and Midcontinent regions (Ethridge, Frank G.)

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*paleobathymetry*: Stratigraphy, depositional environments, and paleogeography of coal-bearing strata in the Upper Cretaceous Mesaverde Group, central Grand Hogback, Garfield County, Colorado (Madden, Dawn J.)

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*cross-bedding*: Changing wind and hydrologic regimes during deposition of the Navajo and Aztec sandstones, Jurassic (?), Southwestern United States (Marzolf, J. E.)

— Correlations and revisions of Precambrian stratigraphy, Needle Mountains, southwest Colorado, and Tusas Mountains, north-central New Mexico (Burns, L. K.)

— Depositional controls on the late Campanian Sego Sandstone and implications for associated coal-forming environments in the Uinta and Piceance basins (Franczyk, Karen J.)

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— Hummocky cross-stratification and associated erosional features; description and depositional processes (Boyles, J. Michael)

— Sedimentology of an eolian sandstone from the Middle Pennsylvanian Eagle Valley Evaporite, Eagle Basin, Northwest Colorado (Schenk, Christopher J.)

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— High-resolution stratigraphic correlations and geochemical analyses, Cretaceous Niobrara Formation, northwestern Denver-Julesburg Basin (Rodriguez, T. E.)

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*rhythmite*: Pelagic/hemipelagic rhythmites of the Greenhorn Limestone (Upper Cretaceous) of northeastern New Mexico and southeastern Colorado (Hattin, Donald E.)

*sand bodies*: Delineation of lenticular-type sand bodies by the vertical seismic profiling method (Lee, Myung W.)

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*zibars*: Climbing zibars of the Algodones (Nielson, Jamie)

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— Petrography and geochemistry of Early Permian calcareous nodules of the Abo and Cutler formations, south-central New Mexico and southwestern Colorado (Schaal, William Conrad)

— Root control on the development of nodular calcrite in Upper Triassic Paleosols, Dolores Fm., S.W. Colorado, U.S.A. (Blodgett, Robert H.)

*genesis*: Mechanical deformation controlled by amount of organic matter, Green River Formation, Colorado (Grabowski, George J., Jr.)

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*tectonic controls*: Biostratigraphic units and tectonism in the mid-Cretaceous foreland of Wyoming, Colorado, and adjoining areas (Merewether, E. A.)

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— Field guide to the continental Cretaceous-Tertiary boundary in the Raton Basin, Colorado and New Mexico (Pillmore, C. L., et al.)

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— Influence of tectonic terranes adjacent to the Precambrian Wyoming on Phanerozoic stratigraphy in the Rocky Mountain region (Tonnsen, John J.)

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— Neogene tectonics and geomorphology of the eastern Uinta Mountains in Utah, Colorado, and Wyoming (Hansen, Wallace R.)

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— Pennsylvanian-Permian paleostructure and stratigraphy as interpreted from seismic data in the Piceance Basin, Northwest Colorado (Waechter, Noel B.)

— San Luis Uplift; fact or fiction (Baars, D. L.)

— Sediment dispersal analysis of the Maroon Formation in the Crested Butte Quadrangle, Colorado (Elkin, Robert Rich)

— Sedimentary rocks of the Eagle Basin (Mallory, William W.)

— Source areas and paleotectonic implications of Upper Cretaceous Ohio Creek Member of

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— Stratigraphy and petroleum potential of Trout Creek and Twentymile sandstones (Upper Cretaceous), Sand Wash Basin, Colorado (Siepman, Bret R.)

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— The Paradox; a pull-apart basin of Pennsylvanian age (Stevenson, G. M.)

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*cyclothem*s: Cretaceous rhythmic bedding sequences; a plausible link between orbital variations and climate (Barron, Eric J., et al.)

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*deposition*: Pennsylvanian and Permian depositional systems and cycles in the Eagle Basin,

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*fluvial sedimentation*: Alluvial-fan sedimentation of the Cutler Formation (Permo-Pennsylvanian), near Gateway, Colorado (Mack, Greg H.)

— Mid-Cretaceous alluvial-plain incision related to eustasy, southeastern Colorado Plateau (Aubrey, W. M.)

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— Raton Basin magnetostratigraphy near Cretaceous-Tertiary boundary (Wolberg, Donald L., et al.)

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- Geology of Precambrian metasedimentary rocks of Lester Mountain, Colorado; a study of depositional environment, metamorphism and structure (White, Christine Anne)
  - environmental analysis*: Depositional environments of the Fox Hills Sandstone (Upper Cretaceous), Cheyenne Basin, Colorado (Nibbelink, Kenneth A.)
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  - models*: Application of a Holocene model to the depositional environment of the Tepee Zone of the Pierre Shale, Pueblo County, Colorado (Petta, Timothy Joseph)
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  - sorting*: Dynamics of bed armoring in response to changes in sediment supply (Thorne, Colin R., et al.)
  - volcaniclastics*: Early Proterozoic bimodal volcanic rocks in central Colorado, U.S.A.; Part I, Petrography, stratigraphy and depositional history (Boardman, Shelby J.)
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  - alpine environment*: Insolation-talus relationships, San Juan Mountains, Colorado (Hyers, Albert D.)
  - anaerobic environment*: Isotopic composition of pyrite; relationship to organic matter type and iron availability in some North American Cretaceous shales (Gautier, Donald L.)
  - arid environment*: Early diagenesis in arkose and paleoclimate (Suttner, Lee J.)
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  - coastal environment*: A regionally extensive altered air-fall ash for use in correlation of lithofacies in the Upper Cretaceous Williams Fork Formation, northeastern Piceance Creek and southern Sand Wash basins, Colorado (Brownfield, Michael E.)
  - Depositional environments of the upper Fountain and Ingleside formations between Lyons and Loveland, Colorado (Schatz, Barry Allen)
  - Depositional systems and geologic history of the lower part of the Fountain Formation, Manitou Embayment, Colorado (Langford, Richard P.)
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  - Preliminary basin analysis of Pictured Cliffs to Ojo Alamo sequence in western and southern San Juan Basin, New Mexico (Hunt, Adrian)
  - Repetitive Pennsylvanian (Upper Carboniferous) eolian quartz sandstone and shallow marine carbonate deposition, northern Utah and northwestern Colorado, U.S.A. (Driese, S. G., et al.)
  - Reservoir sedimentology of Mesaverde rocks at the MWX site (Lorenz, John C.)
  - Storm-dominated shoreface deposits, Sege Sandstone (Campanian), northwestern Colorado (Noe, David C.)
  - Vertically accreted foreshore to shoreface deposits of Sege Sandstone (Campanian), Northwest Colorado (Stancliffe, Richard)
  - deep-sea environment*: Recognizing organic mats in deep water environments (Williams, L. A.)
  - deltaic environment*: Depositional environments and diagenesis of D Sandstone, Wild Horse Field, Weld County, Colorado (Wilson, Kevin M.)
  - Early joints within penecontemporaneous slump blocks of the Eocene Uinta Formation, Piceance Creek basin, northwestern Colorado (Grout, Marilyn A.)
  - Fan-delta variations and associated shelf-bars, lower member of the Honaker Trail Formation (Desmoinesian), southwestern Colorado (Millberry, Kimberlee Whitney)
  - Fountain Formation near Canon City, Colorado; atypical stratigraphy and sedimentation (Shultz, Albert W.)
  - Preservation of ancient delta platform peripheral growth faults and gravity slumps, near Golden, Colorado (Vinckier, Thomas A., et al.)
  - Sedimentology of the Fountain fan-delta complex near Manitou Springs and Canon City, Colorado (Suttner, Lee J., et al.)
  - Sedimentology of the Fountain fan-delta complex near Manitou Springs, Colorado (Langford, Richard P.)
  - Stratigraphy & palynology of the Upper Lewis Shale, Pictured Cliffs Sandstone, & Lower Fruitland Formation (Upper Cretaceous) near Durango, CO (Manfrino, Carrie)
  - Stratigraphy and depositional environments of the Muddy Sandstone in North and Middle Parks basin, Jackson and Grand counties, Colorado (Murphy, W. Dale)
  - Stratigraphy of the Minturn Formation in northwestern Colorado (Irtem, Oguz)
  - The effect of depositional environment on framework mineralogy and diagenesis within a nonmarine-marine transition zone; the lower Fountain fan delta (Pennsylvanian), Manitou Springs, Colorado (Hood, Lindsay Ann)
  - Variations in shoreline sandstones from a Late Cretaceous interdeltaic embayment, Sege Sandstone (Campanian), northwestern Colorado (Noe, David Charles)
  - estuarine environment*: Estuarine and anastomosing fluvial systems of the lower Mesaverde Group, northwestern Colorado (Nelson, Katherine Helen)
  - fluvial environment*: A comparison of uranium-bearing sequences in the Newark Basin, Pennsylvania and New Jersey, and the San Juan Basin, New Mexico (Turner-Peterson, Christine E.)
  - Anastomosing and meandering fluvial systems, Mesaverde Group, (Campanian), northwestern Colorado (Payne, John Beckwith)
  - Changes in fluvial style from the Lytle Formation (Lower Cretaceous) of Middle Park Basin, north-central Colorado (Wineteer, Craig Brian)
  - Coal deposits in Cretaceous and Tertiary fluvial systems of the Rocky Mountain region (Flores, Romeo M.)
  - Depositional history of a vertebrate fossil locality near Lyons, Colo. (Clark, Peter)
  - Determination of textural signature and their relation to paleoenvironment for nine fluvial channel sequences from the Upper Cretaceous Mesaverde Group of Piceance Creek Basin, northwestern, Colorado (North, Robert)
  - Determination of widths of meander-belt sandstone reservoirs from vertical downhole data (Lorenz, John C.)
  - Early Tertiary paleogeography and paleotectonics of the San Juan Basin area, New Mexico and Colorado (Fassett, James E.)
  - Estuarine and fluvial systems, lower Mesaverde Group (Campanian), northwestern Colorado (Nelson, Katherine)
  - Field Trip 4; Guide to the field study of alluvial fan and fan-delta deposits in the Fountain Formation (Pennsylvania-Permian), Colorado (Suttner, L. J., et al.)
  - Field Trip 5; Holocene bradied streams of eastern Colorado and sedimentological effects of Lawn Lake Dam failure, Rocky Mountain National Park (Harvey, M. D., et al.)
  - Flood sedimentation in bedrock fluvial systems (Baker, Victor R.)
  - Fluvial sedimentology of the Mesaverde Formation as revealed in continuous subsurface core (Lorenz, John C.)
  - Fluvial transitions and paleogeography in upper part of Maroon Formation (Pennsylvanian and Permian), northwestern Colorado (Johnson, Samuel Y.)
  - Geomorphologic and sedimentologic features of the Lawn Lake Dam failure, Rocky Mountain National Park, Colorado (Costa, John E.)
  - Lithofacies relationships and depositional environment of the Tertiary Ojo Alamo Sandstone and related strata, San Juan Basin, New Mexico and Colorado (Sikkink, Pamela G. L.)
  - Medano Creek, Colorado, a model for upper-flow-regime fluvial deposition (Langford, Richard P.)
  - Modern and ancient fluvial-eolian interactions (Langford, Richard Parker)
  - Oligocene paleogeography in the southern Denver Basin (Morse, David G.)

- Paleoclimatic implications of fluvial deposits and nonmarine mollusks in Pleistocene terraces along the White River, near Meeker, Colorado (Evanoff, Emmett)
- Paleoenvironmental analysis of the Ralston Creek Formation within the Canon City Embayment, Canon City, Colorado (Carter, Michael Howard)
- Paleohydraulic parameters of a Morrowan point-bar complex, Salt Lake and Haswell fields, Kiowa County, Colorado (Wingate, Thomas P.)
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- Reservoir characteristics of ancient fluvial deposits with emphasis on Rocky Mountain and Midcontinent regions (Ehrhridge, Frank G.)
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- interpretation:* Mysteries in mud; ancient frost crystal impressions and other curiosities in Cave of the Winds (Davis, Donald G.)
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- Natural gamma-ray spectrometry, lithofacies, and depositional environments of selected Upper Cretaceous marine mudrocks, Western United States, including Tropic Shale and Tununk Member of Mancos Shale (Zelt, Frederick Bruce)
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- nearshore environment:* Depositional and diagenetic history of a carbonate unit within the lower member of the Honaker Trail Formation (Pennsylvanian), San Juan Mountains, Colorado (Reich, Matthew A.)
- Depositional history and petrography of the Todilto Formation (Jurassic), New Mexico and Colorado (McCrary, Megan Marie)
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- Geometry and depositional environments of Fruitland Formation coalbeds, San Juan Basin, New Mexico and Colorado: anatomy of a giant coal-bed methane deposit (Fassett, J. E.)
  - Selected trace element anomalies in a Front Range bog, Larimer County, Colorado (Sarnecki, Joseph C.)
- periglacial environment*: Silt translocation in alpine soils; a periglacial phenomenon? (Burns, Scott F.)
- reefs*: Platy algal reef mounds, Paradox Basin (Choquette, Philip W.)
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  - Marine-shelf bar sand/channelized sand shingled couplet, Terry Sandstone Member of Pierre Shale, Denver Basin, Colorado (Siemers, C. T.)
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  - Velocity profile, water-surface slope, and bed-material size for selected streams in Colorado (Marchand, Jean P., et al.)
  - Verification of paleohydraulic reconstruction (Costa, John E.)
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- Turbidite fans in Upper Cretaceous Pierre Shale, Eagle Basin, Colorado; a new reservoir facies (Krystinik, Lee F.)
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- Chronology and sedimentology of some North American cold climate dune fields (Ahlbrandt, Thomas S.)
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  - Dune form and structure at Great Sand Dunes National Monument, Colorado (Merk, George)
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- Grain-size distribution of the insoluble component of contemporary eolian deposits in the alpine zone, Front Range, Colorado, U.S.A. (Thorn, Colin E.)
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- mud:** Mudflows of Mt. Princeton/Chalk Creek, Chaffee County, Colorado (Dillon, Glen D.)
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- Quaternary glacial geology of the Crested Butte area, Gunnison County, Colorado (Dea, Peter A.)
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- Paleosols:** Amino acids in soil; concentrations, isoleucine epimerization and geological applications (Forman, Steven L., et al.)
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- fluvial environment:** Estes Park Flood; sedimentary and hydraulic character of an alluvial fan flood deposit (Hoyt, William H.)

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- peat:** Sources of dissolved humic substances of a subalpine bog in the Boulder watershed, Colorado (Caine, Jennifer M.)

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- magnetic properties:** Paleomagnetism of two late Pleistocene lake basins in Colorado; an evaluation of detrital remanent magnetization as a recorder of the geomagnetic field (Rosenbaum, J. G.)

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— Grain-size sampling and characterization of eolian lag surfaces within alpine tundra, Niwot Ridge, Front Range, Colorado, U.S.A. (Thorn, Colin E.)

— Interpretation of sediment data for the South Platte River in Colorado and Nebraska, and the North Platte and Platte rivers in Nebraska (Kircher, J. E.)

— Particle size and clay mineral distributions within sorted and nonsorted circles and the surrounding parent material, Niwot Ridge, Front Range, Colorado, U.S.A. (Rissing, Joseph M.)

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**Sego Sandstone**

Anastomosing and meandering fluvial systems, Mesaverde Group, (Campanian), northwestern Colorado (Payne, John Beckwith)

— Appropriate stratigraphic nomenclature for coal reservoirs in Piceance Basin, Colorado (Decker, David)

— Book Cliffs coal field, western Colorado (Young, Robert G.)

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— Effect of sediment supply on embayed shoreline deposits, Cretaceous (Campanian), northwestern Colorado (Stancliffe, R.)

— Estuarine and anastomosing fluvial systems of the lower Mesaverde Group, northwestern Colorado (Nelson, Katherine Helen)

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— Quaternary geology and neotectonics of the west flank of the northern Sangre de Cristo Mountains, south-central Colorado (McCalpin, James)

— Relation of seismicity to Cenozoic igneous activity in central and western Colorado (Warner, L. A.)

— Seismic design considerations in the central Front Range in Colorado (Butler, David)

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— Strain rates, stress distribution and seismic potential in central Colorado (Warner, L. A.)

— Tectonic stresses in Colorado and their implications to seismicity (Wong, Ivan G.)

— The 14 August 1983 Cimarron, Colorado earthquake and the Cimarron Fault (Wong, Ivan G.)

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— Seismotectonic evaluation of the Dudley Gulch Graben in the Piceance Creek basin (Clift, Anne Eckert)

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- Shannon Sandstone Member**
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- Sharon Springs Member**
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- Diagenetic facies of the Sharon Springs Member of the Pierre Shale (Cretaceous), Denver Basin (Gautier, Donald L.)
  - Gamma-ray spectrometry of the Sharon Springs Member of the Pierre Shale near Canon City, Colorado (Zelt, F. B.)
  - Late Cretaceous (Campanian-Maastrichtian) diatoms from the Pierre Shale, Wyoming, Colorado and Kansas (Bergstresser, Thomas J.)
  - Natural gamma-ray spectrometry, lithofacies, and depositional environments of selected Upper Cretaceous marine mudrocks, Western United States, including Tropic Shale and Tununk Member of Mancos Shale (Zelt, Frederick Bruce)
  - Origin and source-rock potential of the Sharon Springs Member of the Pierre Shale, Colorado and Kansas (Gautier, Donald L., et al.)
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  - Triassic and Jurassic vertebrate-dominated trace fossil assemblages of the Cimarron Valley region; implications for paleoecology and biostratigraphy (Conrad, Kelly, et al.)
- Sherman Granite**
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  - Petrogenesis of the Silver Plume, Log Cabin and Sherman granites, Colorado and Wyoming (Fountain, J. C., et al.)
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  - Reconnaissance geologic mapping in north-central Colorado using multispectral gamma-ray data (Moll, Stanton H.)
  - Relationship between structure and mineralogy of the Sherman Granite, southern part of the Laramie Range, Wyoming—Colorado (Harrison, Jack Edward)
  - U—Th—Pb systematics of zircon inclusions in rock-forming minerals; a study of armoring against isotopic loss using the Sherman Granite of Colorado—Wyoming, USA (Aleinikoff, John N.)

**Shinarump Member**

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**Sierra Madre Granite**

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— Zircon geochronology of Precambrian rocks in southeastern Wyoming and northern Colorado (Premo, Wayne R.)

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**silver—geochemistry**

*metal ores:* Trace element distribution around precious/base metal veins, Idaho Springs Dist., CO (Budge, Suzanne)

*rocks:* Maps showing anomaly patterns for silver, molybdenum, lead, and zinc in altered rocks and soils, Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

**silver ores** *see under* economic geology; mineral deposits, genesis; paragenesis

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**silver ores—affinities**

*trace elements:* Three major types of epithermal precious-metal deposits (Bonham, Harold F., Jr.)

**silver ores—mineral exploration**

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— Characteristics that distinguish types of epithermal deposits (Hayba, D. O., et al.)

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**Silver Plume Granite**

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— Analytical data on the crystalline rocks of the Strawberry Lake area, Grand County, Colorado (Young, Edward J.)

— Distribution of rubidium, strontium, zirconium and iron of Porphyry Mountain and age of the Silver Plume Granite, Jamestown, Colorado (Solter, Donald D.)

— Excess unsupported  $^{210}\text{Pb}$  in lake sediment from Rocky Mountain lakes; a groundwater effect (Norton, Stephen A., et al.)

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— Granite of Silver Plume type; a possible source of the uranium in deposits of the Tallahassee Creek and High Park areas, Fremont

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— Hydrochemical characterization of alpine and alpine-subalpine stream waters, Colorado Rocky Mountains, U.S.A. (Stednick, J. D.)

— Interpretation of aeromagnetic data over the northern Front Range of Colorado (Moll, S. H.)

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— Paleomagnetism of the Red Mountain intrusive complex (Henderson molybdenum deposit), Empire, Colorado (Graaskamp, G. W., et al.)

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— Reversal of normal role of thorium in fractional crystallization (Phair, George)

— Tabulation of modal and chemical analyses for Silver Plume Quartz Monzonite (Silver Plume Granite), Berthoud Plutonic Suite, Front Range, Colorado (Gable, Dolores J.)

— The petrology of Tertiary intrusions associated with epithermal veins in the Georgetown-Silver Plume District; Clear Creek County, Colorado (Connors, Katherine A.)

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**Skull Creek Shale**

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— Hydrocarbon generation in Lower Cretaceous Mowry and Skull Creek shales of the northern Rocky Mountain area (Burtner, R. L.)

— Regional paleotopographic trends and production, Muddy Sandstone (Lower Cretaceous), Montana, Wyoming, Colorado (Dolson, John C., et al.)

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— Stratigraphy of the Codell Sandstone and Juana Lopez members of the Carlile Formation

(Upper Cretaceous), El Paso and Fremont counties, Colorado (Aulia, Karsani)

— Wattenberg Field; a review (Matuszczak, R. A.)

**Slate River Moraine**

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**Sloan Canyon Formation**

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— Copper deposits in Sheep Pen Sandstone (Triassic) in Cimarron County, Oklahoma, and adjacent parts of Colorado and New Mexico (Fay, Robert O.)

— Dinosaur trackways (Lockley, Martin G.)

— The Triassic System in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Lucas, Spencer G., et al.)

— Triassic and Jurassic vertebrate-dominated trace fossil assemblages of the Cimarron Valley region; implications for paleoecology and biostratigraphy (Conrad, Kelly, et al.)

— Triassic stratigraphy in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Lucas, Spencer G., et al.)

**Sloan Diatreme**

Chrome pyrope from the Sloan Diatreme, Colorado, showing color change with thickness and type of illumination (Collins, Donley S.)

**Sloan Ranch Complex**

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**Smoky Hill Chalk Member**

An integrated geochemical and paleoecological approach to petroleum source rock evaluation, lower Niobrara Formation (Cretaceous), Lyons, Colorado (Barlow, Lisa K.)

— Authigenic kaolinite and associated pyrite in the Cretaceous Smoky Hill chalk member of the Niobrara Formation, eastern Colorado (Pollastro, Richard M.)

— Depositional cycles in the Niobrara Formation, Colorado Front Range (Barlow, Lisa K.)

— Event stratigraphy, paleoenvironments, and petroleum source rock potential of the lower Niobrara Formation (Cretaceous), northern Front Range, Colorado (Barlow, Lisa Katharine)

— Foraminifera of the Storm King Mountain Shale Member, Mancos Shale, western Colorado (Von Holdt, Laura Lynn)

— High-resolution stratigraphic correlations and geochemical analyses, Cretaceous Niobrara Formation, northwestern Denver-Julesburg Basin (Rodriguez, T. E.)

— Inorganic and organic geochemical cycles in petroleum source rocks of the Cretaceous

## Snowshoe Mountain Tuff

- Western Interior seaway; records of paleoceanographic change (Dean, Walter E., et al.)
- Integrated geochemical and paleoecological approach to petroleum source rock evaluation, Cretaceous Niobrara Formation, Lyons, Colorado (Barlow, L. K.)
  - Isotopic and sedimentological study of the lower Niobrara Formation, Lyons, Colorado (Pratt, Lisa M.)
  - Organic and inorganic constituents of the Niobrara Formation in Weld County, Colorado (Precht, William F.)
  - Petroleum potential of Niobrara Formation in Denver Basin (Hann, Megan)
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  - Shallow gas fields in high porosity chalk; an independent's exploration strategy (Lockridge, John P.)
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  - Whole-rock, insoluble residue, and clay mineralogies of marl, chalk, and bentonite, Smoky Hill Shale Member, Niobrara Formation near Pueblo, Colorado; depositional and diagenetic implications (Pollastro, Richard M.)

## Snowshoe Mountain Tuff

- Common-Pb isotopic characteristics of central San Juan ash flow tuffs (Matty, David J., et al.)
- Correlation of late crystal-rich tuffs from the central San Juan caldera cluster, Colorado (Sawyer, D. A., et al.)
  - High-resolution  $^{40}\text{Ar}/^{39}\text{Ar}$  chronology of Oligocene volcanic rocks, San Juan Mountains, Colorado (Lanphere, Marvin A.)
  - Magmatic conditions of the Snowshoe Mountain Tuff, central San Juan volcanic field, Colorado (Matty, David J., et al.)
  - Mineralogy, petrology, and magmatic conditions from the Fish Canyon Tuff, central San Juan volcanic field, Colorado (Whitney, James A.)
  - The Mammoth Mt. Tuff and other shallow zoned rhyolitic ash-flow tuffs, central San Juan volcanic field (Krause, Karen W., et al.)

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- Tectonic implications from U-Pb dating of detrital zircons from the early Proterozoic terrane of the Central Rocky Mountains (Aleinikoff, John N., et al.)

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- connate waters*: Geochemical techniques applied to the identification and disposal of connate coal water (Decker, A. D., et al.)
- ground water*: Thermodynamic controls on quality of water from underground coal mines in Colorado (Turk, John T.)
- igneous rocks*: The concentration and transport of molybdenum in magmatic systems, experimental evidence (Tingle, Tracy N.)
- weathering*: Dissolved mineral salts derived from Mancos Shale (Evangelou, V. P., et al.)

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## soil mechanics—field studies

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## soil mechanics—materials, properties

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- isotropic materials*: Constitutive model for (geological) materials (Desai, Chandrakant S.)
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  - Amino acids in soil; concentrations, isoleucine epimerization and geological applications (Forman, Steven L., et al.)
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  - Geochemical variability of soils and plants in the Piceance Basin, Colorado (Tuttle, Michele, et al.)
  - Geochemistry of alpine soils in the Colorado Front Range, with special reference to acid deposition (Litaor, Michael Iggy)
  - Radon in earth-sheltered structures (Landa, Edward R.)
  - Soil solution chemistry in an alpine watershed, Front Range, Colorado, U.S.A. (Litaor, M. Iggy)
  - Soil test phosphorus and solubility relationships in Calcareous soils (Havlin, J. L.)
  - Solubility relationships of fluorine minerals in soils (Elrashidi, M. A.)
  - The nature of precipitation, soil, and surface-water chemistry in a subalpine ecosystem (Baron, Jill)
  - The solubility product of soil maghemite (Sadiq, Muhammad)
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  - Pedologic evidence for Holocene treeline 100 meters above its present upper limit in the Colorado Rocky Mountains (Shroba, Ralph R.)
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- surveys*: Factors controlling soil moisture and evapotranspiration within alpine vegetation communities; Niwot Ridge, Colorado Front Range (Isard, Scott Alan)
- water regimes*: Hydraulic conductivity of mountain soils (Williams, Owen R., et al.)

- Solute movement on hillslopes in the alpine environment of the Colorado Front Range (Dixon, John C.)
- soils—geochemistry**  
*radon*: Track etch radon ratios to soil uranium and a new uranium abundance estimate (Alter, H. Ward)
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*models*: Soil-geomorphic models and the spatial distribution and development of alpine soils (Burns, Scott F.)
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- soils—surveys**  
*Boulder County*: Aluminum chemistry; fractionation, speciation, and mineral equilibria of soil interstitial water of an alpine watershed, Front Range, Colorado (Litaor, M. Iggy)  
 — Holocene alpine soils in gneissic cirque deposits, Colorado Front Range (Birkeland, P. W., et al.)  
 — Plutonium-239 contamination in the Denver area; discussion (Krey, Philip W.)  
*Chaffee County*: Copper in soil samples downslope from copper-tungsten mine tailings, Cleora District, Chaffee County, Colorado (Cepeda, Joseph C.)  
 — Geology of archeological sites in Middle Cottonwood Creek valley and Taylor Park, Chaffee and Gunnison counties, Colorado (Madole, Richard F.)  
*Clear Creek County*: Geochemical and mineralogical data for altered rocks and soils collected in and near the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)  
 — Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridgetop soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)  
*Colorado*: A helium exploration survey in the Animas Valley, Colorado (McCarthy, Kevin P.)  
 — Acid neutralizing processes in an alpine watershed, Front Range, Colorado, U.S.A.: I. Buffering capacity of dissolved organic carbon in soil solutions (Litaor, M. Iggy)  
 — Amino acids in soil; concentrations, isoleucine epimerization and geological applications (Forman, Steven L., et al.)  
 — An automated manometric method for quantitative determination of calcite and dolomite (Evangelou, V. P., et al.)  
 — Application of a new technique for the detection and analysis of low concentrations of contaminants in soil (Voorhees, Kent J., et al.)  
 — Biogeochemistry of C, N, and P in a soil catena of the shortgrass steppe (Schimel, D., et al.)  
 — Chemical weathering of late Quaternary cirque deposits in the Colorado Front Range (Dixon, John Charles)  
 — Colorado; the legacy of uranium mining (Hazle, Albert J.)  
 — Cultivation and slope position effects on soil organic matter (Woods, L. E.)  
 — Development of a DTPA soil test for zinc, iron, manganese, and copper (Lindsay, W. L.)  
 — Dissolution and desorption rates of calcium and magnesium from Mancos Shale (Evangelou, V. P., et al.)  
 — Distribution of exposed limonitic rocks and soils from Landsat multispectral scanner data on the Southern Ute Indian Reservation, southwestern Colorado (Knepper, Daniel H., Jr.)  
 — Environmental influences upon mercury, radon and helium concentrations in soil gases at a site near Denver, Colorado (Klusman, Ronald W.)  
 — Extractable Fe and Al in late Pleistocene and Holocene Paleosols on Niwot Ridge, Colorado Front Range (Mahaney, W. C.)  
 — Factors controlling soil moisture and evapotranspiration within alpine vegetation communities; Niwot Ridge, Colorado Front Range (Isard, Scott Alan)  
 — Field descriptions and laboratory data for a Quaternary soil sequence in the Golden-Boulder portion of the Colorado Piedmont (Machette, M. N., et al.)  
 — Field measurements of in situ <sup>222</sup>Rn concentrations in soil based on the prompt decay of the <sup>214</sup>Bi counting rate (Stieff, L. R., et al.)  
 — Forest fire and the natural soil erosion regime in the Colorado Front Range (Morris, Scott E.)  
 — Fungi as potential indicators of periglacial soils (Christensen, Martha)  
 — Geoarchaeology and late Quaternary geomorphology of the middle South Platte River, northeastern Colorado (Holliday, Vance T.)  
 — Geochemical variability of soils and plants in the Piceance Basin, Colorado (Tuttle, Michele, et al.)  
 — Geochemistry of alpine soils in the Colorado Front Range, with special reference to acid deposition (Litaor, Michael Iggy)  
 — Geologic factors in the evaluation of water pollution potential at mountain dwelling sites (Burns, L. K., et al.)  
 — Geomorphic age and genesis of some San Luis Valley, Colorado, soils (Nettleton, W. D., et al.)  
 — Geomorphic and lithologic controls of diffuse-source salinity, Grand Valley, western Colorado (Johnson, Richard K.)  
 — Hydraulic conductivity of mountain soils (Williams, Owen R., et al.)  
 — Influence of eolian sediments on Alpine soil development (Burns, Scott F.)  
 — Influence of mine tailing particle density on pipette procedures (Shetron, S. G.)  
 — Late Quaternary stratigraphy, South Platte River, Two Forks area, east-central Front Range, Colorado (Shlemon, Roy J.)  
 — Location of irrigation wells and application rates for irrigated cropland during 1980 in the Northern High Plains of Colorado (Borman, R. G.)  
 — Lower Gunnison Basin unit (U. S. Bureau of Reclamation, Grand Junction Projects Office)  
 — Movement of ice-cemented rock glaciers by hydrostatic pressure: an example from Mount Mestas, Colorado (Giardino, J. R.)  
 — Overland flow and sediment delivery: an experiment with small subdrainage in southwestern Ponderosa pine forests (Colorado, U.S.A.) (Heede, Burchard H.)  
 — Plutonium distribution in Rocky Flats soil (Little, C. A.)  
 — Radon in earth-sheltered structures (Landa, Edward R.)  
 — Remote plutonium contamination and total inventories from Rocky Flats; discussion (Merrill, G. L., Jr., et al.)  
 — Sample design and analysis for regional geochemical studies (Klusman, R. W.)  
 — Sampling soil vapors to detect subsurface contamination; a technique and case study (Nadeau, Royal J., et al.)  
 — Silt translocation in alpine soils; a periglacial phenomenon? (Burns, Scott F.)  
 — Size characteristics of plutonium particles in Rocky Flats soil (McDowell, L. M.)  
 — Soil properties and loess mantles as age indicators for Holocene deposits in alpine and semiarid areas of Colorado and Utah (Shroba, Ralph R.)  
 — Soil solution chemistry in an alpine watershed, Front Range, Colorado, U.S.A. (Litaor, M. Iggy)  
 — Soil stratigraphy related to daub features of the Windy Gap archaeological site, 5GA151, Granby, Colorado (Burns, Scott F.)  
 — Soil test phosphorus and solubility relationships in Calcareous soils (Havlin, J. L.)  
 — Solubility relationships of fluorine minerals in soils (Elrashidi, M. A.)  
 — Solute movement on hillslopes in the alpine environment of the Colorado Front Range (Dixon, John C.)  
 — The Fourth of July Valley; glacial geology and archeology of the timberline ecotone (Benedict, James B.)  
 — The Frazier Site, Colorado (Wormington, H. M.)  
 — The influence of eolian dust on the genesis of alpine soils in the Front Range, Colorado (Litaor, M. Iggy)  
 — The nature of precipitation, soil, and surface-water chemistry in a subalpine ecosystem (Baron, Jill)  
 — The solubility product of soil maghemite (Sadiq, Muhammad)  
 — The spatial variation of soil loss and soil loss controls (Bovis, Michael J.)  
 — Uranium-trend dating and soil B horizon properties of till of Bull Lake age, North St. Vrain drainage basin, Front Range, Colorado (Shroba, Ralph R., et al.)  
 — Using organo-cutans in subalpine soils as indicators of a past lower treeline (Burns, Scott F.)  
*Denver County*: Soil survey of Golden area, Colorado, parts of Denver, Douglas, Jefferson, and Park counties (Price, Alan B.)  
*Dolores County*: Selected properties, distribution, source, and age of eolian deposits and soils of Southwest Colorado (Price, A. B., et al.)  
*Douglas County*: Soil survey of Golden area, Colorado, parts of Denver, Douglas, Jefferson, and Park counties (Price, Alan B.)  
*Garfield County*: Geochemical variability of soils and biogeochemical variability of plants in the Piceance Basin, Colorado (Tuttle, M. L., et al.)

- Soil survey of Rifle area, Colorado; parts of Garfield and Mesa counties (Harman, Jerry B.)
  - Grand County:** Aluminum chemistry; fractionation, speciation, and mineral equilibria of soil interstitial water of an alpine watershed, Front Range, Colorado (Litaor, M. Iggy)
  - Geochemical and mineralogical data for altered rocks and soils collected in and near the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
  - Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates derived from stream sediments and ridgetop soils from the upper Keyser Creek basin in the St. Louis Peak Roadless Area, Grand County, Colorado (Barton, H. N.)
  - Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridgetop soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)
  - Holocene alpine soils in gneissic cirque deposits, Colorado Front Range (Birkeland, P. W., et al.)
  - Relative dating and soils of late Quaternary deposits, Devil's Thumb Lake valley, Colorado Front Range (Albino, Katharine Chase)
  - Soil survey of Grand County area, Colorado (Alstatt, David)
  - Great Plains:** Mapping irrigated cropland from Landsat data for determination of water use from the High Plains Aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming (Thelin, Gail P.)
  - Potential selenium problems in Great Plains soils (Boon, David Y.)
  - Gunnison County:** Analytical results and sample locality map of stream-sediment, soil, heavy-mineral-concentrate, and rock samples from the Maroon Bells-Snowmass Wilderness, Gunnison and Pitkin counties, Colorado (McHugh, J. B., et al.)
  - Geology of archeological sites in Middle Cottonwood Creek valley and Taylor Park, Chaffee and Gunnison counties, Colorado (Madole, Richard F.)
  - Hinsdale County:** Quaternary deposits and soils in the Durango area, southwestern Colorado (Gillam, Mary L., et al.)
  - Road Log; Quaternary deposits and soils in the Durango area, southwestern Colorado (Moore, David W.)
  - Huerfano County:** Soil survey of Huerfano County area, Colorado (McCullough, M. Bruce, et al.)
  - Jefferson County:** Investigation of the Ken Caryl Fault at the Ken Caryl Trench Fault, Indian Hills Quadrangle, Colorado (Dickson, Peter A.)
  - Investigation of the Kennedy Gulch Fault at Reynolds Park (Yadon, Douglas M.)
  - Soil survey of Golden area, Colorado, parts of Denver, Douglas, Jefferson, and Park counties (Price, Alan B.)
  - La Plata County:** Quaternary alluvial deposits and soil formation, lower Animas River area, Colorado and New Mexico (Gillam, Mary L., et al.)
  - Quaternary deposits and soils in the Durango area, southwestern Colorado (Gillam, Mary L., et al.)
  - Road Log; Quaternary deposits and soils in the Durango area, southwestern Colorado (Moore, David W.)
  - Mesa County:** Geochemical variability of soils and biogeochemical variability of plants in the Piceance Basin, Colorado (Tuttle, M. L., et al.)
  - Soil survey of Rifle area, Colorado; parts of Garfield and Mesa counties (Harman, Jerry B.)
  - Mineral County:** Use of the chloride ion in determining hydrologic-basin water budgets; a 3-year case study in the San Juan Mountains, Colorado, U.S.A. (Claassen, Hans C., et al.)
  - Montezuma County:** Selected properties, distribution, source, and age of eolian deposits and soils of Southwest Colorado (Price, A. B., et al.)
  - Otero County:** Soil survey of Otero County, Colorado (Larsen, Roy J., et al.)
  - Park County:** Soil survey of Golden area, Colorado, parts of Denver, Douglas, Jefferson, and Park counties (Price, Alan B.)
  - Pitkin County:** Analytical results and sample locality map of stream-sediment, soil, heavy-mineral-concentrate, and rock samples from the Maroon Bells-Snowmass Wilderness, Gunnison and Pitkin counties, Colorado (McHugh, J. B., et al.)
  - Rio Blanco County:** Electron titration as a technique to study iron and manganese redox transformations in soils (Sadiq, Muhammad)
  - Geochemical variability of soils and biogeochemical variability of plants in the Piceance Basin, Colorado (Tuttle, M. L., et al.)
  - Routt County:** Soil-water hydrology and geochemistry of a coal spoil at a reclaimed surface mine in Routt County, Colorado (Williams, Robert S., Jr.)
  - Saguache County:** Relative mobility of lead and copper in soils; an example from the Bonanza District, Saguache County, Colorado (Cepeda, Joseph C.)
  - Soil survey of Saguache County area, Colorado (Yenter, James M.)
  - San Juan County:** Quaternary alluvial deposits and soil formation, lower Animas River area, Colorado and New Mexico (Gillam, Mary L., et al.)
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  - Summit County:** Geochemical and mineralogical data for altered rocks and soils collected in and near the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)
  - Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridgetop soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)
  - United States:** General soil maps of the United States (Gennadiyev, A. N.)
  - Hydrologic characteristics of soils in parts of Arkansas, Colorado, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, South Dakota, and Texas (Dugan, Jack T.)
  - Using geology to map and understand radon hazards in the United States (Otton, James K.)
  - Washington County:** Soil survey of Washington County, Colorado (Petersen, Michael L., et al.)
  - Topsoil removal effects on soil chemical and physical properties (Greb, B. W.)
  - Weld County:** Geoarchaeology and late Quaternary geomorphology of the middle South Platte River, northeastern Colorado (Holliday, Vance T.)
  - Geology of the Frazier Site, Kersey, Colorado (Malde, Harold E.)
  - Western U.S.:** The Oligocene rodent *Ischyromys* in relation to the Paleosols of the Brule Formation (Howe, John Alfred)
- soils—water regimes**
- irrigation:** Conjunctive use of groundwater and surface water for irrigated agriculture; risk aversion (Bredehoeft, John D.)
  - movement:** Use of rainfall-simulator data in precipitation-runoff modeling studies (Lusby, G. C.)
- solution features see under geomorphology**
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- South Mountain Latite**
- Genesis of acid-sulfate alteration and Au-Cu-Ag mineralization at Summitville, Colorado (including sections on supergene alteration and clay mineralogy of the deposit) (Stoffregen, Roger Eben)
- South Platte Formation**
- Chemical fractionation and evolution of the South Platte pegmatite suite, Jefferson County, Colorado (Simmons, W. B., et al.)
- South Table Mountain Lavas**
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- Southwestern U.S.—areal geology**
- San Juan Basin:** San Juan GIS project (Crane, Michael P.)
- Southwestern U.S.—economic geology**
- fuel resources:** Oil and gas developments in Four Corners-Intermountain area in 1982 (Stevenson, Gene M.)
  - gold ores:** Mining methods in underground gold and silver mines in the Southwestern United States (Helms, W.)
  - lead-zinc deposits:** Heat and fluid flow in the Rio Grande Rift; a possible modern thermal analogue of a mississippi valley type ore-forming system (Morgan, P., et al.)

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- silver ores*: Mining methods in underground gold and silver mines in the Southwestern United States (Helms, W.)
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- Southwestern U.S.—environmental geology**  
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- Southwestern U.S.—geochemistry**  
*crust*: Pb isotopic evidence for the formation of Proterozoic crust in the Southwestern United States (Wooden, J. L., et al.)  
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- Southwestern U.S.—hydrogeology**  
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- Southwestern U.S.—paleontology**  
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- Southwestern U.S.—sedimentary petrology**  
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*archaeology*: Archaeomagnetic paleointensity in the American Southwest during the past 2000 years (Sternberg, Robert S.)  
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 — Quaternary pollen analysis and vegetational history of the Southwest (Hall, Stephen A.)
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*tectonics*: Evolving parallel tectonic styles in adjacent Proterozoic crustal provinces of the southwestern United States (Condie, Kent C.)  
 — Geophysical constrains on the development of Rio Grande rift (Morgan, P., et al.)  
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- Southwestern U.S.—tectonophysics**  
*isostasy*: Tectonic controls of late Paleozoic subsidence in the south central United States (Coldstein, Arthur)  
*mantle*: Upwarp of anomalous asthenosphere beneath the Rio Grande Rift (Parker, E. C., et al.)  
*plate tectonics*: Early Proterozoic arc terranes and continental accretion in the Southwestern United States (Condie, Kent C.)
- spectrometry** *see* spectroscopy
- spectroscopy** *see* chemical analysis; X-ray analysis
- spectroscopy—emission spectroscopy**  
*trace-element analyses*: A new method of analysis for trace elements in gold-silver deposits; comparison with Lake City data (Sanford, Richard F.)
- spectroscopy—mass spectroscopy**  
*applications*: Characterization of airborne particulates from western Colorado oil shale lands by pyrolysis mass spectrometry (Malley, Michael J.)  
*techniques*: Analysis of groundwater contamination by a new surface static trapping/mass spectrometry technique (Voorhees, Kent J., et al.)  
 — Quantitative analysis of fluid-inclusion gases; applications to studies of ore deposits (Landis, G. P., et al.)
- spectroscopy—techniques**  
*applications*: Spectral reflectance of carbonates and related alkalic igneous rocks; selected samples from four North American localities (Rowan, Lawrence C., et al.)
- speleology** *see* caves
- Spergen Formation**  
 Tectonic and sedimentation model for Morrow Sandstone deposition, Sorrento Field area, Denver Basin, Colorado (Sonnenberg, Stephen A.)  
 — Upper Mississippian grainstone reservoirs in the Ladder Creek Field area, Cheyenne County, Colorado (Canter, Karen Lyn)
- Spermatophyta—paleoecology**  
*Oligocene*: An evaluation of the methods for estimating paleoaltitudes using Tertiary floras from the Rio Grande Rift vicinity, New Mexico and Colorado (Meyer, Herbert William)
- sponges—biostratigraphy**  
*Pennsylvanian*: A field guide to the Pennsylvanian biofacies of the Minturn Formation, Bond-McCoy area, central Colorado Trough (Houck, Karen J.)
- spores** *see* palynomorphs
- springs** *see* ground water  
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- Squamata** *see under* Reptilia
- Stanaker Formation**  
 Stratigraphy of the Upper Triassic Stanaker formations of the eastern Uinta Mountain area, northeastern Utah and northwestern Colorado (Sikich, S. W.)
- standard materials—igneous rocks**  
*tuff*: Fission-track dating calibration of the Fish Canyon Tuff standard in French reactors (Carpe#2.na, J.)
- standard materials—preparation**  
*water*: The use of natural waters as U.S. Geological Survey reference samples (Janzer, V. J.)
- State Bridge Siltstone**  
 A paleomagnetic investigation of the Permian-Carboniferous Maroon and Upper Permian-Lower Triassic State Bridge formations in north-central Colorado (Christensen, F. Deon)  
 — Late Paleozoic stratigraphy and syndepositional tectonism, Northwest Colorado (De Voto, Richard H., et al.)  
 — Stratigraphic and sedimentologic studies of late Paleozoic strata in the Eagle Basin and northern Aspen Sub-basin, Northwest Colorado (Johnson, Samuel Y.)  
 — Structural reinterpretation of Ruedi and Woody Creek quadrangles, Pitkin and Eagle counties, Colorado; a central Colorado overthrust belt (Zoerner, Frederick P.)  
 — The Fryngpan Member of the Maroon Formation; a Lower Permian(?) basin-margin dune field in northwestern Colorado (Johnson, Samuel Y.)



## Stockade Beaver Shale Member

- Thermal maturity and hydrocarbon source-rock potential of the Eagle Basin, northwestern Colorado (Nuccio, Vito F.)

## Stockade Beaver Shale Member

Middle Jurassic age of the fish-bearing horizon in the Cañon City Embayment, Colorado (Schultze, Hans-Peter)

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## Storm King Mountain Shale Member

Foraminifera of the Storm King Mountain Shale Member, Mancos Shale, western Colorado (Von Holdt, Laura Lynn)

## stratigraphy

*archaeology*: A brief history of Lindenmeier (Anderson, Adrienne B.)

— A partial muskox skeleton from eolian deposits, Southwest Colorado (Clay, Vickie L.)

— Age and paleoclimatic significance of Holocene sand dunes in northeastern Colorado (Muhs, Daniel R.)

— Arapaho Pass; glacial geology and archeology at the crest of the Colorado Front Range (Benedict, James B.)

— Archaeological geology in the Colorado Piedmont and High Plains of southeastern Wyoming (Holliday, Vance T.)

— Archaeomagnetism and magnetic anomalies in the American Southwest (Sternberg, Robert S.)

— Chronology and sedimentology of some North American cold climate dune fields (Ahlbrandt, Thomas S.)

— Colorado site yields valuable information on Folsom hunters (Harney, Thomas)

— Geoarchaeology and late Quaternary geomorphology of the middle South Platte River, northeastern Colorado (Holliday, Vance T.)

— Geological significance of a new radiocarbon date from the Lindenmeier Site (Haynes, C. Vance)

— Lichenometric dating of tundra game-drive structures (Benedict, James B.)

— Man and environment in the Dolores River valley, SW Colorado; some pollen evidence (Petersen, Kenneth Lee)

— New radiocarbon dates for some old Folsom sites using accelerator technology (Haynes, C. Vance, Jr., et al.)

— Origin of Haystack Cave; an archeologic site near Gunnison, Colo. (Burns, Lary K., et al.)

— Petrographic analysis of possible early daub from the Windy Gap Site, 5GA151, Granby, Colorado (Kamilli, Diana C.)

— Review of the Dent mammoth site (Cassells, E. Steve)

— Soil stratigraphy related to daub features of the Windy Gap archaeological site, 5GA151, Granby, Colorado (Burns, Scott F.)

— Stewart's cattle guard; a Folsom site in south-central Colorado (Jodry, Margaret A.)

— The Drake Clovis cache (Stanford, Dennis J.)

— The Fourth of July Valley; glacial geology and archeology of the timberline ecotone (Benedict, James B.)

— The Frazier Site, Colorado (Wormington, H. M.)

*Cambrian*: Early and late Paleozoic remagnetization of the Upper Cambrian Peerless Formation, central Colorado (Dubois, Robert L., et al.)

— Paleomagnetic and petrographic study of sandstone dikes and the Cambrian Sawatch Sandstone, eastern flank of the southern Front Range, Colorado (Kost, Linda Suzanne)

— Paleomagnetic dating of hematite authigenesis, Upper Cambrian Peerless Formation, Colorado (Peck, Craig J., et al.)

— Paleomagnetism and diagenesis of the Upper Cambrian Peerless Formation, central Colorado (Peck, Craig Jonathan)

— Paleomagnetism of the Cambro-Ordovician McClure Mountain alkalic complex, Colorado (Lynnes, C. S.)

— Paleozoic diagenesis of the Upper Cambrian Peerless Formation, Colorado (Peck, Craig J.)

*Carboniferous*: In search of the base of the Kiaman Superchron in western North America (Magnis, G. J.)

— Magnetic stratigraphy, past and future (Opdyke, Neil D.)

*catalogs*: Catalog of Colorado and Nebraska cores housed at the USGS Core Repository, Denver, Colorado (Michalski, Thomas C.)

— Catalog of Kansas and Oklahoma cores housed at the USGS Core Repository, Denver, Colorado (Michalski, Thomas C.)

— GEONAMES data base of geologic names of the United States through 1986; CO, NM, AZ (Luttrell, G. W., et al.)

*Cenozoic*: Paleomagnetism of some Laramide intrusives, Jamestown mining district, Colorado (Sheldon, E. K.)

*Cretaceous*: A depositional model for middle Mesaverde coals, Yampa Field, northwestern Colorado (Fenske, John M., Jr.)

— A preliminary interpretation of carbon and oxygen isotopic data from surface rocks, Southern Ute Indian Reservation, southwestern Colorado (Henry, Mitchell E.)

— Abrupt appearance of shocked quartz at the Cretaceous-Tertiary boundary, Raton Basin, Colorado and New Mexico (Izett, Glen A.)

— Alamosaurus and the sauropod hiatus in the Cretaceous of the North American Western Interior (Lucas, Spencer G.)

— Ammonite record from Bridge Creek Member of Greenhorn Limestone at Pueblo Reservoir State Recreation Area, Colorado (Cobban, William A.)

— An initial study of the sensitivity of modeled Cretaceous climate to cyclical insolation forcing (Glancy, T. J., Jr., et al.)

— Anoxic events, a comparison of Cretaceous regimes (Fischer, Alfred G., et al.)

— Biostratigraphic correlation of Cretaceous-Tertiary boundary rocks, Colorado to San Juan Basin, New Mexico (Newman, Karl R.)

— Biostratigraphic correlation of K-T rocks from northwestern Colorado to San Juan Basin, Colorado and New Mexico (Newman, Karl R.)

— Biostratigraphic units and tectonism in Mid-Cretaceous foreland of Wyoming, Colorado, and adjoining areas (Merewether, E. A.)

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— Biostratigraphy and paleoecology of calcareous nannofossils in the Greenhorn marine cycle (Watkins, David K.)

— Biostratigraphy of Fruitland, Kirtland, and Animas formations (Cretaceous and Paleocene), northern San Juan Basin, Colorado (Newman, Karl R.)

— Biotic patterns across the Cenomanian-Turonian extinction boundary near Pueblo, Colorado (Elder, William P.)

— Characteristic magnetization of Cretaceous/Tertiary boundary claystone in Raton Basin is reversed (Shoemaker, E. M., et al.)

— Chart showing correlation of Upper Cretaceous rocks in the northern Denver Basin, Colorado and Wyoming, with other areas in eastern Wyoming (Kiteley, L. W.)

— Comparative analysis of coal accumulation in Cretaceous alluvial deposits, southern United States Rocky Mountain basins (Flores, Romeo M.)

— Cretaceous palynomorph biozones for the Central and Northern Rocky Mountain region of the United States (Nichols, D. J., et al.)

— Cyclic sedimentation in the Fort Hays Limestone Member, Niobrara Formation (Upper Cretaceous) in northeastern New Mexico and southeastern Colorado (Laferriere, Allen P.)

— Depositional environment of the Kremmling Sandstone Member, Pierre Shale, Middle Park, Colorado (Wiedemeier, Todd H.)

— Depositional history of the Terry and Hygiene sandstone members, Cheyenne Basin (Patton, Jean J.)

— Depositional systems of the Upper Cretaceous Mancos and Mesaverde groups, Axial Basin region, northwestern Colorado (Tondou, R. Joe.)

— Detailed stratigraphy of the Upper Cretaceous Ohio Creek Member of the Williams Fork Formation, Rifle, Colorado (Valasek, David W.)

— Estuarine and fluvial systems, lower Mesaverde Group (Campanian), northwestern Colorado (Nelson, Katherine)

— Event communities of Tepee Buttes, Cretaceous submarine springs (Howe, Brigitte)

— Event stratigraphy, paleoenvironments, and petroleum source rock potential of the lower Niobrara Formation (Cretaceous), northern Front Range, Colorado (Barlow, Lisa Katharine)

— Evidence from cathodoluminescence for non-volcanic origin of shocked quartz at the Cretaceous/Tertiary boundary (Owen, Michael R.)

— Exploration intensity map of the Cretaceous J Sandstone, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, D. K., et al.)

— Exploration intensity map of the Upper Cretaceous Codell Sandstone, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)

— Exploration intensity map of the Upper Cretaceous D Sandstone, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)

— Exploration intensity map of the Upper Cretaceous Niobrara Formation, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)

— Exploration intensity map of the Upper Cretaceous Pierre Shale, Denver Basin, Colo-

- rado, Nebraska, and Wyoming (Higley, Debra K., et al.)
- Field guide and discussions of coal deposits, depositional environments and the Cretaceous-Tertiary boundary, southern Raton Basin (field trip 3) (Pillmore, Charles L.)
  - Field guide to the continental Cretaceous-Tertiary boundary in the Raton Basin, Colorado and New Mexico (Pillmore, C. L., et al.)
  - Fluvial sedimentology of the Mesaverde Formation as revealed in continuous subsurface core (Lorenz, John C.)
  - Foraminifera and organic carbon content of transgressive deposits of Cretaceous marine cycles in Colorado (Von Holdt, Laura L.)
  - Foraminifera of the Cenomanian-Turonian boundary interval, Greenhorn Formation, Rock Canyon Anticline, Pueblo, Colorado (Leckie, R. Mark)
  - Gamma-ray spectrometry of the Sharon Springs Member of the Pierre Shale near Canon City, Colorado (Zelt, F. B.)
  - Geologic history and hydrocarbon potential of Late Cretaceous-age, low-permeability reservoirs, Piceance Basin, western Colorado; final report (Johnson, R. C.)
  - Geologic overview, coal deposits, and potential for methane recovery from coalbeds, Piceance Basin; Colorado (Choate, R., et al.)
  - Geologic overview, coal deposits, and potential methane recovery from coalbeds of the Uinta Basin; Utah and Colorado (Adams, M. A.)
  - Geologic overview, coal, and coalbed methane resources of the greater Green River coal region; Wyoming and Colorado (McCord, J. P.)
  - Geometry and depositional environments of Fruitland Formation coalbeds, San Juan Basin, New Mexico and Colorado; anatomy of a giant coal-bed methane deposit (Fassett, J. E.)
  - Graphic correlation of high-resolution event and biostratigraphic data; a Mid-Cretaceous test case (Kirkland, J. I.)
  - Hummocky cross-stratification and associated erosional features; description and depositional processes (Boyles, J. Michael)
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  - Investigation of stratigraphic and paleostructural controls on hydrocarbon migration and entrapment in Cretaceous D and J sandstones of the Denver Basin (Tainter, Patrick A.)
  - Iridium abundance anomalies at the palynological Cretaceous/Tertiary boundary in coal beds of the Raton Formation, Raton Basin, New Mexico and Colorado (Pillmore, C. L., et al.)
  - Iridium anomaly at the Cretaceous-Tertiary boundary in the Raton Basin (Orth, Charles J., et al.)
  - Is it possible to identify eustatic sea-level-change events in the Upper Cretaceous rocks of the San Juan Basin, New Mexico and Colorado? (Fassett, James E.)
  - Late Cretaceous (Campanian) estuarine and fluvial systems associated with rapid subsidence, northwestern Colorado (Nelson, K.)
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  - Late Maastrichtian (Cretaceous) palynomorph age of "Ohio Creek" Conglomerate, eastern Piceance Creek basin, Colorado (Newman, Karl R.)
  - Linking impacts in plant extinctions (Leahy, Guy D., et al.)
  - Microstratigraphy of continental sedimentary rocks in the Cretaceous-Tertiary boundary interval in the Western Interior of North America (Lzett, Glen A.)
  - Mid-Cretaceous biostratigraphic units, unconformities, and diastrophism in Wyoming, Colorado, and adjacent areas (Merewether, E. A.)
  - Mid-Cretaceous Codell Sandstone Member of Carlile Shale, eastern Colorado (Merewether, E. A.)
  - Mid-Cretaceous dinoflagellates from the Western Interior, U. S. A. (Bint, Anthony Neil)
  - Mineralogy and petrology of the Cretaceous-Tertiary boundary clay bed and adjacent clay-rich rocks, Raton Basin, New Mexico and Colorado (Pollastro, Richard M.)
  - Natural gamma-ray spectrometry, lithofacies, and depositional environments of selected Upper Cretaceous marine mudrocks, Western United States, including Tropic Shale and Tununk Member of Mancos Shale (Zelt, Frederick Bruce)
  - Osmium isotopic composition of the Raton Basin Cretaceous-Tertiary boundary interval (Esser, B. K.)
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  - Paleocceanographic events and lithologic/geochemical facies of the Greenhorn marine cycle (Upper Cretaceous) examined using natural gamma-ray spectrometry (Zelt, Frederick B.)
  - Palynology of the Latest Cretaceous and earliest Tertiary rocks in the Raton Basin, Colorado, USA (Williams, C.)
  - Palynology of Upper Cretaceous and lower Tertiary strata from the northern Raton Basin, south-central Colorado (Williams, Carol Alvis)
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  - Pelagic/hemipelagic rhythmites of the Greenhorn Limestone (Upper Cretaceous) of northeastern New Mexico and southeastern Colorado (Hattin, Donald E.)
  - Petrography, diagenesis and depositional environments of the Codell Sandstone and Juana Lopez members of the Carlile Shale (Upper Cretaceous), south-central Colorado (Resser, Kurt Douglas)
  - Porosity development in the Cretaceous Niobrara Formation, Colorado (Billo, Saleh M.)
  - Predictions of size and orientations of lenticular reservoirs in the Mesaverde Group, northwestern Colorado (Lorenz, J. C.)
  - Preliminary structure contour map on the base of the Cretaceous Dakota Sandstone in the San Juan Basin and vicinity, New Mexico, Arizona, Colorado, and Utah (Thaden, R. E.)
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  - Rhythmic bedding patterns in the Fort Hays Limestone Member, Niobrara Formation (Upper Cretaceous), U.S. Western Interior (Laferrriere, Alan Price, et al.)
  - Sandstone petrography of the Mesaverde Group of northwestern Colorado (Rogers, D. J.)
  - Section of Pierre Shale measured in the Florence and Canon City quadrangles, Colorado (Gill, J. R., et al.)
  - Sedimentological aspects of stratigraphic correlations in the Upper Cretaceous Ericson Sandstone, Greater Green River basin, Wyoming, Colorado, and Utah (Law, B. E., et al.)
  - Sedimentology of the Rocky Ridge Sandstone (Upper Cretaceous), Cheyenne Basin, Colorado (Vendetti, Michael J.)
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  - Seismic stratigraphic study of the Lower Cretaceous Dakota Group, Douglas Creek Arch, western Colorado (Eisenmenger, Karl Kenneth)
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  - Stratigraphic cross section showing Upper Cretaceous rocks across the San Juan Basin, New Mexico and Colorado (Molenaar, C. M.)
  - Stratigraphic framework of Upper Cretaceous (Campanian) coal in western Colorado (Newman, Karl R.)
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  - Stratigraphic significance of  $^{13}\text{C}/^{12}\text{C}$  ratios in Mid-Cretaceous rocks on the Western Interior, U.S.A. (Pratt, Lisa M.)
  - Stratigraphy & palynology of the Upper Lewis Shale, Pictured Cliffs Sandstone, & Lower Fruitland Formation (Upper Cretaceous) near Durango, CO (Manfrino, Carrie)

- Stratigraphy and depositional environments of a portion of upper Campanian Mesaverde Group, central Grand Hogback, Northwest Colorado (Madden, Dawn J.)
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  - Structure contour map and isochore map of the nonmarine part of the Mesaverde Group, Piceance Creek basin, Colorado (Granica, M. P.)
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  - Studies of sedimentary environments in the Cretaceous Dakota Sandstone in northwestern Colorado (Lane, Donald Wilson)
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— Geologic map of the Holy Cross Quadrangle, Eagle, Lake, Pitkin, and Summit counties, Colorado (Tweto, Ogden)

— Geology and petroleum potential, Colorado Park Basin province, north-central Colorado (Maughan, Edwin K.)

— Reconnaissance geologic map of the Dillon 15-minute Quadrangle, Summit, Eagle, and Grand counties, Colorado (Tweto, Ogden)

— Reconnaissance geologic map of the Mount Powell 15-minute Quadrangle, Grand, Summit, and Eagle counties, Colorado (Tweto, Ogden)

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*bibliography:* Leadville 1' by 2' Quadrangle, Colorado; a pre-assessment (Wallace, Alan R., et al.)

*fluorspar:* Map showing hydrothermal alteration and fluorite occurrences in the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G.)

*fuel resources:* Petroleum geology of the Uinta Mountains-White River Uplift, Colorado and Utah (Osmond, John C.)

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— Gold in the Central City mining district, Colorado (Wallace, Alan R.)

*maps:* Map showing hydrothermal alteration and fluorite occurrences in the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear

Creek, Grand, and Summit counties, Colorado (Eppinger, R. G.)

— Map showing the distribution of selected mineral assemblages in nonmagnetic heavy-mineral concentrates from stream sediments from the Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

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— Mineral resource potential map of the Vasquez Peak Wilderness Study Area, and the St. Louis Peak and Williams Fork Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Theobald, P. K., et al.)

— Physical and chemical controls of Zn-Pb-Cu-Ag mineralization at the Big Four Mine, Summit County, Colorado (Karr, Leonard J.)

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— Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates from ridgetop soils from the Williams Fork Roadless Area, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)

— Geochemical maps showing the distribution and abundance of selected elements in heavy-mineral concentrates of stream sediments from Vasquez Peak Wilderness Study Area and the Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Barton, H. N.)

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- survey organizations—current research**
- Colorado Geological Survey*: Colorado Geological Survey involvement in SSC siting and characterization (Rogers, W. P.)
- Colorado State Geological Survey*: Preliminary data report conducted for the Colorado State Geological Survey on the Superconducting, Supercollider study (Collins, Donley S.)
- U. S. Geological Survey*: Catalog of Colorado and Nebraska cores housed at the USGS Core Repository, Denver, Colorado (Michalski, Thomas C.)
- Catalog of Kansas and Oklahoma cores housed at the USGS Core Repository, Denver, Colorado (Michalski, Thomas C.)
- Catalog of thin sections available at the USGS Core Research Center, Denver, Colorado (Richards, Diana L.)
- In situ geomechanics of crystalline and sedimentary rocks; Part IV, Continued field testing of the modified U.S. Geological Survey 3-D borehole stress probe (Nichols, T. C., Jr.)
- Summary of water-resources activities of the U.S. Geological Survey in Colorado, fiscal year 1986 (Stewart, Julie M.)
- Summary of water-resources activities of the U.S. Geological Survey in Colorado; fiscal year 1987 (Stewart, Julie M.)
- U.S. Geological Survey ground-water studies in Colorado (Weeks, John B.)
- U.S. Geological Survey toxic substances hydrology program, surface-water contamination; proceedings of the technical meeting, Denver, Colorado, February 2-4, 1987 (Mallard, Gail E.)
- survey organizations—general**
- Colorado Geological Survey*: The Colorado Geological Survey: 15 years of progress and problems (Rold, John W.)
- survey organizations—research**
- Colorado Geological Survey*: Colorado Geological Survey's role and responsibility; abandoned mine subsidence hazards (Turney, Julia E.)
- U. S. Geological Survey*: Hydrologic studies of the U.S. Geological Survey related to coal development in Colorado (U. S. Geological Survey)
- Water-quality data-collection activities in Colorado and Ohio; Phase I, Inventory and

## Sussex Sandstone Member

evaluation of 1984 programs and costs (Hren, Janet, et al.)

## Sussex Sandstone Member

Depositional environment of the Codell Sandstone in the northern Denver-Julesburg Basin, Colorado (Caraway, Donna C.)

— Early-time tight gas production forecasting technique improves reserves and reservoir description (Neal, D. B.)

**syenites** *see under* igneous rocks

## symposia—areal geology

**Rocky Mountains:** Front Range AGU meeting (Spence, William)

— Front Range AGU meeting (Harthill, Norman)

## symposia—economic geology

**pegmatite:** Colorado pegmatites; abstracts, short papers, and field guides from the Colorado pegmatite symposium (Modreski, Peter J., et al.)

**water resources:** Proceedings; Workshop on Water quality monitoring in Colorado (Ward, Robert C.)

## symposia—environmental geology

**conservation:** Aquatic resources management of the Colorado River ecosystem (Adams, V. Dean)

**pollution:** U.S. Geological Survey toxic substances hydrology program, surface-water contamination; proceedings of the technical meeting, Denver, Colorado, February 2-4, 1987 (Mallard, Gail E.)

## symposia—general

**AGU:** AGU, 2d annual Front Range regional meeting (Harthill, Norman)

— Front Range report (Spence, William)

## symposia—stratigraphy

**Cretaceous:** The Cretaceous-Tertiary boundary in the San Juan and Raton basins, New Mexico and Colorado (Fassett, James E.)

## T

## Table Mountain Shoshonite

Zeolites and related minerals from the Table Mountain lava flows near Golden, Colorado (Kile, Daniel E.)

## Tallahassee Creek Conglomerate

Geology of volcanic uranium deposits within the Tallahassee Creek Conglomerate, Tallahassee Creek uranium district, Colorado (Hon, Ken)

**tar sands** *see* oil sands

## Taylor River Limestone Member

A new pernopecten (Bivalvia; Pectinacea) from the Pennsylvanian Gothic Formation of Colorado (Rice, William F.)

**tectonics** *see* faults; folds; geosynclines; neotectonics; orogeny; plate tectonics; salt tectonics; structural analysis

*see under* structural geology *under* Boulder County; Chaffee County; Clear Creek County; Colorado Plateau; Custer County; Delta County; Douglas County; Eagle County; Fremont County; Garfield County; Gilpin County; Grand County; Gunnison County; Hinsdale County; Huerfano County; Jackson County; Jefferson County; La Plata County; Lake County; Mesa County; Moffat County; North

America; Park County; Pitkin County; Rio Blanco County; Rocky Mountains; Routt County; Saguache County; San Juan County; Sedgwick County; Southwestern U.S.; Summit County; Teller County; United States; Weld County; Western U.S.

*see under* structural geology

## tectonophysics

**crust:** Bouyant sub-surface loading of the lithosphere in the Great Plains foreland basin (Angewine, Charles L.)

— Crustal structure in Utah and Colorado from seismic refraction studies (Krishna, V. G., et al.)

— Gravity anomalies and lithospheric flexure beneath the Denver Basin; evidence for a buoyant subcrustal load (Babits, Steven J.)

— Gravity evidence for Precambrian crustal structure in southeastern Wyoming and northern Colorado (Johnson, R. A., et al.)

— Nd in the Colorado Front Range and implications for crust formation and mantle evolution in the Proterozoic (DePaolo, Donald J.)

— Profile of induction soundings across south-central Colorado (Keller, G. V., et al.)

— South-central United States well-bore breakout-data catalog (Dart, Richard L.)

— The nature of the lower crust; chemical, isotopic and seismic velocity characteristics (Arculus, R. J., et al.)

**heat flow:** Geothermal studies in the Rio Grande rift zone in central and northern Colorado (Decker, E. R., et al.)

— Geothermal studies in Wyoming and northern Colorado, with a geophysical model of the Southern Rocky Mountains near the Colorado-Wyoming border (Buelow, Kenneth L.)

— Heat flow in geophysical exploration of sedimentary basins (Gosnold, William D.)

— Heat flow in the Colorado Plateau (Swanberg, C. A.)

— Heat flow in the north central United States (Gosnold, William D.)

— Magnetotelluric investigation in the San Luis Valley, Colorado (Mdala, Chisengu L.)

— Significance of past and recent heat-flow and radioactivity studies in the Southern Rocky Mountains region (Decker, Edward R., et al.)

— Structural and thermal history of Piceance Creek basin, Colorado, in relationship to hydrocarbon occurrence in Mesaverde Group (Johnson, Ronald C.)

— The thermal regime of the San Juan Basin since Late Cretaceous times and its relationship to San Juan Mountains thermal sources (Clarkson, Gerry)

**isostasy:** Isostatic compensation of the Denver Basin (Babits, Steven J.)

**mantle:** Geothermal studies in Wyoming, Colorado, and Montana (Heasler, H. P., et al.)

— Nd in the Colorado Front Range and implications for crust formation and mantle evolution in the Proterozoic (DePaolo, Donald J.)

**paleomagnetism:** Anisotropy of magnetic susceptibility data; an aid in evaluating remanent magnetic data (Ellwood, Brooks B.)

**plate tectonics:** Early Proterozoic tectonic history in Colorado (Knoper, Michael W., et al.)

— Factors controlling the phases and styles of extension in the northern Rio Grande Rift (Morgan, Paul)

— Rio Grande Rift; problems and perspectives (Baldrige, W. Scott, et al.)

**tektites** *see* meteorites

## Teller County—areal geology

**Florissant Fossil Beds National Monument:** Florissant Fossil Beds National Monument (Anonymous)

**maps:** Reconnaissance geologic map of the Florissant 15-minute Quadrangle, Park and Teller counties, Colo. (Wobus, R. A.)

## Teller County—economic geology

**dolostone deposits:** Mineral resources of the Beaver Creek Wilderness Study Area, Fremont, El Paso, and Teller counties, Colorado (Lindsey, David A., et al.)

**gems:** Field trip; Colorado amazonite (Voynick, Steve)

— Outstanding mineral specimens from the Pikes Peak Batholith (Muntyan, Barbara L.)

— Pegmatite cavities in the Lake George area, Colorado (Kile, Daniel E.)

**gold ores:** A geophysical investigation of the San Juan Belt and its relationship to mineralization at Cripple Creek, Colorado (Whitacre, Thomas James)

— Cripple Creek, Cresson, Camp Bird (Poss, John R.)

— Mineralized veins and breccias of the Cripple Creek District, Colorado (Thompson, Tommy B., et al.)

— West of Denver (Norwood, Victor G. C.)

**maps:** Mineral resources of the Beaver Creek Wilderness Study Area, (CO-050-016), El Paso, Fremont, and Teller counties, Colorado (Kreidler, Terry J.)

— Problems of using rock volume data in predictive resource studies (Howarth, Richard J.)

**metal ores:** Cripple Creek, Cresson, Camp Bird (Poss, John R.)

**mineral resources:** Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1' by 2' Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

— Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Beaver Creek Wilderness Study Area (CO-050-016), El Paso, Fremont, and Teller counties, Colorado (Detra, David E., et al.)

— Mineral appraisal of the San Isabel National Forest, Colorado (U. S. Bureau of Mines, Intermountain Field Operations Center)

— Mineral resources of the Beaver Creek Wilderness Study Area, (CO-050-016), El Paso, Fremont, and Teller counties, Colorado (Kreidler, Terry J.)

— Mineral resources of the Beaver Creek Wilderness Study Area, Fremont, El Paso, and Teller counties, Colorado (Lindsey, David A., et al.)

**pegmatite:** Geology of the Ten Percenter pegmatite mine, Lake George District, Teller County, Colorado (Wobus, Reinhard A., et al.)

— Pegmatite cavities in the Lake George area, Colorado (Kile, Daniel E.)

**rare earth deposits:** The Black Cloud Pegmatite, Teller County, Colorado (Simmons, William B.)

**silver ores:** West of Denver (Norwood, Victor G. C.)

*uranium ores*: Granite of Silver Plume type; a possible source of the uranium in deposits of the Tallahassee Creek and High Park areas, Fremont and Teller counties, Colorado (Hills, Francis Allan)

— Problems of using rock volume data in predictive resource studies (Howarth, Richard J.)

*water resources*: Water-resources appraisal of the upper Arkansas River basin from Leadville to Pueblo, Colorado (Crouch, Thomas M., et al.)

#### Teller County—geochemistry

*maps*: Analytical results and sample locality map of stream-sediment and heavy-mineral-concentrate samples from the western three-quarters of the Pueblo 1° by 2° Quadrangle, south-central Colorado (Zimbelman, David R., et al.)

— Analytical results and sample locality map of stream-sediment, heavy-mineral-concentrate, and rock samples from the Beaver Creek Wilderness Study Area (CO-050-016), El Paso, Fremont, and Teller counties, Colorado (Detra, David E., et al.)

#### Teller County—geochronology

*Proterozoic*: Evolution of the early Proterozoic Colorado Province; constraints from U-Pb geochronology; with Suppl. Data 87-31 (Reed, John C., Jr., et al.)

#### Teller County—geophysical surveys

*magnetic surveys*: Aeromagnetic map of part of the Pike National Forest and vicinity, Colorado (U. S. Geological Survey)

*maps*: Aeromagnetic map of part of the Pike National Forest and vicinity, Colorado (U. S. Geological Survey)

*remote sensing*: A geophysical investigation of the San Juan Belt and its relationship to mineralization at Cripple Creek, Colorado (Whitacre, Thomas James)

— Air-photo lineament analysis; east-central Front Range, Colorado (Steele, S. G.)

— High resolution geologic remote sensing of the Cripple Creek/Canon City area, Teller County, Colorado (Taranik, Dan L.)

— Mapping hydrothermally altered rocks with Landsat data—Cartographie Landsat de roches altérées par hydrothermalisme (U. S. Geological Survey)

— Plans for integrated airborne geophysical study of the Geophysics Environmental and Minerals demonstration area, south-central Colorado (Watson, Kenneth, et al.)

— The nature and characteristics of lineaments mapped from satellite and aerial imagery in an area of south-central Colorado bounded by 105°00' to 105°30' west longitude to 38°15' to 38°52'30" north latitude (Rowan, Charles David V.)

#### Teller County—mineralogy

*framework silicates, alkali feldspar*: What's new in minerals? (Wilson, Wendell E.)

*miscellaneous minerals*: The Cresson Vug, Cripple Creek (Smith, Arthur E., Jr., et al.)

#### Teller County—paleobotany

*angiosperms*: Attached leaves, inflorescences, and fruits of *Fagopsis*, an extinct genus of fagaceous affinity from the Oligocene Florissant flora of Colorado, U.S.A. (Manchester, Steven R.)

#### Teller County—petrology

*fluid inclusions*: Geology, mineralization, and fluid inclusion analysis of the Ajax vein system, Cripple Creek, Colorado (Dwellely, Peter C.)

*igneous rocks*: Petrology of the alkalic hypabyssal and volcanic rocks at Cripple Creek, Colorado (Eriksson, Carl L.)

— Tabulation of modal and chemical analyses for Silver Plume Quartz Monzonite (Silver Plume Granite), Berthoud Plutonic Suite, Front Range, Colorado (Gable, Dolores J.)

#### Teller County—stratigraphy

*Cretaceous*: Codell and Juana Lopez in south-central Colorado (McLane, Michael)

*Oligocene*: Araneid taphonomy; a paleothermometer (Licht, Edwin L.)

— The Florissant Fossil Beds National Monument, Teller County, Colorado (Hutchinson, Robert M.)

*Pennsylvanian*: Climatic influence on Fountain sedimentation in the Manitou Embayment (Suttner, Lee J.)

— New interpretation of the stratigraphic relationship between the Fountain Formation and its Glen Eyrie Member (Suttner, Lee J., et al.)

— Sedimentology of the Fountain fan-delta complex near Manitou Springs and Canon City, Colorado (Suttner, Lee J., et al.)

— Sedimentology of the Fountain fan-delta complex near Manitou Springs, Colorado (Langford, Richard P.)

#### Teller County—structural geology

*tectonics*: Air-photo lineament analysis; east-central Front Range, Colorado (Steele, S. G.)

— Tectonic history of the Front Range, Colorado (Bilodeau, William L.)

— The nature and characteristics of lineaments mapped from satellite and aerial imagery in an area of south-central Colorado bounded by 105°00' to 105°30' west longitude to 38°15' to 38°52'30" north latitude (Rowan, Charles David V.)

#### Telluride Conglomerate

Geological and geochemical controls of metal precipitation in epithermal systems, western San Juans, Colorado (Kyle, J. Richard, et al.)

— Laramide oblique-slip, high-angle faults, southern San Juan Mountains, Colorado (Morse, Earl L.)

#### tellurides see under mineralogy; minerals

#### tellurites see under mineralogy; minerals

#### tellurium—geochemistry

*metal ores*: Trace element distribution around precious/base metal veins, Idaho Springs Dist., CO (Budge, Suzanne)

#### temperature logging see under well-logging

#### Tenmile Granite

Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)

— Proterozoic geology of the Needle Mountains; a summary (Tewksbury, Barbara J.)

— Proterozoic geology of the Needle Mtns., Colorado (Tewksbury, B. J.)

#### Tensleep Sandstone

Permeability transects in eolian sands and their use in generating random permeability fields (Goggin, D. J., et al.)

#### tephrochronology see under geochronology

#### terraces see under fluvial features under geomorphology

#### terrestrial crust see crust

#### terrestrial mantle see mantle

#### Terry Sandstone Member

Albitization in the Upper Cretaceous Terry Sandstone, Denver Basin, Colorado (Pittman, Edward D.)

— Character and origin of natural gases from Wattenberg area, Denver Basin, Colorado (Rice, Dudley D.)

— Depositional history of the Terry and Hygiene sandstone members, Cheyenne Basin (Patton, Jean J.)

— Diagenesis in the Terry Sandstone Member of the Pierre Shale, Denver Basin, Colorado (Hays, Phillip D.)

— Diagenesis of Terry Sandstone (Upper Cretaceous), Spindle Field, Colorado (Pittman, Edward D.)

— Marine-shelf bar sand/channelized sand shingled couplet, Terry Sandstone Member of Pierre Shale, Denver Basin, Colorado (Siemers, C. T.)

— Shallow oil fields of the Denver Basin, Colorado and Nebraska, U.S.A. (deChadenedes, J. F.)

— The Carter Sandstone Member of the Pierre Shale; a Cretaceous shoreline (Mieras, Barbara L.)

*Tertiary* see Eocene; Miocene; Neogene; Oligocene; Paleocene; Paleogene; Pliocene

see under geochronology under Conejos County; Custer County; Grand County; Hinsdale County; Jackson County; Mineral County; Saguache County; San Juan County

see under stratigraphy under Garfield County; Huerfano County; Las Animas County; Moffat County; North America; San Juan County

#### Tertiary—stratigraphy

*boundary*: Osmium-187/osmium-186 in manganese nodules and the Cretaceous-Tertiary boundary (Luck, J. M.)

*chemostratigraphy*: The Cretaceous-Tertiary boundary problem; an assessment from lead isotope systematics (Dia, Aline, et al.)

*paleomagnetism*: Magnetic properties of K/T and E/O microspherules; origin by combustion? (Cisowski, Stanley M.)

#### Thatcher Limestone Member

Depositional history of the Graneros Shale (Cenomanian), Rock Canyon Anticline (Kauffman, Erle G.)

*theoretical studies* see under deformation see under sheet silicates, chlorite group under phase equilibria

*thermal analysis* see chemical analysis; spectroscopy; X-ray analysis

*thermal conductivity* see under heat flow see under interpretation under well-logging

*thermal waters* see geothermal energy; springs

*thermoluminescence* see under geochronology

#### Thermopolis Shale

Hydrocarbon generation in Lower Cretaceous Mowry and Skull Creek shales of the northern Rocky Mountain area (Burner, R. L.)

## Thirteen Finger Limestone

- Quantified assemblage zones; a case study in nearshore facies from the Lower Cretaceous of the Western United States (Metzger, Ellen P.)
- Stratigraphy and depositional environments of the Muddy Sandstone in North and Middle Parks basin, Jackson and Grand counties, Colorado (Murphy, W. Dale)

## Thirteen Finger Limestone

Paleohydraulic parameters of a Morrowan point-bar complex, Salt Lake and Haswell fields, Kiowa County, Colorado (Wingate, Thomas P.)

## Thirtynine Mile Volcanic Series

Geology and uranium geochemistry of the western margin of the Thirtynine Mile volcanic field, Park, Chaffee and Fremont counties, Colorado (Smith, Larry B.)

## thorium—geochemistry

*basalts*: Uranium, thorium, and trace elements in geologic occurrences as analogues of nuclear waste repository conditions (Wollenberg, H. A., et al.)

*igneous rocks*: Reconnaissance geologic mapping in north-central Colorado using multi-spectral gamma-ray data (Moll, Stanton H.)

*monazite*: Reversal of normal role of thorium in fractional crystallization (Phair, George)

*plutonic rocks*: Redistribution of U and Th in shallow plutonic environments (Gosnold, William D., Jr.)

*sedimentary rocks*: Natural gamma-ray spectrometry, lithofacies, and depositional environments of selected Upper Cretaceous marine mudrocks, Western United States, including Tropic Shale and Tununk Member of Mancos Shale (Zelt, Frederick Bruce)

*shale*: Gamma-ray spectrometry of marine shales in outcrop; a tool for petroleum exploration and basin analysis (Zelt, Frederick B.)

## thorium— isotopes

*radioactive isotopes*: Uranium and thorium endowment, distribution and mobilization in a uraniumiferous Precambrian granite (Silver, Leon T., et al.)

*Th-230*: Isotopic composition of uranium and thorium in crystalline rocks (Rosholt, J. N.)

— Uranium-series nuclides in the Golden Fault, Colorado, U.S.A., dating latest fault displacement and measuring recent uptake of radionuclides by fault-zone materials (Szabo, B. J.)

*Th-232/Th-230*: Isotopic composition of uranium and thorium in crystalline rocks (Rosholt, John N.)

*Th/U*: Granite of Silver Plume type; a possible source of the uranium in deposits of the Tallahassee Creek and High Park areas, Fremont and Teller counties, Colorado (Hills, Francis Allan)

*thorium ores* *see under economic geology* *see under economic geology under Custer County*; Fremont County; Larimer County

*thrust faults* *see under displacements under faults* *see under field studies under deformation*

## Tidwell Member

Interpretation of the Morrison Formation as a time-transgressive unit (Bowman, Sue Ann Bilbey, et al.)

*time scales* *see under geochronology* *see under concepts under stratigraphy*

## Timpas Limestone

VSP interval velocities from travelttime inversion (Stewart, R. R.)

*tin ores* *see under economic geology* *see under economic geology under Grand County*; Jackson County

## Tintic Quartzite

Altered igneous rocks around Rocky Mountain manto deposits; the Gilman (Colorado) example (O'Neill, T. F., et al.)

## titanium—geochemistry

*igneous rocks*: Igneous dikes of the eastern Uinta Mountains, Utah and Colorado (Ritzma, Howard R.)

*titanium ores* *see under economic geology under Gunnison County*

## Tocito Sandstone

Chipeta (oil) (Armstrong, Karen, et al.)

— The marine transgressive surface as a sequence boundary; a case study of the upper Coniacian transgression in the San Juan Basin (Nummedal, Dag)

## Todilto Formation

Depositional history and petrography of the Todilto Formation (Jurassic), New Mexico and Colorado (McCrary, Megan Marie)

— Evaporitic environments as a source of petroleum (Evans, Robert)

— Paleogeography and facies distribution of the Todilto Limestone and Pony Express Limestone Member of the Wanakah Formation, Colorado and New Mexico (Ridgley, Jennie L.)

— Paleontological evidence of a non-marine, saline, model of deposition of the Jurassic Todilto Formation, northern New Mexico and southwestern Colorado (Kietzke, Kenneth K.)

## Tongue River Member

Paleoenvironmental significance of fossil chlorococcalean algae from the Raton Formation, Colorado and New Mexico (Fleming, R. Farley)

*trace elements* *see under geochemistry* *see under affinities under gold ores*; *silver ores* *see under eclogite under metamorphic rocks* *see under geochemical methods under mineral exploration*

*see under geochemistry under Adams County*; Alamosa County; Arapahoe County; Chaffee County; Clear Creek County; Costilla County; Custer County; Delta County; El Paso County; Elbert County; Fremont County; Garfield County; Gilpin County; Grand County; Gunnison County; Hinsdale County; Huerfano County; igneous rocks; Jackson County; Jefferson County; La Plata County; Lake County; Las Animas County; lava; magmas; Mesa County; metamorphic rocks; Mineral County; Moffat County; Montrose County; organic materials; Park County; Pueblo County; rare earths; Rio Blanco County; Routt County; Saguache County; San Juan County; sedimentary rocks; sediments; Summit County; Weld County; Western U.S.

*see under monzonites under igneous rocks*

*trace-element analyses* *see under emission spectroscopy under spectroscopy* *see under methods under chemical analysis*

*tracks* *see under biogenic structures under sedimentary structures*

*see under occurrence under ichnofossils*

*tracks and trails* *see ichnofossils*

## Travesser Formation

Copper deposits in Sheep Pen Sandstone (Triassic) in Cimarron County, Oklahoma, and adjacent parts of Colorado and New Mexico (Fay, Robert O.)

— The Triassic System in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Lucas, Spencer G., et al.)

— Triassic and Jurassic vertebrate-dominated trace fossil assemblages of the Cimarron Valley region; implications for paleoecology and biostratigraphy (Conrad, Kelly, et al.)

— Triassic stratigraphy in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma (Lucas, Spencer G., et al.)

## Treasure Mountain Tuff

Cyclical ash-flow tuff volcanism, Platoro-Summitville caldera complex, Southeast San Juan volcanic field, south-central Colorado (Dungan, M. A.)

— Genesis of high-K calc-alkaline lavas and ash-flow tuffs from alkaline and subalkaline parent magmas; Platoro-Summitville caldera complex, SE San Juan volcanic field, Co. (Colucci, M. T., et al.)

— Geochemistry and evolution of post-collapse lavas, Platoro-Summitville caldera complex, Southeast San Juan Mountains, Colorado (Ferguson, K. M., et al.)

— Geologic systems as analogs for long-term radioactive waste isolation (Wollenberg, Ernesto A., et al.)

— Magnetostratigraphy of the Treasure Mountain Tuff, Platoro-Summitville caldera complex, San Juan volcanic field, Colorado (Brown, Laurie L.)

— Oligocene volcanic rocks in the La Veta Pass area, northern Sangre De Cristo Mountains, south-central Colorado (Kearney, Barbara Cowles)

— Petrologic evolution of the Conejos Formation; pre-collapse intermediate volcanism of the Platoro caldera complex, Southeast San Juan volcanic field (Colucci, M., et al.)

*tree rings* *see under geochronology*

*Triassic* *see under stratigraphy under Colorado Plateau*; Dolores County; Eagle County; Garfield County; Gunnison County; Jefferson County; La Plata County; Lake County; Mesa County; Montezuma County; Ouray County; Pitkin County; Rio Blanco County; San Juan County; San Miguel County; Summit County; Western U.S.

## Trilobita—occurrence

*Cambrian*: Collecting fossils (Jones, Bob)

## Trimble Granite

Geology and uranium mineralization of the Florida Mountain area, Needle Mountains, southwestern Colorado (Collier, James D.)

— Mid-Proterozoic postorogenic granites, and associated uranium mineralization of the Needle Mountains, southwestern Colorado (Collier, James D.)

— Proterozoic geology of the Needle Mtns., Colorado (Tewksbury, B. J.)

- Trace-element evidence for the evolution of the Eolus Batholith, Needle Mountains, southwestern Colorado (Collier, James D.)

**Trinidad Sandstone**

- Field guide and discussions of coal deposits, depositional environments and the Cretaceous-Tertiary boundary, southern Raton Basib (field trip 3) (Pillmore, Charles L.)
- Field guide to the continental Cretaceous-Tertiary boundary in the Raton Basin, Colorado and New Mexico (Pillmore, C. L., et al.)
- New wildcat strengthens Raton Basin hunt (McCaslin, John C.)
- Petrology and diagenesis of Trinidad Sandstone (Upper Cretaceous), Huerfano and Las Animas counties, Colorado (Dunaway, Sabrina G.)
- Possible basin centered gas accumulation, Raton Basin, southern Colorado (Rose, P. R., et al.)
- Potential basin-centered gas accumulation in Cretaceous Trinidad Sandstone, Raton Basin, Colorado (Rose, Peter R., et al.)
- Raton Basin magnetostratigraphy near Cretaceous-Tertiary boundary (Wolberg, Donald L., et al.)
- Sedimentology of Upper Cretaceous and Tertiary siliciclastics and coals in the Raton Basin, New Mexico and Colorado (Flores, Romeo M.)
- Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado (Pillmore, Charles L.)
- Stratigraphy of the Trinidad Sandstone and Vermejo Formation (Upper Cretaceous), Canon City coal field, Fremont County, Colorado (Gaffke, Thresa M.)
- Structure of the Raton Basin from a regional seismic line (Applegate, James K.)
- The hydrogeochemical effects of past mining on the Raton Basin, Colorado (Howard, W. Brant)

**Trinity Complex**

Aeromagnetic data and crustal structure of the Western United States (Johnson, P. R.)

**tritium** *see* deuterium; hydrogen

**Tropic Shale**

- Natural gamma-ray spectrometry, lithofacies, and depositional environments of selected Upper Cretaceous marine mudrocks, Western United States, including Tropic Shale and Tununk Member of Mancos Shale (Zelt, Frederick Bruce)
- Tarrantoceras Stephenson and related ammonoid genera from Cenomanian (Upper Cretaceous) rocks in Texas and the Western Interior of the United States (Cobban, William A.)

**Troublesome Formation**

- Miocene mammals from the central Colorado Rocky Mountains (Kron, Donald Gordon)
- Rapid alteration of primary magnetizations in Tertiary and Quaternary tephra from the Western United States (Summa, Lori L.)

**Trout Creek Sandstone Member**

A depositional model for middle Mesaverde coals, Yampa Field, northwestern Colorado (Fenske, John M., Jr.)

- Description and origin of the lower part of the Mesaverde Group in Rifle Gap, Garfield County, Colorado (Madden, Dawn J.)
- Facies relationships in Campanian wave-dominated coastal deposits in Sand Wash Basin (Siepman, Bret R.)
- Predicting the influences of post-mining conditions on surface and groundwater resources (Day, Michael J., et al.)
- Stratigraphic distribution suggesting environmental significance of pollen in Late Cretaceous upper Iles and lower Williams Fork formations, Rifle Gap, Garfield County, Colorado (Madden-McGuire, Dawn J.)
- Stratigraphic framework of Upper Cretaceous (Campanian) coal in western Colorado (Newman, Karl R.)
- Stratigraphy and depositional environments of a portion of upper Campanian Mesaverde Group, central Grand Hogback, Northwest Colorado (Madden, Dawn J.)
- Stratigraphy and petroleum potential of Trout Creek and Twentymile sandstones (Upper Cretaceous), Sand Wash Basin, Colorado (Siepman, Bret R.)
- Stratigraphy of Grand Hogback Coalfield, upper Campanian Mesaverde Group, Rifle Gap to New Castle, Garfield County, Colorado (Madden, Dawn J.)
- Stratigraphy, depositional environments, and paleogeography of coal-bearing strata in the Upper Cretaceous Mesaverde Group, central Grand Hogback, Garfield County, Colorado (Madden, Dawn J.)
- Structure contour map of the top of the Rollins Sandstone Member of the Mesaverde Formation and Trout Creek Sandstone Member of the Iles Formation, Piceance Creek basin, Colorado (Johnson, R. C.)

**Tucumcarl Shale**

- Biogeographic influences on Early Cretaceous paleocommunities, Western Interior (Scott, R. W.)
- Regional correlation of Dakota Group disconformities; Front Range, New Mexico to Wyoming (Mateer, Niall J.)
- The Dakota Group of northeastern New Mexico and southern Colorado (Mateer, Niall J.)

**Tulloch Member**

- Correlation of early Paleocene palynomorph biozones, Montana, Colorado, and New Mexico (Newman, Karl R.)
- Linking impacts in plant extinctions (Leahy, Guy D., et al.)

**tungsten ores** *see under* mineral deposits, genesis *see under* economic geology *under* Boulder County; Huerfano County; North America; Pueblo County

**tunnels** *see under* engineering geology *see under* engineering geology *under* Clear Creek County; data processing; Garfield County; Lake County; Summit County

**tunnels—design**  
*rock mechanics:* Exploration strategy and technology; update and review (Sinha, Raghupati S.)

**turbidity current structures** *see under* sedimentary structures

**turbidity currents** *see under* transport *under* sedimentation

**Tusas Granite**

Reports on field investigations of uranium anomalies (Goodknight, Craig S.)

**Twentymile Sandstone Member**

- Facies relationships in Campanian wave-dominated coastal deposits in Sand Wash Basin (Siepman, Bret R.)
- Predicting the influences of post-mining conditions on surface and groundwater resources (Day, Michael J., et al.)
- Stratigraphy and petroleum potential of Trout Creek and Twentymile sandstones (Upper Cretaceous), Sand Wash Basin, Colorado (Siepman, Bret R.)

**Twilight Gneiss**

- Correlations and revisions of Precambrian stratigraphy, Needle Mountains, southwest Colorado, and Tusas Mountains, north-central New Mexico (Burns, L. K.)
- Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)
- Polyphase deformation in allochthonous rocks of the Precambrian Uncompahgre Formation, Needle Mountains, southwestern Colorado (Tewksbury, Barbara J.)
- Proterozoic geology of the Needle Mountains; a summary (Tewksbury, Barbara J.)
- Proterozoic geology of the Needle Mtns., Colorado (Tewksbury, B. J.)
- The Irving Formation and the Proterozoic sequence in the Needle Mountains, southwestern Colorado (Ellingson, Jack A., et al.)

**Twin Lakes Formation**

Timing of Cenozoic magmatism and tectonism in the Sawatch Uplift and northern Rio Grande Rift, Colorado (Shannon, J. R., et al.)

**Twowells Sandstone**

- Depositional environments of the Dakota Sandstone and adjacent units in the San Juan Basin utilizing discriminant analysis of trace elements in shales (Walters, Lester J., Jr., et al.)
- Is it possible to identify eustatic sea-level-change events in the Upper Cretaceous rocks of the San Juan Basin, New Mexico and Colorado? (Fassett, James E.)

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**Uinta Formation**

- A debris-flow model for the origin of high-level sloping surfaces on the northern flanks of Battlement Mesa, Garfield County, Colorado (Stover, Bruce K.)
- Chart showing correlation of selected parts of the Eocene Uinta and Green River formations, southeastern Piceance Creek basin, Colorado (O'Sullivan, R. B.)
- Chart showing intertongued units of the Eocene Green River and Uinta formations, northwestern Piceance Creek basin, northwestern Colorado (Hail, W. J., Jr.)
- Computer modeling of interaction of TOSCO II leachate with weathered Uinta Formation (Esmaili, Esmail, et al.)
- Detailed lithologic, rock quality, and hydrologic data from four drill holes in the



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- central Piceance Creek basin, Rio Blanco County, Colorado (Daub, G. J., et al.)
- Development of a pore interaction model for hydrodynamic dispersion (Baker, F. G.)
- Development of a pore interaction model for hydrodynamic dispersion during flow through porous media (Baker, Fred G.)
- Early joints within penecontemporaneous slump blocks of the Eocene Uinta Formation, Piceance Creek basin, northwestern Colorado (Grout, Marilyn A.)
- Effect of solid-solution ratio on the variability of distribution coefficient values in a complex rock-fluid system (Pavlik, Hannah F.)
- Final environmental impact statement; Federal prototype oil shale tract C-a, offtract lease (U. S. Bureau of Land Management, White River Resource Area)
- Final environmental impact statement; Wolf Ridge Corporation mine plan for a nahcolite solution mine (Anonymous)
- Fracture history of the northern Piceance Creek basin, northwestern Colorado (Verbeek, Earl R.)
- Geochemical modeling and evaluation of lithium and fluoride distribution coefficients using batch and column methods; oil shale leachate in contact with Uinta Formation Sandstone, Piceance Creek basin, Colorado (Pavlik, Hannah Flora)
- Geotechnical characterization for underground mining at the Colony shale oil property (Brechtel, C. E., et al.)
- Hydrogeologic characterization of the Colony Shale Oil Project area (Day, Michael J.)
- Preliminary report on solid bitumens in Eocene rocks of Piceance Creek basin, northwestern Colorado (O'Sullivan, R. B.)
- Reconstruction of reaction pathways in a rock-fluid system using MINTEQ (Pavlik, H. F.)
- Seismotectonic evaluation of the Dudley Gulch Graben in the Piceance Creek basin (Clift, Anne Eckert)
- Simulated oil-shale mine dewatering using a confined multiaquifer model, Piceance Basin, Colorado, U.S.A. (Weeks, John B.)
- The geology and seismology of the Dudley Gulch Graben and related faults, Piceance Creek basin, northwestern Colorado (Eckert, Anne Douglas)
- The rodents *Pseudotomus* and *Quadratomus* and the content of the tribe Manitshini (Paramyinae, Ischyromyidae) (Korth, William W.)
- Two case histories on the design and pump testing of individual aquifers with dual completed wells (Jehn, James L.)
- Vitrinite reflectance and temperature gradient models applied at a site in Piceance Basin, Colorado (Bostick, Neely H.)

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- A model for the tectonic evolution of the PC-X (?) Red Creek Quartzite, Utah and Colorado (Sears, James W., et al.)
- An interpretation of the subsurface structural style of the Beaver Creek Anticline, Moffat and Routt counties, Colorado (Morel, John A., et al.)

- Igneous dikes of the eastern Uinta Mountains, Utah and Colorado (Ritzma, Howard R.)
- Interpretation of a seismic section across the Danforth Hills Anticline (Maudlin Gulch) and axial arch in Northwest Colorado (Richard, J. J.)
- Precambrian geochronology of northern Utah (Hedge, Carl E.)
- Rb-Sr ages of the Uinta Mountain Group of Utah and Colorado (Chaudhuri, S.)
- Seismic and borehole evidence for important pre-Laramide faulting along the axial arch in Northwest Colorado (Stone, Donald S.)
- The accretion of Proterozoic crust in Colorado; igneous, sedimentary, deformational, and metamorphic history (Bickford, M. E.)
- The Precambrian of the Rocky Mountain region (Hedge, Carl E., et al.)

## ultramafics *see under* igneous rocks

## Uncompahgre Formation

- A sedimentological and structural analysis of the Proterozoic Uncompahgre Group, Needle Mountains, Colorado (Harris, Charles William)
- Basement-cover relationships in Southwest Colorado; implications for early to middle Proterozoic crustal evolution of the Southwest USA (Harris, C. W., et al.)
- Conjugate crenulation cleavages in the Uncompahgre Formation, Needle Mountains, Colorado (Tewksbury, B. J.)
- Depositional environments of the Cambrian Ignacio Formation and Devonian pre-Elbert conglomerate, San Juan Mountains, southwestern Colorado (Wiggin, Roger Clay)
- Grenadier fault block, Coalbank to Molas passes, Southwest Colorado (Baars, D. L., et al.)
- Kinematic analysis and implications of Proterozoic strike-slip shear zones, West Needle Mtns., Colorado (Gibson, Richard G.)
- Paleocology of phylloid algal mud mounds, Honaker Trail Formation (Pennsylvanian), Southwest Colorado (Soar, Linda Katherine)
- Polyphase deformation in allochthonous rocks of the Precambrian Uncompahgre Formation, Needle Mountains, southwestern Colorado (Tewksbury, Barbara J.)
- Proterozoic "broken formation zones" in layered gneisses of the West Needle Mountains, SW Colorado (Gibson, R. G.)
- Proterozoic cusped basement-cover structure, Needle Mountains, Colorado (Harris, C. W., et al.)
- Proterozoic geology of the Middle Mountain area, Needle Mountains, Colorado (Gonzales, David A.)
- Proterozoic geology of the Needle Mountains; a summary (Tewksbury, Barbara J.)
- Proterozoic polydeformation in basement rocks of the Needle Mountains, Colorado (Gibson, Richard G.)
- Proterozoic Uncompahgre Formation; remnant of a Precambrian fold and thrust belt (Houston, Betty Green)
- Regional implications of Proterozoic deformation and lithostratigraphy in the Needle Mtns., Colorado (Gibson, R. G., et al.)
- Revised interpretation of the age of allochthonous rocks of the Uncompahgre Formation,

- Needle Mountains, Colorado (Tewksbury, B. J.)
- Sediment-filled veins of the Golden Wonder Mine, Lake City, Colorado (Kalliokoski, J.)
- Similarities in deformational style as evidence for correlation between the type section and Needle Mtns. portion of the Proterozoic Uncompahgre Fm., southwestern Colorado (Tewksbury, B. J.)
- Structural studies in a Proterozoic gneiss complex and adjacent cover rocks, West Needle Mountains, Colorado (Gibson, Richard G.)
- Tectonic significance of Proterozoic faults, San Juan Mountains, southwestern Colorado (Baars, Don L.)
- The Irving Formation and the Proterozoic sequence in the Needle Mountains, southwestern Colorado (Ellingson, Jack A., et al.)
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- Tide-, storm-, and wave-influenced shelf sedimentation in a tectonically active intracratonic basin: the Proterozoic Uncompahgre Group, Southwest Colorado (Harris, C. W.)
- Timing of crenulation cleavage development in metapelites of the Precambrian Uncompahgre Formation, Needle Mountains, Colorado (Tewksbury, B. J.)

## underground installations *see under* engineering geology

*see under* engineering geology *under* Adams County; Hinsdale County; Lincoln County; Morgan County; United States

## underground installations—mines

*design*: Design guidelines and instrumentation for in-situ stress and rock discontinuity conditions in coal mines (O'Rourke, J. E.)

## underground water *see* ground water

**United States** *see* Southwestern U.S.; Western U.S.

## United States—economic geology

*coal*: General coal lease sales for FY 1981 (Anonymous)

*fuel resources*: Reservoir characteristics of ancient fluvial deposits with emphasis on Rocky Mountain and Midcontinent regions (Ethridge, Frank G.)

*gold ores*: A review of non-producing U.S. gold resources (Silver, Douglas)

*metal ores*: Landsat evaluation of mineral production areas of the United States (Southworth, Scott)

*mineral resources*: Evaluation of Landsat-4 thematic mapper data as applied to geologic exploration; summary of results (Dykstra, Jon D., et al.)

— Evaluation of the use of mineral resource assessments in federal land-use decisions (Davis, James F.)

— Federal land availability for mineral access (Pavlovich, Bob)

*natural gas*: Coal-bed methane and tight gas sands interrelationships (Rightmire, Craig T.)

— Coal-bed methane production potential in complex geologic settings (Mitchell, Terry E.)

- oil shale*: ESR study of oil shales (Harrell, J. W., Jr., et al.)  
 — Oil from shale; the potential, the problems, and a plan for development (Lewis, A. E.)  
 — The outlook for shale oil (Culberson, S. Frank)  
 — Utilization of oil shales and basic research in organic geochemistry (Burnham, Alan K.)  
*petroleum*: Onshore successes dominate U.S. exploratory efforts (King, Robert E.)  
 — Use of carbon dioxide in enhanced oil recovery (Orr, F. M., Jr.)  
*water resources*: Editorial; Making peace with Mother Nature (Lehr, Jay H.)  
 — Ground-water models for water resource planning (Moore, J. E.)  
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- United States—engineering geology**  
*geologic hazards*: Constraint; the missing variable in the coal burst problem (Babcock, Clarence O.)  
*land subsidence*: Geodetic evidence for subsidence due to groundwater withdrawal in many parts of the U.S. (Chi, S. C.)  
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*land use*: Evaluation of the use of mineral resource assessments in federal land-use decisions (Davis, James F.)  
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*pollution*: A time resolution methodology for assessing the quality of lake sediment cores that are dated by <sup>137</sup>Cs (Miller, Kevin M.)  
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 — Relationships among observed metal concentrations, criteria, and benthic community structural responses in 15 streams (LaPoint, T. W., et al.)  
 — Septic tank density and ground-water contamination (Yates, Marylynn V.)  
 — U.S. Geological Survey toxic substances hydrology program, surface-water contamination; proceedings of the technical meeting, Denver, Colorado, February 2-4, 1987 (Mallard, Gail E.)  
 — Vanadium concentrations in Colorado River basin waters (Linstedt, K. Daniel)  
*reclamation*: Editorial; Making peace with Mother Nature (Lehr, Jay H.)  
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- United States—geochemistry**  
*chromium*: Chromium contamination of groundwater (Calder, L. M.)  
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- United States—geochronology**  
*Holocene*: A time resolution methodology for assessing the quality of lake sediment cores that are dated by <sup>137</sup>Cs (Miller, Kevin M.)  
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- United States—geophysical surveys**  
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- United States—hydrogeology**  
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 — Outlook for artificial recharge (Priestaf, Iris)  
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 — Using geographic-information-system technology to support a hydrologic investigation (Kernodle, John Michael)
- United States—mineralogy**  
*framework silicates, silica minerals*: American classics (Zeitner, June Culp)  
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- United States—paleobotany**  
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- United States—petrology**  
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*ground water*: Ground-water contamination near a uranium tailings disposal site in Colorado (Goode, Daniel J.)  
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*surface water*: Releases of radium and uranium into Ralston Creek and Reservoir, Colorado, from uranium mining (Yang, I. C.)
- uranium—*isotopes***  
*ground water*: Occurrence and treatment of uranium in point of use systems in Colorado (Varani, Frederick T., et al.)  
*minerals*: Contact zones and hydrothermal systems as analogues to repository conditions (Wollenberg, H. A.)

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*U-234:* Uranium-series nuclides in the Golden Fault, Colorado, U.S.A., dating latest fault displacement and measuring recent uptake of radionuclides by fault-zone materials (Szabo, B. J.)

*U-238:* Colorado; the legacy of uranium mining (Hazle, Albert J.)

*U-238/U-234:* Isotopic composition of uranium and thorium in crystalline rocks (Rosholt, John N.)

— Isotopic composition of uranium and thorium in crystalline rocks (Rosholt, J. N.)

*U-238/U-235:* Precision, accuracy and meaning of fission track ages (Poupeau, G.)

**uranium ores** *see under* economic geology; isotopes; mineral deposits, genesis; paragenesis *see under* analysis *under* isotopes *see under* dates *under* absolute age

*see under* economic geology *under* Basin and Range Province; Boulder County; Chaffee County; Colorado Plateau; data processing; Delta County; El Paso County; Fremont County; Garfield County; Grand County; Gunnison County; Jefferson County; La Plata County; Larimer County; Mesa County; Moffat County; Montrose County; Ouray County; Park County; Proterozoic; Pueblo County; Rocky Mountains; Saguache County; San Juan County; San Miguel County; Teller County; Weld County; Western U.S.

*see under* geochemical methods *under* mineral exploration

*see under* geochemistry *under* helium; radon *see under* geological methods *under* mineral exploration

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*processes:* Uraniferous Proterozoic marginal marine sediments; precursors to major uranium deposits in metamorphic rocks (Nash, J. Thomas)

#### uranium ores—resources

*evaluation:* SURE; a system for uranium resource evaluation (Howarth, R. J., et al.)

## V

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— Proterozoic geology of the Needle Mtns., Colorado (Tewksbury, B. J.)

— Sedimentology of a Precambrian quartz-pebble conglomerate, Southwest Colorado (Ethridge, Frank G., et al.)

— Sedimentology of a Precambrian quartz-pebble conglomerate; Southwest Colorado (Ethridge, Frank G., et al.)

— The Irving Formation and the Proterozoic sequence in the Needle Mountains, southwestern Colorado (Ellingson, Jack A., et al.)

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**vanadates** *see under* minerals

#### vanadium—geochemistry

*oil shale:* The role of kerogen in the origin and evolution of nickel and vanadyl geoporphyris (Van Berkel, Gary Joseph)

*sedimentary rocks:* Geochemical processes affecting the zonation of vanadium, iron, and chromium, and implications for vanadium-uranium ore formation in the Colorado Plateau (Wanty, Richard B., et al.)

*surface water:* Vanadium concentrations in Colorado River basin waters (Linstedt, K. Danicl)

**vanadium ores** *see under* economic geology *see under* economic geology *under* Colorado Plateau; Fremont County; Garfield County; Moffat County; Montrose County; Ouray County; San Miguel County

**varves** *see under* geochronology

#### Vermejo Formation

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— Clay mineralogy of the Vermejo Formation (Upper Cretaceous), Canon City, Colorado (Hunt, David Gardiner)

— Coal bed methane desorption data (Tremain, Carol M.)

— Field guide and discussions of coal deposits, depositional environments and the Cretaceous-Tertiary boundary, southern Raton Basin (field trip 3) (Pillmore, Charles L.)

— Field guide to the continental Cretaceous-Tertiary boundary in the Raton Basin, Colorado and New Mexico (Pillmore, C. L., et al.)

— Interpretation of vitrinite reflectance data for the Raton Basin, southern Colorado-northern New Mexico (Close, Jay C.)

— More drilling heating up Raton Basin play (McCaslin, John C.)

— Palynology of the Vermejo Formation coals (Upper Cretaceous) in the Canon City coal field, Fremont County, Colorado (Clarke, Robert Travis)

— Palynology of Upper Cretaceous and lower Tertiary strata from the northern Raton Basin, south-central Colorado (Williams, Carol Alvis)

— Raton Basin magnetostratigraphy near Cretaceous-Tertiary boundary (Wolberg, Donald L., et al.)

— Sedimentology of Upper Cretaceous and Tertiary siliciclastics and coals in the Raton Basin, New Mexico and Colorado (Flores, Romeo M.)

— Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado (Pillmore, Charles L.)

— Stratigraphy of the Trinidad Sandstone and Vermejo Formation (Upper Cretaceous),

Canon City coal field, Fremont County, Colorado (Gaffke, Thresa M.)

— Structure of the Raton Basin from a regional seismic line (Applegate, James K.)

— Tectonic control on alluvial paleoarchitecture of the Cretaceous and Tertiary Raton Basin, Colorado and New Mexico (Flores, Romeo M.)

#### Vermillion Creek coal bed

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**Vertebrata** *see* Amphibia; Aves; fossil man; ichnofossils; Mammalia; Pisces; problematic fossils; Reptilia

#### Vertebrata—biologic evolution

*Mesozoic:* Continuing study of new Jurassic/Cretaceous vertebrate faunas from Colorado and Utah (Jensen, James A.)

#### Vertebrata—faunal studies

*Cretaceous:* Late Cretaceous nonmarine vertebrates of the Denver Basin (Carpenter, Kenneth)

#### Vertebrata—morphology

*ultrastructure:* Cambrian vertebrates; are they arthropods? (Thompson, Diane)

**vertebrates** *see* fish; mammals; reptiles

#### vertebrates—biostratigraphy

*Cretaceous:* Biostratigraphic correlation of Cretaceous-Tertiary boundary rocks, Colorado to San Juan Basin, New Mexico (Newman, Karl R.)

*Oligocene:* Vertebrate biochronology of Oligocene sediments in Southwest North Dakota (Kihm, Allen J.)

*Paleocene:* Early Paleocene vertebrates of the Denver Basin, Colorado (Middleton, Michael D.)

*Pleistocene:* Late Pleistocene vertebrates from Gunnison County, Colorado (Emslie, Steven D.)

#### vertebrates—ecology

*Holocene:* Mysteries in mud; ancient frost crystal impressions and other curiosities in Cave of the Winds (Davis, Donald G.)

#### vertebrates—miscellaneous

*egg structure:* Not every "egg" is an egg (Hirsch, Karl F.)

#### vertebrates—occurrence

*Pleistocene:* A partial muskox skeleton from eolian deposits, Southwest Colorado (Clay, Vickie L.)

#### vertebrates—paleoecology

*Jurassic:* Paleontological evidence of a non-marine, saline, model of deposition of the Jurassic Todilto Formation, northern New Mexico and southwestern Colorado (Kietzke, Kenneth K.)

#### Virginia Dale Batholith

Interpretation of aeromagnetic data over the northern Front Range of Colorado (Moll, S. H.)

— Reconnaissance geologic mapping in north-central Colorado using multispectral gamma-ray data (Moll, Stanton H.)

**volcanic features** *see under* geomorphology

**volcanic rocks** *see under* igneous rocks

**volcanism** *see under* petrology; volcanology  
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**volcanoes** *see under* volcanology  
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#### **volcanology—volcanism**

*absolute age*: K/Ar geochronology of the composite volcano and trap-door caldera at Bonanza, NE San Juan Mountains, and implications for mid-Tertiary volcanism in Colorado (Smith, Brian M.)

*basalts*: Red Mountain Volcano; a source for local basalt flows north of Gunnison, Colorado (Rubel, N. Daniel)

*calderas*: An oxygen isotope study of hydrothermal alteration in the Lake City Caldera, San Juan Mountains, Colorado (Larson, Peter B.)

— Central San Juan Caldera cluster, Colorado; new stratigraphic and structural interpretations and implications for mineralization (Lipman, Peter W., et al.)

— Characterizing thermal energy and mass transport in volcanic caldera complexes; the role of scientific drilling (Hermance, John F.)

— Compositional layers in the zoned magma chamber of the Grizzly Peak Tuff (Fridrich, Christopher J.)

— Computer analysis of mineralization within evolving subvolcanic and caldera systems, Breckenridge and Bonanza regions, Colorado mineral belt, U.S.A. (Pride, D. E.)

— Deformation around the Creede Caldera; a consequence of isostatic adjustment following caldera formation (Gephart, John W.)

— Evolution of the early Oligocene Bonanza Caldera, Northeast San Juan volcanic field, Colorado (Varga, Robert J.)

— Paleomagnetic evidence for the timing of collapse and resurgence of the Lake City Caldera, San Juan Mountains, Colorado (Reynolds, Richard L., et al.)

— Preliminary geology of the San Luis Peak Quadrangle and adjacent areas, San Juan volcanic field, southwestern Colorado (Lipman, Peter W.)

— The Grizzly Peak Cauldron, Colorado; structure and petrology of a deeply dissected resurgent ash-flow caldera (Fridrich, Christopher John)

*eruptions*: A pyroclastic surge deposit and its relation to the hydrothermal center at Hahns Peak, Colorado (Casaceli, Robert J.)

— Limited magma mixing in a basalt-rhyolite complex Handkerchief Mesa; San Juan Mountains, Colorado (Thompson, Ren S.)

— Oligocene ash-flow eruptions of the San Juan volcanic field, Colorado (Lipman, Peter W.)

— The geology of Summer Coon Volcano near Del Norte, Colorado (Noblett, Jeffrey B.)

— The Lake City Caldera, western San Juan Mountains, Colorado (Hon, Ken, et al.)

— Trapdoor collapse of a conejos-age summit caldera at Bonanza, Colorado (Varga, Robert J.)

*evolution*: A Proterozoic volcano-plutonic terrane, Gunnison and Salida areas, Colorado (Bickford, M. E.)

*explosive eruptions*: A krakatoan-type caldera at Bonanza, San Juan volcanic field, Colorado (Varga, Robert J.)

*interpretation*: The thermal regime of the San Juan Basin since Late Cretaceous times and its relationship to San Juan Mountains thermal sources (Clarkson, Gerry)

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*Lake City Caldera*: Electrical studies conducted on the Lake City Caldera, Colorado, July 1984 (Pierce, Herb)

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#### **Wadge Bed**

Characterization of lower Williams Fork Formation coals from the eastern Yampa coal field, Routt County, Colorado (Affolter, Ronald H.)

#### **Wagon Wheel Gap Volcanics**

Structure of the Bachelor Caldera, Creede, CO (Sawyer, D. A.)

#### **Wall Mountain Tuff**

Geology of the Mount Aetna cauldron complex, Sawatch Range, Colorado (Shannon, James R.)

— Oligocene paleogeography in the southern Denver Basin (Morse, David G.)

— Oligocene volcanic rocks as a uranium source for sandstone-type uranium deposits in central Colorado (Dickinson, Kendall A.)

— Rocks of the Thirty-nine Mile volcanic field as possible sources of uranium for epigenetic deposits in central Colorado, U.S.A. (Dickinson, Kendall A.)

#### **Wanakah Formation**

Mineral resources of the Gunnison Gorge Wilderness Study Area, Montrose and Delta counties, Colorado (Armbrustmacher, Theodore J., et al.)

— Paleogeography and facies distribution of the Todilto Limestone and Pony Express Limestone Member of the Wanakah Formation, Colorado and New Mexico (Ridgley, Jennie L.)

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— San Juan Sag; Cretaceous rocks in a volcanic-covered basin, south central Colorado (Gries, Robbie Rice)

— The oldest (?) Morrison Formation dinosaur, Gunnison, Colorado (Bartleson, Bruce L.)

#### **Wanapum Basalt**

Geologic systems as analogs for long-term radioactive waste isolation (Wollenberg, Ernesto A., et al.)

#### **Wasatch Formation**

A debris-flow model for the origin of high-level sloping surfaces on the northern flanks of Battlement Mesa, Garfield County, Colorado (Stover, Bruce K.)

— Application of Thematic Mapper-type data over a porphyry-molybdenum deposit in Colorado (Rickman, D. L.)

— Case study of gas migration in the Wasatch and Mesaverde formations of the Piceance Basin, Colorado (Mercer, J. C., et al.)

— Case study of gas migration in the Wasatch and Mesaverde formations of the Piceance Basin, Colorado (Mercer, J. C., et al.)

— Coal deposits in Cretaceous and Tertiary fluvial systems of the Rocky Mountain region (Flores, Romeo M.)

— Correlation of surface sections of the inter-tongued Eocene Wasatch and Green River formations across the central part of the Sand Wash Basin, Northwest Colorado, and eastern part of the Washakie Basin, Southwest Wyoming (Roehler, H. W.)

— Correlation of surface sections of the inter-tongued Eocene Wasatch and Green River formations along the western margins of the Sand Wash Basin, Northwest Colorado, and Washakie Basin, Southwest Wyoming (Roehler, H. W.)

— Cross section showing correlations of Upper Cretaceous Fox Hills Sandstone and Lance Formation, and lower Tertiary Fort Union and Wasatch formations, southeastern Washakie Basin, Wyoming, and eastern Sand Wash Basin, Colorado (Honey, J. G.)

— Cross sections showing stratigraphic framework of Upper Cretaceous Dakota Sandstone, Mancos Shale, Mesaverde Group, and Mesaverde Formation, and lower Tertiary Wasatch Formation, west-central Piceance Basin, Garfield County, Colorado (Ellis, M. S.)

— Depositional environment of Green River Formation (Sullivan, Raymond)

## Washington County—areal geology

- Douglas Pass area slope stability investigation; detailed study area geological investigation (Stover, B. K.)
- Early Eocene mammalian faunas of the Piceance Creek basin, northwestern Colorado (Kihm, Allen James)
- Fracture studies in Cretaceous and Paleocene strata in and around the Piceance Basin, Colorado; preliminary results and their bearing on a fracture-controlled natural-gas reservoir at the MWX site (Verbeek, Earl R.)
- Geologic map of the Mt. Axtell Quadrangle, Gunnison County, Colorado (Gaskill, D. L., et al.)
- Hydrogeologic characterization of the Colony Shale Oil Project area (Day, Michael J.)
- Movement kinematics of the Muddy Creek landslide complex (Cannon, Susan H.)
- Organic geochemistry and organic petrography (Bostick, Neely H., et al.)
- Origin and distribution of fractures in Tertiary and Cretaceous rocks, Piceance Basin, Colorado, and their relation to hydrocarbon occurrence (Pitman, Janet K.)
- Production characterization of tight lenticular gas sands in the Rulison area of western Colorado (Mercer, J. C.)
- Regional geochemical patterns in Wyoming and northern Colorado as defined by analysis of stream sediment samples (Warren, Richard G., et al.)
- Simulated oil-shale mine dewatering using a confined multi-aquifer model, Piceance Basin, Colorado, U.S.A. (Weeks, John B.)
- Stratigraphy and palynology of Late Cretaceous and early Tertiary rocks, Tommy's Draw, Rio Blanco County, Colorado (Zeiler, Rose M.)
- Stratigraphy of the Ohio Creek Member of the Williams Fork Formation, Piceance Creek Gap to Rifle Gap, Garfield and Rio Blanco counties, Colorado (Valasek, David W.)
- Structural development and oil occurrence on northeast flank of Uinta Mountains near Irish Canyon, northwestern Colorado (Roehler, Henry W.)
- The coal bed methane potential of the Sand Wash Basin, Green River coal region, Colorado (Boreck, Donna L., et al.)
- The depositional setting of the Eocene rocks of the Green River basin (Sullivan, Raymond)
- Vitrinite reflectance and temperature gradient models applied at a site in Piceance Basin, Colorado (Bostick, Neely H.)
- Wasatch sandstones in the eastern Green River basin (Steinmetz, Richard)

## Washington County—areal geology

*maps:* Historic trail maps of the Sterling 1' by 2' Quadrangle, northeastern Colorado (Scott, Glenn R.)

## Washington County—economic geology

- fuel resources:* Isoreflectance map of the J Sandstone in the Denver Basin of Colorado (Higley, D. K., et al.)
- Use of computer-generated maps of oil and gas development and exploration intensity for delineating producing trends, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)

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*natural gas:* Shallow Upper Cretaceous Niobrara gas fields in the eastern Denver Basin (Lockridge, John P.)

*petroleum:* Core porosity, permeability, and vitrinite reflectance data from the Lower Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)

— Geochemical evidence for Paleozoic oil in Lower Cretaceous O Sandstone, northern Denver Basin (Clayton, J. L.)

## Washington County—engineering geology

*land subsidence:* High plains depressions in eastern Colorado; distribution, classification, and genesis (Walker, Graham Thomas)

*petroleum engineering:* Niobrara development program, Washington County, CO (Hanley, Edward J.)

## Washington County—geomorphology

*olian features:* High plains depressions in eastern Colorado; distribution, classification, and genesis (Walker, Graham Thomas)

## Washington County—hydrogeology

*ground water:* Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)

— Water-level records for the northern High Plains of Colorado, 1970-86 (Reed, Raymond L.)

*maps:* Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)

— Potential well yields from the Ogallala Aquifer in the northern High Plains of Colorado (Lindner-Lunsford, Juli B.)

## Washington County—soils

*maps:* Soil survey of Washington County, Colorado (Petersen, Michael L., et al.)

*properties:* Topsoil removal effects on soil chemical and physical properties (Greb, B. W.)

## Wason Park Tuff

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— Mineralogy, petrology, and magmatic conditions from the Fish Canyon Tuff, central San Juan volcanic field, Colorado (Whitney, James A.)

— The Mammoth Mountain and Wason Park tuffs; magmatic evolution in the central San Juan volcanic field, southwestern Colorado (Webber, Karen Louise)

— The Mammoth Mt. Tuff and other shallow zoned rhyolitic ash-flow tuffs, central San Juan volcanic field (Krause, Karen W., et al.)

*waste disposal see under engineering geology; environmental geology; pollution see under applications under rock mechanics; well-logging*

*see under engineering geology under Boulder County; Clear Creek County; data processing; Dolores County; Fremont County; Garfield County; Grand County; Gunnison County; Jefferson County; La Plata County; Lake County; Mesa County; Montrose County; Rio Blanco County; San Juan County; San Miguel County; United States*

*see under environmental geology under Adams County; Arapahoe County; data processing; Denver County; Dolores County; Garfield County; La Plata County; Larimer County; Mesa County; Montezuma County; Montrose County; Rio Blanco County; Routt County; San Juan County; San Miguel County; Weld County; Yuma County see under petroleum engineering under engineering geology*

## waste disposal—radioactive waste

*effects:* Geologic systems as analogs for long-term radioactive waste isolation (Wollenberg, Ernesto A., et al.)

*pollution:* Geochemical interactions between acidic tailings fluid and bedrock; use of the computer model MINTEQ (Davis, Andy)

— Uranium mill tailings; radium geochemistry (Landa, Edward R.)

*seepage:* Geochemical kinetics (Claassen, Hans C.)

*storage:* A short-pulse electromagnetic transponder for hole-to-hole use (Wright, David L., et al.)

— Natural analogues; Alamosa River monzonite intrusive into tuffaceous and andesitic rocks (Brookins, Douglas G., et al.)

— Slurry cutoff walls; applications in the control of hazardous wastes (Ryan, Christopher R.)

*thermal effects:* Geomechanics (Swolfs, H. S.)

*transport:* Geochemical kinetics (Claassen, Hans C.)

## waste disposal—site exploration

*well-logging:* Single-hole short-pulse borehole radar experiments and a crosshole transponder (Wright, D. L., et al.)

*water see ground water; hydrogeology; hydrology; water resources*

*water quality see under pollution under ground water*

*see under water under pollution*

## water resources see under economic geology

*see under economic geology under Adams County; Arapahoe County; Boulder County; Chaffee County; Colorado Plateau; Custer County; data processing; Denver County; Douglas County; El Paso County; Elbert County; Fremont County; Garfield County; Grand County; Great Plains; Jefferson County; Lake County; Larimer County; Logan County; Mesa County; Moffat County; Montezuma County; Morgan County; Park County; Pueblo County; Rio Blanco County; Rocky Mountains; Saguache County; Sedgwick County; Southwestern U.S.; symposia; Teller County; United States; Weld County; Western U.S. see under natural resources under conservation*

*see under natural resources under conservation*

*water supply see water resources*

*waterways see under engineering geology*

*see under engineering geology under Boulder County; Chaffee County; Clear Creek County; data processing; Denver County; Garfield County; Gilpin County; Jefferson County; Larimer County;*

Mesa County; Moffat County; Morgan County; Park County; Pueblo County; Rio Grande County; Weld County

#### weathering—chemical weathering

*alpine environment*: Chemical weathering of late Quaternary cirque deposits in the Colorado Front Range (Dixon, John Charles)

*rates*: Hydrochemical characterization of alpine and alpine-subalpine stream waters, Colorado Rocky Mountains, U.S.A. (Stednick, J. D.)

*sediments*: Rare-earth element and mineralogic changes in Holocene soil and stream sediment; a case study in the Wet Mountains, Colorado, U.S.A. (Cullers, Robert L., et al.)

#### weathering—environment

*acidic environment*: Observations on the behavior of gold during supergene oxidation at Summitville, Colorado, U.S.A., and implications for electromobility stability in the weathering environment (Stoffregen, Roger E.)

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*granites*: Rare-earth element (REE) and mineralogic changes in size fractions of soils and sediment during weathering of the San Isabel Batholith, Wet Mountains, USA (Cullers, Robert L., et al.)

*pyroclastics*: The hydration and alteration of the perlite, pitchstone, and upper pyroclastic unit at Ruby Mountain, Nathrop, Colorado (Nickel, Brian K.)

#### weathering—minerals

*pyrite*: Degradation of massive pyrite; physical, chemical, and bacterial effects (Paciorek, Kazimiera J. L., et al.)

#### weathering—physical weathering

*temperature*: Insolation-talus relationships, San Juan Mountains, Colorado (Hyers, Albert D.)

#### weathering—processes

*leaching*: Soluble mineral content in surficial alluvium and associated Mancos Shale (Larone, Jonathan B.)

#### weathering—sedimentary rocks

*organic residues*: The effects of weathering on the petrographic and fluorescent properties of sub-bituminous coal from the Fort Union Formation, Colorado (Babcock, Douglas L.)

*shale*: Dissolved mineral salts derived from Mancos Shale (Evangelou, V. P., et al.)

#### Weber Sandstone

An interpretation of the subsurface structural style of the Beaver Creek Anticline, Moffat and Routt counties, Colorado (Morel, John A., et al.)

— Carbon dioxide injection and resultant alteration of Weber Sandstone (Pennsylvanian-Permian), Rangely Field, Colorado (Bowker, K. A.)

— Cretaceous and Pennsylvanian oil and gas production at Elk Springs and Winter Valley pools, Moffat County, Colorado (MacMillan, Logan)

— Field guide and road log; Pennsylvanian and Permian depositional systems and cycles in the Eagle Basin, northwestern Colorado (Schenk, Christopher J., et al.)

— Interdune pond carbonates, Weber Sandstone (Pennsylvanian-Permian), northern Utah and Colorado (Driese, Steven G.)

— Mineral resources of the Bull Canyon Wilderness Study Area, Moffat County, Colorado, and Uintah County, Utah (Soulliere, Sandra J., et al.)

— Paleotectonic, stratigraphic, and diagenetic history of the Weber Sandstone in the Rangely area (Koelmel, Mark)

— Paleotectonic, stratigraphic, and diagenetic history of Weber Sandstone, Rangely area, Colorado (Koelmel, Mark)

— Pennsylvanian and Permian depositional systems and cycles in the Eagle Basin, Northwest Colorado (Johnson, Samuel Y., et al.)

— Pennsylvanian-Permian paleostructure and stratigraphy as interpreted from seismic data in the Piceance Basin, Northwest Colorado (Wachter, Noel B.)

— Physical chemistry of reservoir fluids (Billo, Saleh M.)

— Post-Mississippian paleotectonic, stratigraphic, and diagenetic history of the Weber Sandstone in the Rangely Field area, Colorado (Koelmel, Mark H.)

— Rangely Field summary; 1, Development history and engineering data, Weber Sand unit (Mendeck, M. F.)

— Rangely Field summary; 2, Seismic profile, structural cross section, and geochemical comparisons (Stone, Donald S.)

— Rangely Field; eolian system-boundary trap in the Permo-Pennsylvanian Weber Sandstone of Northwest Colorado (Fryberger, Steven G.)

— Sedimentology of and petroleum occurrence in the Lower Permian Schoolhouse Tongue of the Weber Sandstone, Northwest Colorado (Johnson, Samuel Y., et al.)

— Sedimentology of interdune carbonates, Weber Sandstone (Pennsylvanian-Permian), northern Utah and Colorado (Driese, S. G.)

— Seismic interpretation in the Piceance Basin, Northwest Colorado (Wachter, Noel B.)

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— Stratigraphic and sedimentologic studies of late Paleozoic strata in the Eagle Basin and northern Aspen Sub-basin, Northwest Colorado (Johnson, Samuel Y.)

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— Texaco discovery spurs Weber play (Rountree, Russ)

— The Willow Creek Fault, eastern Uinta Mountains; geological analysis of a foreland subthrust play (Powers, Richard B.)

— Weber hunt stirs interest in NW Colorado (McCaslin, John C.)

#### Weld County—areal geology

*maps*: Historic trail maps of the Sterling 1' by 2' Quadrangle, northeastern Colorado (Scott, Glenn R.)

#### Weld County—economic geology

*coal*: Chemical analyses of coal samples from the Denver region (Khalsa, Nirbhao S.)

— Coal geology and coal, oil, and gas resources of the Erie and Frederick quadrangles, Boulder and Weld counties, Colorado (Spencer, Frank D.)

*diamonds*: Discovery of the George Creek, Colorado kimberlite dikes (Carlson, J. A.)

*energy sources*: Energy and mineral resource (excluding sand and gravel), Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)

*fuel resources*: Codell Sandstone, new exploration play, Denver Basin (Weimer, Robert J.)

— Denver Basin focus is on two areas (Rountree, Russ)

— Isoreflectance map of the J Sandstone in the Denver Basin of Colorado (Higley, D. K., et al.)

— Seismic profiles in the area of the Pierce and Black Hollow fields, Weld County, Colorado (Stone, Donald S.)

— Use of computer-generated maps of oil and gas development and exploration intensity for delineating producing trends, Denver Basin, Colorado, Nebraska, and Wyoming (Higley, Debra K., et al.)

*gravel deposits*: Sand and gravel resources, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)

*maps*: Coal geology and coal, oil, and gas resources of the Erie and Frederick quadrangles, Boulder and Weld counties, Colorado (Spencer, Frank D.)

— Energy and mineral resource (excluding sand and gravel), Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)

— Geologic, biostratigraphic, and structure map of the Pierre Shale between Loveland and Round Butte, Colorado (Scott, G. R.)

— Isoreflectance map of the J Sandstone in the Denver Basin of Colorado (Higley, D. K., et al.)

*mineral resources*: Energy and mineral resource (excluding sand and gravel), Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)

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— Origin and significance of surface occurrences of natural gas, northern Denver Basin, Colorado (Rice, Dudley D., et al.)

*oil and gas fields*: Character and origin of natural gas from Upper Cretaceous Codell Sandstone, Denver Basin, Colorado (Rice, Dudley D.)

— Depositional environments and diagenesis of D Sandstone, Wild Horse Field, Weld County, Colorado (Wilson, Kevin M.)

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— Greeley Field reveals Parkman promise (Nelms, Ralph L.)

— Seismic-stratigraphic analysis of Lanyard-Lost Creek Field area, Denver Basin, Colorado; application to exploration and field delineation (Plybon, Steven C.)

— Stratigraphy and petrology of the Lower Cretaceous J Sandstone, Wattenberg Gas Field, Weld County, Colorado (Young, Genevieve B. C.)

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- A possible petroleum-related geochemical anomaly in surface rocks, Boulder and Weld counties, Colo. (Donovan, Terrence J., et al.)
- Coal geology and coal, oil, and gas resources of the Eric and Frederick quadrangles, Boulder and Weld counties, Colorado (Spencer, Frank D.)
- Depositional environments and diagenesis of D Sandstone, Wild Horse Field, Weld County, Colorado (Wilson, Kevin M.)
- Discovery of Upper Cretaceous "Parkman Sandstone" production, Denver Basin, Colorado (Guion, Douglas J., et al.)
- Discovery of Upper Cretaceous Parkman Sandstone production in Colorado (Hutson, L. Roger)
- Preliminary investigations of an integrative gas geochemical technique for petroleum exploration (Hickey, James C.)
- uranium ores:* Gaseous emanations associated with sandstone-type uranium deposits (Reimer, G. M.)
- Uranium in situ solution mining and groundwater quality at Grover test site, Weld Cty., CO (Wade, Kenneth)
- water resources:* Alluvial and bedrock aquifers of the Denver Basin; eastern Colorado's dual ground-water resource (Robson, S. G.)
- Conjunctive use of groundwater and surface water for irrigated agriculture; risk aversion (Bredehoeft, John D.)
- Hydrologic data for the Larimer-Weld regional water monitoring program, Colorado, 1975-82 (Blakely, Steven R.)
- Water resources of upper Crow Creek, Colorado (Kirkham, Robert M.)

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- bibliography:* Annotated bibliography of subsidence studies over abandoned coal mines in Colorado (Hatton, Tom)
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- slope stability:* Slope analysis, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)
- waterways:* Pilot study for collection of bridge-scour data (Jarrett, Robert D.)

## Weld County—environmental geology

- geologic hazards:* Environmental geology of the Front Range urban corridor and vicinity, Colorado (Hansen, Wallace R.)
- Nature and origin of "vent gases" in the LaSalle area, northeastern Colorado (Rice, Dudley D., et al.)
- Origin and significance of surface occurrences of natural gas, northern Denver Basin, Colorado (Rice, Dudley D., et al.)

*impact statements:* Narrows Unit, Pick-Sloan Missouri Basin Program, Colorado (U. S. Bureau of Reclamation, Lower Missouri Region)

*land use:* Bedrock geology, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)

- Bedrock topography of valley-fill areas, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)
- Drainage basins and areas of past flooding, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)
- Environmental geology of the Front Range urban corridor and vicinity, Colorado (Hansen, Wallace R.)
- Existing land use, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)
- Ground water availability, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)
- Sand and gravel resources, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)
- Shallow surficial materials, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)
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- Solid waste disposal suitability, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)

*maps:* Bedrock geology, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)

- Bedrock topography of valley-fill areas, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)
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- Water quality and sources of potential pollution, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)

*pollution:* Groundwater contamination by the herbicide atrazine, Weld County, Colorado (Wilson, Michael Phillip)

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- waste disposal:* Solid waste disposal suitability, Windsor study area, Larimer and Weld counties, Colorado (Shelton, D. C.)

## Weld County—geochemistry

*maps:* Nitrogen, sulfate, chloride, and manganese in ground water in the alluvial deposits of the South Platte River valley near Greeley, Weld County, Colorado (Gaggiani, Neville G.)

*trace elements:* Chemical analyses of coal samples from the Denver region (Khalsa, Nirbha S.)

## Weld County—geophysical surveys

*gravity surveys:* Geophysical and geological study of the Greeley Arch, Colorado (Gelberg, Russ)

*seismic surveys:* Seismic profiles in the area of the Pierce and Black Hollow fields, Weld County, Colorado (Stone, Donald S.)

— Seismic-stratigraphic analysis of Lanyard-Lost Creek Field area, Denver Basin, Colorado; application to exploration and field delineation (Plybon, Steven C.)

## Weld County—hydrogeology

*ground water:* Comparison of numerical and analytical solutions of groundwater flow for Coors' coal mine, Keensburg, Colorado (Weider, Mark F.)

— Distinction between in-situ biogenic gas and migrated thermogenic gas in ground water, Denver Basin, Colorado (Rice, Dudley D.)

— Ground water/surface water conjunctive use project in Beebe Draw, Adams and Weld counties, Colorado (Mangelson, Kenneth A.)

— Hydrogeologic data from parts of the Denver Basin, Colorado (Major, Thomas J., et al.)

— Hydrogeology and water quality studies in the Cache la Poudre Basin, Colorado (Waltz, James P.)

— Nitrogen, sulfate, chloride, and manganese in ground water in the alluvial deposits of the South Platte River valley near Greeley, Weld County, Colorado (Gaggiani, Neville G.)

*hydrology:* Selected hydrologic characteristics of the South Platte River in the vicinity of the proposed Narrows Reservoir near Fort Morgan, Colorado (Minges, Donald R.)

*maps:* Generalized altitude and configuration of the water table in parts of Larimer, Logan, Sedgwick, and Weld counties, Colorado (Borman, R. G.)

— Shallow ground water in the Boulder-Fort Collins-Greeley area, Front Range urban corridor, Colorado, 1975-77 (Schneider, P. A., Jr.)

— Water resources of upper Crow Creek, Colorado (Kirkham, Robert M.)

## Weld County—mineralogy

*sulfates:* The Stoneham barite locality, Colorado (Bennett, Norman L.)

## Weld County—sedimentary petrology

*sedimentation:* Organic and inorganic constituents of the Niobrara Formation in Weld County, Colorado (Precht, William F.)

## Weld County—stratigraphy

*archaeology:* Archaeology of the Jurgens Site (Scott, Douglas D.)

— Geoarchaeology and late Quaternary geomorphology of the middle South Platte River, northeastern Colorado (Holliday, Vance T.)

— Geology of the Frazier Site, Kersey, Colorado (Malde, Harold E.)

- Cretaceous:** Depositional environments and diagenesis of D Sandstone, Wild Horse Field, Weld County, Colorado (Wilson, Kevin M.)
- Field trip guide, Codell Sandstone, northern Front Range (Sonnenberg, Stephen A.)
  - Geologic, biostratigraphic, and structure map of the Pierre Shale between Loveland and Round Butte, Colorado (Scott, G. R.)
  - Seismic-stratigraphic analysis of Lanyard-Lost Creek Field area, Denver Basin, Colorado: application to exploration and field delineation (Plybon, Steven C.)
  - Stratigraphy and petrology of the Lower Cretaceous J Sandstone, Wattenberg Gas Field, Weld County, Colorado (Young, Genevieve B. C.)
- maps:** Geologic, biostratigraphic, and structure map of the Pierre Shale between Loveland and Round Butte, Colorado (Scott, G. R.)
- Quaternary:** Geoarchaeology and late Quaternary geomorphology of the middle South Platte River, northeastern Colorado (Holliday, Vance T.)
- Weld County—structural geology**
- tectonics:** Geophysical and geological study of the Greeley Arch, Colorado (Gelberg, Russ)
- Weld County—tectonophysics**
- heat flow:** Burial history reconstruction of the Lower Cretaceous J Sandstone in the Wattenberg Field, Colorado, "hot spot" (Higley, D. K.)
- well-logging see under geophysical surveys**
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- applications:** Carbonate-anhydrite facies determination by quantitative seismic stratigraphy in Paradox Basin (Wadleigh, Richard F., Jr.)
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  - Vertical seismic profiles at the multi-well experiment site, Garfield County, Colorado (Lee, Myung W.)
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- A regionally extensive altered air-fall ash for use in correlation of lithofacies in Upper Cretaceous Williams Fork Formation, northeastern Piceance Creek and southern Sand Wash basins, Colorado (Johnson, Edward A.)
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- Preliminary data report conducted for the Colorado State Geological Survey on the Superconducting, Supercollider study (Collins, Donley S.)
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  - Overview of U.S. Department of Energy Multiwell Experiment, Piceance Creek basin, Colorado (Spencer, Charles W.)
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  - Petrology of selected sandstones in the MWX wells (Northwest Colorado) and its relationship to borehole geophysical-log analysis and reservoir quality (Pitman, Janet K.)
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**White River Group**

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— Stratigraphy of the Williams Canyon Formation, Colorado (Robertson, Billy Gene)

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- Chemical analyses of coal samples from the Green River region (Khalsa, Nirbhao S.)
- Coal bed methane desorption data (Tremain, Carol M.)
- Detailed stratigraphy of the Upper Cretaceous Ohio Creek Member of the Williams Fork Formation, Rifle, Colorado (Valasek, David W.)
- Facies relationships in Campanian wave-dominated coastal deposits in Sand Wash Basin (Siepmann, Bret R.)
- Geologic and engineering implications of production history from five Mesaverde wells in central Piceance Creek basin, Northwest Colorado (Chancellor, R. E.)
- Geologic characterization of a field laboratory for coalbed methane exploration and development (Wiman, Stephen K., et al.)
- Geologic map and coal sections of the Sawmill Mountain Quadrangle, Rio Blanco County, Colorado (Reheis, Marith Cady C.)
- Geologic map and coal sections of the Thornburgh Quadrangle, Moffat and Rio Blanco counties, Colorado (Reheis, Marith Cady C.)
- Geophysical logs and sample analysis for 10 holes drilled during 1981 in the western part of the Yampa coal field, Moffat County, Colorado (Johnson, Edward A.)
- Geophysical logs for 34 holes drilled during 1980 in the Yampa coal field, Moffat and Routt counties, Colorado (Johnson, Edward A.)
- Origin and production implications of abnormal coal reservoir pressure (Decker, A. D.)
- Petrology of selected coal seams of the Williams Fork Formation, Moffat County, Colorado (Joliat, Steven A.)
- Petrology, provenance, and tectonic significance of Upper Cretaceous Ohio Creek Member, Williams Fork Formation, Piceance Creek basin, Colorado (Whited, Joseph Michael)
- Porosity, permeability, and pore structure of the tight Mesaverde Sandstone, Piceance Basin, Colorado (Soeder, D. J.)
- Predicting the influences of post-mining conditions on surface and groundwater resources (Day, Michael J., et al.)
- Preliminary sedimentology and biostratigraphy, Upper Cretaceous Williams Fork Formation (Mesaverde Group), Rio Blanco County, Piceance Creek basin, NW Colorado (Noll, Michael D.)
- Red Mountain Unit, Piceance Basin, Colorado; field laboratory for research and development in coal bed methane production (Wiman, Stephen K.)
- Sedimentological aspects of stratigraphic correlations in the Upper Cretaceous Ericson Sandstone, Greater Green River basin, Wyoming, Colorado, and Utah (Law, B. E., et al.)
- Source rock evaluation; a method of predicting dominant reservoir mechanisms of deeply buried, low-permeability coal reservoirs (Decker, A. D.)
- Stratigraphic distribution suggesting environmental significance of pollen in Late Cretaceous upper Iles and lower Williams Fork formations, Rifle Gap, Garfield County, Colorado (Madden-McGuire, Dawn J.)
- Stratigraphic distribution suggesting environmental significance of pollen in Late Cretaceous upper Iles and lower Williams Fork

- formations, Rifle Gap, Garfield County, Colorado (Madden-McGuire, Dawn J.)
- Stratigraphic framework of Upper Cretaceous (Campanian) coal in western Colorado (Newman, Karl R.)
- Stratigraphy and depositional environments of a portion of upper Campanian Mesaverde Group, central Grand Hogback, Northwest Colorado (Madden, Dawn J.)
- Stratigraphy of Grand Hogback Coalfield, upper Campanian Mesaverde Group, Rifle Gap to New Castle, Garfield County, Colorado (Madden, Dawn J.)
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- The effects of depositional environment on petrophysical properties of Mesaverde reservoirs, northwestern Colorado (Lorenz, J. C., et al.)

#### Willwood Formation

- Comparative osteology of North American dichobunid artiodactyls (Rose, Kenneth D.)
- Paleopathology of early Cenozoic Coryphodon (Mammalia; Pantodonta) (Lucas, Spencer G.)

#### Wind River Formation

- Comparative osteology of North American dichobunid artiodactyls (Rose, Kenneth D.)
- Hydrochemical studies of uranium mill tailing piles at Riverton, Wyoming, and Maybell, Colorado (Narasimhan, T. N., et al.)
- Paleocene and Eocene rodents of North America (Black, Craig C.)
- Regional geochemical patterns in Wyoming and northern Colorado as defined by analysis of stream sediment samples (Warren, Richard G., et al.)
- Types and usages of drilling fluids utilized to install monitoring wells associated with metals and radionuclide ground water studies (Ericson, Wayne A., et al.)

#### Windy Point Granite

- The Pikes Peak Batholith and associated plutons, Colorado (Wobus, Reinhard A.)

#### Wingate Sandstone

- Chemical and thermal evolution of diagenetic fluids and the genesis of uranium and copper ore in and adjacent to the Paradox Basin with emphasis on the Lisbon Valley and Temple Mountain areas, Utah and Colorado (Morrison, Stan Jay)
- Colorado National Monument (Hall, Robert B.)
- Dinosaur tracksites of western Colorado and eastern Utah (Lockley, Martin G.)
- Distribution and structural geometry of faults and folds along the northwestern Uncompahgre Uplift, western Colorado and eastern Utah (Heyman, O. Glenn)

- Evaluation of Landsat-4 thematic mapper data as applied to geologic exploration; summary of results (Dykstra, Jon D., et al.)
- Fault/fracture strain; Wingate Sandstone (Jamison, William R.)
- Laramide deformation of the Uncompahgre Plateau; geometry and mechanisms (Heyman, O. G., et al.)
- Laramide deformation of the Wingate Sandstone, Northeast Uncompahgre Plateau, Colorado (Jamison, William R.)
- Nonmarine depositional environments and Paleosol development in the Upper Triassic Dolores Formation, southwestern Colorado (Blodgett, Robert H.)

#### Wire Patch Intrusive Complex

- Lithologic and alteration controls on Rb-Sr geochemistry of a mineralized breccia pipe complex, Breckenridge, Colorado (Cocker, Mark D.)

#### Wolf Creek Bed

- A depositional model for middle Mesaverde coals, Yampa Field, northwestern Colorado (Fenske, John M., Jr.)
- Characterization of lower Williams Fork Formation coals from the eastern Yampa coal field, Routt County, Colorado (Affolter, Ronald H.)

## X

**X-ray analysis** *see* chemical analysis; spectroscopy

#### X-ray analysis—X-ray diffraction analysis

- applications:* Ostwald ripening and interparticle-diffraction effects for illite crystals (Eberl, Dennis D.)
- oil shale:* Multiphase quantitative analysis of Colorado oil shales involving overlap of the diffraction peaks (Smith, D. K., et al.)

**X-ray diffraction analysis** *see under* X-ray analysis

**xenoliths** *see under* inclusions

*see under* inclusions *under* phase equilibria  
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**xenon** *see under* geochemistry

## Y

#### Yampa Bed

- A regionally extensive altered air-fall ash for use in correlation of lithofacies in Upper Cretaceous Williams Fork Formation, northeastern Piceance Creek and southern Sand Wash basins, Colorado (Johnson, Edward A.)

#### Yavapai Series

- Basement-cover relationships in Southwest Colorado; implications for early to middle Proterozoic crustal evolution of the Southwest USA (Harris, C. W., et al.)
- Evolving parallel tectonic styles in adjacent Proterozoic crustal provinces of the southwestern United States (Condie, Kent C.)
- Regional implications of Proterozoic deformation and lithostratigraphy in the Needle Mtns., Colorado (Gibson, R. G., et al.)

**ytterbium—geochemistry**

*magmas*: A modified crustal source for the Colorado mineral belt; implications for REE buffering in CO<sub>2</sub>-rich fluids (Musselman, Thomas E.)

**yttrium—geochemistry**

*oxides*: Zinc- and Y-group-bearing senaite from St Peters Dome, and new data on senaite from Dattas, Minas Gerais, Brazil (Foord, E. E., et al.)

*pegmatite*: Geochemistry and evolution of the South Platte granite-pegmatite system, Jefferson County, Colorado (Lee, Maxie T.)

**Yuma County—areal geology**

*maps*: Historic trail maps of the Sterling 1' by 2' Quadrangle, northeastern Colorado (Scott, Glenn R.)

**Yuma County—economic geology**

*fuel resources*: Colorado hosts varied exploration activity (McCaslin, John C.)

— Relation of hydrocarbon type to maturity of organic matter in Upper Cretaceous chalks, eastern Denver Basin (Rice, Dudley D.)

*natural gas*: Direct detection of Niobrara gas using seismic techniques; Yuma County, Colorado (Claussen, John P.)

— Shallow gas fields in high porosity chalk; an independent's exploration strategy (Lockridge, John P.)

— Shallow Upper Cretaceous Niobrara gas fields in the eastern Denver Basin (Lockridge, John P.)

*oil and gas fields*: Offset-amplitude seismic analysis; Bonny gas field, Yuma County, Colorado (Harwell, Jeffrey W.)

— Shallow gas fields in high porosity chalk; an independent's exploration strategy (Lockridge, John P.)

*petroleum*: Core porosity, permeability, and vitrinite reflectance data from the Lower

Cretaceous J Sandstone in 141 Denver Basin core holes (Higley, Debra K.)

— Geochemical evidence for Paleozoic oil in Lower Cretaceous O Sandstone, northern Denver Basin (Clayton, J. L.)

**Yuma County—environmental geology**

*land use*: Land use controls to protect groundwater quality in the arid Southwest (Stephenson, Larry K.)

*pollution*: Land use controls to protect groundwater quality in the arid Southwest (Stephenson, Larry K.)

*waste disposal*: Land use controls to protect groundwater quality in the arid Southwest (Stephenson, Larry K.)

**Yuma County—geochemistry**

*organic materials*: Relation of hydrocarbon type to maturity of organic matter in Upper Cretaceous chalks, eastern Denver Basin (Rice, Dudley D.)

**Yuma County—geophysical surveys**

*seismic surveys*: Direct detection of Niobrara gas using seismic techniques; Yuma County, Colorado (Claussen, John P.)

— Offset-amplitude seismic analysis; Bonny gas field, Yuma County, Colorado (Harwell, Jeffrey W.)

**Yuma County—hydrogeology**

*ground water*: Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)

— Water-level records for the northern High Plains of Colorado, 1970-86 (Reed, Raymond L.)

*maps*: Ground-water hydrographs, 1970-87, and water-level data, 1986-87, for the northern High Plains of Colorado (Reed, Raymond L.)

— Potential well yields from the Ogallala Aquifer in the northern High Plains of Colorado (Lindner-Lunsford, Juli B.)

**Yuma County—mineralogy**

*miscellaneous minerals*: Who's who in mineral names; Edwin Jenkins Over, Jr. (Mitchell, Richard S.)

## Z

**zinc—geochemistry**

*metal ores*: Trace element distribution around precious/base metal veins, Idaho Springs Dist., CO (Budge, Suzanne)

*oxides*: Adsorption of Cu, Pb, and Zn onto birnessite (Catts, John G.)

*peat*: Selected trace element anomalies in a Front Range bog, Larimer County, Colorado (Sarnecki, Joseph C.)

*rocks*: Maps showing anomaly patterns for silver, molybdenum, lead, and zinc in altered rocks and soils, Williams Fork and St. Louis Peak Roadless Areas, Clear Creek, Grand, and Summit counties, Colorado (Eppinger, R. G., et al.)

*soils*: Development of a DTPA soil test for zinc, iron, manganese, and copper (Lindsay, W. L.)

**zinc ores see under economic geology**

see lead-zinc deposits

see under economic geology under Chaffee County

**zirconium—geochemistry**

*igneous rocks*: Petrology of the alkalic hypabyssal and volcanic rocks at Cripple Creek, Colorado (Eriksson, Carl L.)

**zoogeography see biogeography**