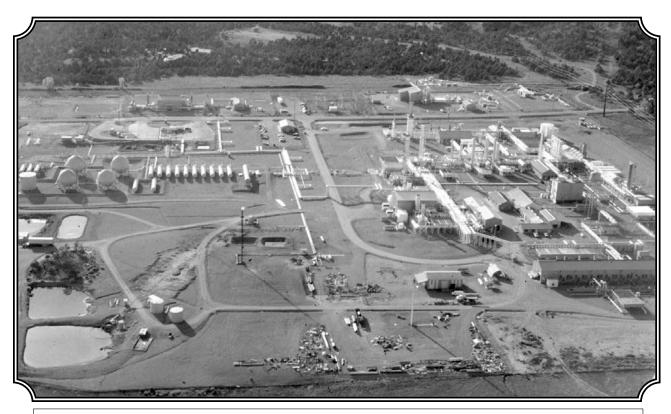
Information Series 35

SELECTED REFERENCES RELATED TO COALBED METHANE IN THE GREATER GREEN RIVER, PICEANCE, POWDER RIVER, RATON, AND SAN JUAN BASINS



WILLIAMS GAS PROCESSING PLANT, IGNACIO, COLORADO

By Roger Tyler, Naijiang Zhou, R. G. McMurry, M. L. W. Jackson, and C. M. Tremain

Colorado Geological Survey Department of Natural Resources Denver, Colorado 1992

Information Series 35

SELECTED REFERENCES RELATED TO COALBED METHANE IN THE GREATER GREEN RIVER, PICEANCE, POWDER RIVER, RATON, AND SAN JUAN BASINS

By

Roger Tyler, Naijiang Zhou, R. G. McMurry, M. L. W. Jackson Bureau of Economic Geology The University of Texas at Austin

and

C. M. Tremain Colorado Geological Survey Department of Natural Resources

DOI: https://doi.org/10.58783/cgs.is35.xhip2168

Colorado Geological Survey Department of Natural Resources Denver, Colorado 1992

DISCLAIMER

LEGAL NOTICE This report was prepared by the Bureau of Economic Geology and the Colorado Geological Survey as an account of work sponsored by the Gas Research Institute (GRI). Neither GRI, members of GRI, nor any person acting on behalf of either;

- a. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained
- in this report, or that the use of any apparatus method, or process disclosed in this report may not infringe privately owned rights; or
- b. Assumes any liability with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed in this report.

CONTENTS

Acknowledgements \mathbf{v}

Abbreviations vi

Introduction 1

References 3

FIGURE

1. Rocky Mountain coal basins. 2

ACKNOWLEDGEMENTS

Funding for this project was provided by the Gas Research Institute (GRI) under contract number 5087-214-1544. Contributions from Stephen Laubach, William A. Ambrose, Andrew R. Scott, William R. Kaiser, and Garth J. Hawkins of the Bureau of Economic Geology, The University of Texas at Austin, and Cheryl Brchan of the Colorado Geological Survey, were invaluable. GRI contractors assisted in the addition, completion, and improvement of this bibliography. Personnel of Advanced Resources International, Incorporated, provided information about the Raton Basin, and the assistance of Bruce Kelso is gratefully acknowledged. Others who contributed to

the production of this bibliography were the following Bureau of Economic Geology staff members: Jana S. Robinson, who prepared the illustration of the basins under the direction of Richard L. Dillon, chief cartographer; Rodney Heathcott, who designed and programmed the electronic copy; Susan Lloyd and Dixon Coulbourn, who did the word processing under the direction of Susann Doenges, editor in chief; and Bobby Duncan, who edited the bibliography. Larry M. Scott of CGS drafted the illustration, and Barry Okita, of the Colorado Department of Natural Resources, Information Technical Services, wrote the WordPerfect search macro.

ABBREVIATIONS

Each entry has abbreviation(s) for the coal basin(s) covered in that reference.

GR Greater Green River Basin

PB Piceance Basin

PR Powder River Basin

RB Raton Basin

SJ San Juan Basin

UB Uinta Basin

WR Wind River Basin

Introduction

The exploration, investigation, and development of energy resources in the western United States have generated a vast amount of literature, which appears in professional journals, books, theses and dissertations, public and private agency publications, and data bases. That literature contributed greatly toward the understanding of coalbed methane in Rocky Mountain coal basins (shown on p. 2). This bibliography, a compilation of these references, is designed to assist both academic and industry research efforts on coalbed methane in the Greater Green River, Piceance, Powder River, Raton, and San Juan Basins. These five intermontane basins contain approximately 63 percent (249 Tcf [7.04 Tm³]) of the total United States coalbed methane resource (392 Tcf ([11.09 Tm³]) and have the potential to make a significant contribution to the United States gas supply.

Thick, laterally continuous Upper Cretaceous shoreline coals and lower Tertiary fluvial coals offer numerous methane targets. These basins are already producing or have the potential for coalbed methane production based on their similar geologic and hydrologic characteristics. A less comprehensive list of references on the Uinta and Wind River Basins is also included.

This book is arranged alphabetically by the surname of the primary author. Where possible each citation is given an abbreviated basin reference for use in geographic or regional location. Although efforts have been made to ensure the accuracy of the entries, errors and omissions may have occurred. Notifying the authors of such errors would be greatly appreciated.

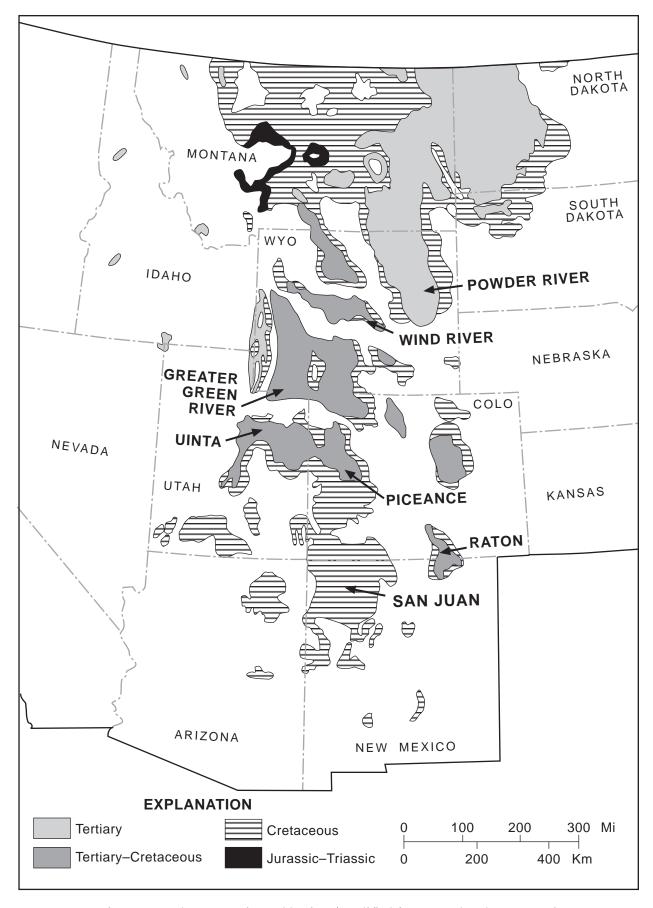


Figure 1. Rocky Mountain coal basins. (Modified from Wood and Bour, 1988)

REFERENCES

A

- Advanced Resources International (ARI) Inc. [formerly ICF, Inc.], 1991, Geologic assessment of natural gas from coal seams in the Raton Basin: Geologic peer review prepared for the Gas Research Institute, 93 p. RB
- Aguilera, R., 1980, Naturally fractured reservoirs: Tulsa, Okla., PennWell Books, 619 p. GR, PB, PR, RB, SJ
- Al-Saadoon, F. T., and Byrer, C. W., 1984, Technical and economic analysis of coalbed methane recovery in the Piceance Basin: Energy Progress, v. 4, no. 3, p. 162–169. **PB**
- Alcock, E. D., Aronson, H. H., and Knutson, C. F., 1974, Massive fracturing of tight gas-bearing sandstone reservoirs in the Piceance Creek Basin, Colorado, *in* Murray, D. K., ed., Energy resources of the Piceance Creek Basin, Colorado: Rocky Mountain Association of Geologists, twenty-fifth field conference, p. 199–293. **PB**
- Aldrich, M. J., Jr., and Laughlin, A. W., 1982, Orientation of least-principle horizontal stress: Arizona, New Mexico, and the Trans-Pecos area of West Texas (stress data and references): Los Alamos National Laboratory LA-9158-Map, scale 1:1,000,000. **SJ**
- Aldrich, M. J., Jr., and Laughlin, A. W., 1984, A model for the tectonic development of the southeastern Colorado Plateau boundary: Journal of Geophysical Research, v. 89, p. 10207–10218. **SJ**
- Aldrich, M. J., Jr., Chapin, C. E., and Laughlin, A. W., 1986, Stress history and tectonic development of the Rio Grande Rift, New Mexico: Journal of Geophysical Research, v. 91, no. B6, p. 6199–6211. SJ
- Allan, D. K., and Ray, R. R., 1988, North Glo Field: a Minnelusa discovery resulting from the integration of the stratigraphic-seismic method with subsurface geology, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirtyninth field conference, p. 89–103. **PR**
- Allmendinger, R. W., Brown, L. D., Oliver, J. E., and Kaufman, S., 1983, COCORP deep seismic profiles across the Wind River Mountains, Wyoming, *in* Bally, A. W., ed., Seismic expression of structural styles: American Association of Petroleum Geologists Studies in Geology 15, v. 3, p. 3.2.1-29–3.3.1-33. **GR**
- Alvarez, Walter, and Vann, D. W., 1979, Comment on Lindsay, E. H., Jacobs, L. L., and Butler, R. F., Biostratigraphy and magnetostratigraphy of Paleocene terrestrial deposits, San Juan Basin, New Mexico: Geology, v. 7, no. 2, p. 66–67. **SJ**

- Ambrose, W. A., and Ayers, W. B., 1991, Geological controls on coalbed methane occurrence and producibility in the Fruitland Formation, Cedar Hill field and COAL site, San Juan Basin, Colorado and New Mexico, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 227–240. **SJ**
- Ambrose, W. A., and Ayers, W. B., Jr., 1991, Geologic controls on coalbed occurrence, thickness, and continuity, Cedar Hill field and the COAL site, 1991, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 47–68. **SJ**
- Ameri, S., Al-Saadoon, F. T., Byrer, C. W., 1981, Coalbed methane resources estimate of the Piceance Basin: final report, University of West Virginia, Department of Petroleum Engineering, 44 p. **PB**
- Ammosov, I. I., and Eremin, I. V., 1960, Fracturing in coal: Moscow, IZDAT Publishers (translated from Russian), 109 p. [Available from the Office of Technical Services, Washington, D.C.] **GR, PB, PR, RB, SJ**
- Amuedo, C. L., and Bryson, R. S., 1976, Trinidad-Raton Basins (Colorado-New Mexico): a model coal resource evaluation program, *in* Murray, D. K., ed., Geology of Rocky Mountain coal: Colorado Geological Survey Resource Series 1, p. 45–60. **RB**
- Amuedo, C. L., and Ivey, J., 1978, Detailed geologic mapping, U.S. Bureau of Mines tract, Piceance Creek Basin, Rio Blanco County, Colorado: Report prepared for the U.S. Bureau of Mines, Denver Federal Center, under contract no. S0271034, 35 p. **PB**
- Amuedo, C. L., and Mott, M. R., eds., Exploration for oil and gas in northwestern Colorado: Rocky Mountain Association of Geologists, 122 p. **PB**
- Anson, Mark, 1989, Coalbed methane potential of the Williams Fork Formation in the Sand Wash Basin, *in* Lorenz, J. C., and Lucas, S. G., eds., Energy frontiers in the Rockies: Albuquerque Geological Society, p. 59–60. **GR**
- Applegate, J. K., and Rose, P. R., 1985, Structure of the Raton Basin from a regional seismic line, *in* Gries, R. R., and Dyer, R. C., eds., Seismic exploration of the Rocky Mountain region: Rocky Mountain Association of Geologists and Denver Geophysical Society, p. 259–266. **RB**

Armstrong, F. C., and Oriel, S. S., 1965, Tectonic development of Idaho-Wyoming thrust belt: American Association of Petroleum Geologists Bulletin, v. 49, no. 11, p. 1847–1866. **GR**, **PB**, **SJ**

- Armstrong, R. L., 1968, Sevier orogenic belt in Nevada and Utah: Geological Society of America Bulletin, v. 79, p. 429–458. **GR, PB, RB, SJ**
- Ash, S. R., and Tidwell, W. D., 1976, Upper Cretaceous and Paleocene floras of the Raton Basin, Colorado and New Mexico, *in* Ewing, R. C., and Kues, B. S., eds., Vermejo Park, northeastern New Mexico: New Mexico Geological Society Guidebook, twenty-seventh field conference, p. 197–203. **RB**
- Asquith, D. O., 1966, Geology of Late Cretaceous Mesaverde and Paleocene Fort Union oil production, Birch Creek Unit, Sublette County, Wyoming: American Association of Petroleum Geologists Bulletin, v. 50, no. 10, p. 2176–2184. **GR**
- Asquith, D. O., 1970, Depositional topography and major marine environments, Late Cretaceous, Wyoming: American Association of Petroleum Geologists Bulletin, v. 54, no. 7, p. 1184–1224. **GR**, **PB**, **SJ**
- Asquith, D. O., 1975, Petroleum potential of deeper Lewis and Mesaverde sandstones in the Red Desert, Washakie and Sand Wash Basins: Wyoming and Colorado, *in* Bolyard, D. W., ed., Deep drilling frontier of the central Rocky Mountains: Rocky Mountain Association of Geologists, p. 159–162. **GR**
- Ayers, W. B., Jr., 1984, Depositional systems and coal occurrence in the Fort Union Formation (Paleocene), Powder River Basin, Wyoming and Montana: The University of Texas at Austin, Ph.D. dissertation, 208 p. **PR**
- Ayers, W. B., Jr., 1986, Coal resources of the Tongue River Member, Fort Union Formation (Paleocene), Powder River Basin, Wyoming and Montana: Geological Survey of Wyoming Report of Investigations 35, 21 p. PR
- Ayers, W. B., Jr., 1986, Lacustrine and fluvial-deltaic depositional systems, Fort Union Formation (Paleocene), Powder River Basin, Wyoming and Montana: American Association of Petroleum Geologists Bulletin, v. 70, no. 11, p. 1651–1673. **PR**
- Ayers, W. B., Jr., 1988, Geologic evaluation of critical production parameters for coalbed methane resources: Quarterly Review of Methane from Coal Seams Technology, v. 5, nos. 3 and 4, p. 50–52. **SJ**
- Ayers, W. B., Jr., 1988, Geologic evaluation of critical production parameters for coalbed methane resources: Quarterly Review of Methane from Coal Seams Technology, v. 6, no. 1, p. 45–50. SJ
- Ayers, W. B., Jr., 1990, Geological evaluation of critical production parameters for coalbed methane resources, San Juan Basin, *in* Methane from Coal Deposits Project Area, Natural Gas Supply Project Ad-

- visors Meeting Guidebook, September 17–19, 1990, Durango, Colorado: Gas Research Institute, 67 p. SJ
- Ayers, W. B., Jr., 1991, Geologic evaluation of critical production parameters for coalbed methane resources: Quarterly Review of Methane from Coal Seams Technology, v. 8, no. 2, p. 27–33. SJ
- Ayers, W. B., Jr., and Ambrose, W. A., 1990, Geologic controls on the occurrence of coalbed methane, Fruitland Formation, San Juan Basin, *in* Ayers, W. B., Jr., and others, Geologic evaluation of critical production parameters for coalbed methane resources, part 1, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, annual report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-90/0014.1), p. 9–72. **SJ**
- Ayers, W. B., Jr., and Kaiser, W. R., 1982, Tongue River (Paleocene) depositional systems and the occurrence of coal in the Powder River Basin of Wyoming and Montana (abs.): American Geophysical Union, 11th International Congress on Sedimentology, abstracts of papers, p. 56. **PR**
- Ayers, W. B., Jr., and Kaiser, W. R., 1984, Lacustrine interdeltaic coal in the Fort Union Formation (Paleocene), Powder River Basin, Wyoming and Montana, U.S.A., *in* Rahmani, R. A., and Flores, R. M., eds., Sedimentology of coal and coal-bearing sequences: International Association of Sedimentologists Special Publication No. 7, p. 61–84. **PR**
- Ayers, W. B., Jr., and Mink, R. M., 1989, Geologic evaluation of critical production parameters for coalbed methane resources: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 34–37. **SJ**
- Ayers, W. B., Jr., and Zellers, S. D., 1988, Sedimentologic and structural controls on the occurrence and producibility of coalbed methane, Fruitland Formation, northern San Juan and Rio Arriba Counties, New Mexico, *in* Ayers, W. B., Jr., and others, Geologic evaluation of critical production parameters for coalbed methane resources, part 1, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, annual report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-88/0332.1), p. 3–59. **SJ**
- Ayers, W. B., Jr., and Zellers, S. D., 1989, Geologic controls on occurrence and producibility of coalbed methane, Fruitland Formation, north-central San Juan Basin, New Mexico, *in* Proceedings of the 1989 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, April 17-20, 1989, p. 75–86. SJ
- Ayers, W. B., Jr., and Zellers, S. D., 1991, Geologic controls on Fruitland coal occurrence, thickness, and continuity, Navajo Lake area, San Juan Basin, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on occurrence and producibility of coalbed methane,

Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 69–94. **SJ**

- Ayers, W. B., Jr., Ambrose, W. A., and Yeh, Joseph, 1991, Depositional and structural controls on coalbed methane occurrence and resources in the Fruitland Formation, San Juan Basin, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 9–46. **SJ**
- Ayers, W. B., Jr., Epsman, M. L., and Mink, R. M., 1989, Geologic evaluation of critical production parameters for coalbed methane resources: Quarterly Review of Methane from Coal Seams Technology, v. 6, nos. 3 and 4, p. 52–58. **SJ**
- Ayers, W. B., Jr., Kaiser, W. R., Ambrose, W. A., Swartz, T. E., Laubach, S. E., Tremain, C. M., and Whitehead, N. H., III, 1990, Geological evaluation of critical production parameters for coalbed methane resources, part 1, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, annual report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-90/0014.1), 175 p. SJ
- Ayers, W. B., Jr., Kaiser, W. R., Laubach, S. E., Ambrose, W. A., Baumgardner, R. W., Jr., Scott, A. R., Tyler, Roger, Yeh, Joseph, Hawkins, G. J., Swartz, T. E., Schultz-Ela, D. D., Zellers, S. D., Tremain, C. M, and Whitehead, N. H., III, 1991, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), 314 p. SJ
- Ayers, W. B., Jr., Kaiser, W. R., Swartz, T. E., Zellers, S. D., and Scanlon, A. H., 1988, Geologic evaluation of critical production parameters for coalbed methane resources, part 1, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology annual report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-88/0332.1), 100 p. SJ
- Ayers, W. B., Jr., Zellers, S. D., and Fiduk, J. C., 1988, Depositional and tectonic controls on occurrence of Fruitland Formation (Upper Cretaceous) coal seams, north-central San Juan Basin, New Mexico (abs.): Geological Society of America Abstract with Programs, v. 20, no. 7, p. A28. SJ

B

Baars, D. L., 1962, Permian system of Colorado Plateau: American Association of Petroleum Geologists Bulletin, v. 46, no. 2, p. 149–218. **PB**

- Baars, D. L., Bartleson, B. L., Chapin, C. E., Curtis, B. F., De Voto, R. H., Everett, J. R., Johnson, R. C., Molenaar, C. M., Peterson, F., Schenk, C. J., Love, J. D., Merin, I. S., Rose, P. R., Ryder, R. T., Waechter, N. B., and Woodward, L. A., 1988, Basins of the Rocky Mountain region, *in* Sloss, L. L., ed., Sedimentary cover—North American Craton, U.S.: Geological Society of America, Decade of North American Geology, v. D-2, p. 109–220. GR, PB, PR, RB, SJ
- Babcock, R. N., and Hobbs, R. G., 1979, Geophysical logging of water wells for coal occurrences in northern Campbell County and eastern Sheridan County, Wyoming: U.S. Geological Survey Open-File Report 79-1213, 11 p. **PR**
- Bader, J. W., 1990, Cross-section A—A', subsurface correlations of Upper Cretaceous and Tertiary rocks, Cherokee Ridge Arch, south-central Wyoming and north-western Colorado: U.S. Geological Survey Open-File Report 90-0325-A, 1 sheet. **GR**
- Bader, J. W., 1990, Cross-section B—B', subsurface correlations of Upper Cretaceous and Tertiary rocks, Cherokee Ridge Arch, southern Washakie basin, Wyoming to northern Sand Wash basin, Colorado: U.S. Geological Survey Open-File Report 90-0325-B, 1 sheet. **GR**
- Bader, J. W., and others, 1983, Biostratigraphic correlation chart of some Upper Cretaceous rocks from the Lost Soldier area, Wyoming to west of Craig, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1548. **GR**
- Bader, J. W., Law, B. E., and Spencer, C. W., 1982, Preliminary chart showing electric log correlation of some Upper Cretaceous and Tertiary rocks, section D—D', Green River Basin, Wyoming: U.S. Geological Survey Open-File Report 82-129. **GR**
- Bair, E. S., O'Donnell, T. P., and Picking, L. W., 1985, Potentiometric mapping from incomplete drill-stem test data: Palo Duro Basin area, Texas and New Mexico: Ground Water, v. 23, p. 198–211.
- Baker, A. A., 1929, The northward extension of the Sheridan coal field, Big Horn and Rosebud Counties, Montana: U.S. Geological Survey Bulletin 806-B, p. 15–67. **PR**
- Bally, A. W., and Snelson, S., 1980, Realms of subsidence, *in* Facts and principles of world petroleum occurrence: Canadian Society of Petroleum Geologists Memoir 6, p. 9–94. **GR**, **PB**, **PR**, **RB**, **SJ**
- Balsley, J. K., 1980, Cretaceous wave-dominated delta systems: Book Cliffs, east central Utah: American Association of Petroleum Geologists Continuing Education Course Field Guide, 163 p. **PB**
- Baltz, E. H., 1965, Stratigraphy and history of Raton Basin and notes on San Luis Basin, Colorado-New Mexico: American Association of Petroleum Geologists Bulletin, v. 49, no. 11, p. 2041–2075. **RB**

Baltz, E. H., 1967, Stratigraphy and regional tectonic implications of part of Upper Cretaceous and Tertiary rocks in east-central San Juan Basin, New Mexico: U.S. Geological Survey Professional Paper 552, 101 p. SJ

- Barker, C. E., 1989, Fluid inclusion evidence for paleotemperature within the Mesaverde group, Multiwell Experiment site, Piceance Basin, Colorado, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. M1–M11. **PB**
- Barker, C. E., 1989, Rock-Eval analysis of sediments and ultimate analysis of coal, Mesaverde Group, Multiwell Experiment site, Piceance Basin, Colorado, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. N1–N11. **PB**
- Barlow, J. A., Jr., 1961, Almond Formation and lower Lewis Shale, east flank of Rock Springs Uplift, Sweetwater County, Wyoming, *in* Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 113–115. **GR**
- Barlow, J. A., Jr., and Haun, J. D., 1966, Regional stratigraphy of the Frontier Formation and relation to Salt Creek field, Wyoming: American Association of Petroleum Geologists Bulletin, v. 50, p. 2185–2196. **GR**
- Barnes, Harley, 1953, Geology of the Ignacio area, Ignacio and Pagosa Springs Quadrangles, La Plata and Archuleta Counties, Colorado: U.S. Geological Survey Oil and Gas Investigations Map OM-138, scale 1:63,360. **SJ**
- Barnes, Harley, Baltz, E. H., Jr., and Hayes, P. T., 1954, Geology and fuel resources of the Red Mesa area, La Plata and Montezuma Counties, Colorado: U.S. Geological Survey Oil and Gas Investigations Map OM-149, scale 1:62,500. **SJ**
- Barton, C. C., and Hsieh, P. A., 1989, Physical and hydrogeologic flow properties of fractures: 28th International Geological Congress, field trip guidebook T385, 36 p. GR, PB, PR, RB, SJ
- Barton, C. C., and Larsen, Eric, 1985, Fractal geometry of two-dimensional fracture networks at Yucca Mountain, southwestern Nevada, *in* Fundamentals of rock joints: Proceedings of the International Symposium, Bjorkliden, Sweden, p. 77–84. **GR**, **PB**, **PR**, **RB**, **SJ**
- Barton, C. C., Larsen, Eric, Page, W. R., and Howard, T. M., 1987, Characterizing fractured rock for fluid-flow, geomechanical, and paleostress modeling: methods and preliminary results from Yucca Mountain, Nevada: U.S. Geological Survey Open-File Report USGS-OFR-87. **GR**, **PB**, **PR**, **RB**, **SJ**

- Basler, Dan, 1990, WestGas builds hub in San Juan Basin: Western Oil World, v. 47, no. 10, p. 27. SJ
- Bass, N. W., 1932, The Ashland coal field, Rosebud, Powder River, and Custer Counties, Montana: U.S. Geological Survey Bulletin 831-B, p. 19–105. **PR**
- Bauer, C. M., 1924, The Ekalaka lignite field, southeastern Montana: U.S. Geological Survey Bulletin 751-F, p. 213–267. **PR**
- Bauer, J. A., 1989, Oligocene gas potential along the southern margin of the Powder River Basin, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 63–72. **PR**
- Bauer, P. W., Lucas, S. P., Mawer, C. K., and McIntosh, W.
 C., eds., 1990, Tectonic development of the southern
 Sangre de Cristo Mountains, New Mexico: New Mexico Geological Society Guidebook, forty-first field conference, 450 p.
- Baumgardner, R. W., Jr., 1987, Landsat-based lineament analysis, East Texas Basin and Sabine Uplift area: The University of Texas at Austin, Bureau of Economic Geology Report of Investigations No. 167, 26 p. GR, PB, PR, RB, SJ
- Baumgardner, R. W., Jr., 1991, Comparative lineament analysis of the San Juan Basin: relationships between lineament attributes and coalbed methane production, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 153–179. **SJ**
- Baumgardner, R. W., Jr., 1991, Lineament analysis of northern San Juan Basin, New Mexico and Colorado—applications to coalbed methane exploration, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 21–34. **SJ**
- Baumgardner, R. W., Jr., Ayers, W. B., Jr., and Patchen, D. G., 1991, Geologic evaluation of critical production parameters for coalbed methane resources: Quarterly Review of Methane from Coal Seams Technology, v. 8, no. 3, p. 27–31. **SJ**
- Baumgardner, R. W., Jr., Tye, R. S., Laubach, S. E., Diggs, T. N., Herrington, K. L., and Dutton, S. P., 1988, Site selection for GRI cooperative tight gas field research, v. II: Geologic characteristics of selected low-permeability gas sandstones: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5082-211-0708 (GRI-88/0180), 225 p. GR, PB
- Beach, L. J., and Jentgen, R. W., 1978, Coal test drilling for the San Juan Mine Extension, San Juan County, New Mexico: U.S. Geological Survey Open-File Report 78-960, 87 p. **SJ**

Beaumont, Christopher, 1981, Foreland basins: Geophysical Journal, Royal Astronomical Society, v. 65, p. 291–329. **GR**, **PB**, **PR**, **RB**, **SJ**

- Beaumont, Christopher, Keen, C. E., and Boutilier, R., 1982, A comparison of foreland and rift margin sedimentary basins: Philosophical Transactions, Royal Society of London A 305, p. 295–317. **GR**, **PB**, **PR**, **RB**, **SI**
- Beaumont, E. A., 1979, Depositional environments of Fort Union sediments (Tertiary, northwest Colorado) and their relation to coal: American Association of Petroleum Geologists Bulletin, v. 63, no. 2, p. 194–217. **GR**, **PB**
- Belitz, Kenneth, and Bredehoeft, J. D., 1988, Hydrodynamics of Denver Basin: explanation of subnormal fluid pressures: American Association of Petroleum Geologists Bulletin, v. 72, no. 11, p. 1334–1359.
- Bell, G. J., 1983, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 2, p. 8–9. **PR**
- Bell, G. J., 1983, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 3, p. 13–15. **PB**
- Bell, G. J., 1984, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 2, no. 1, p. 9–14. **PB**
- Bell, G. J., 1985, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 3, no. 2, p. 29–39. **PB**
- Bell, G. J., and Holt, Larry, 1984, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 4, p. 9–12. **PB**
- Bell, G. J., and Wiman, S. K., 1984, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 2, no. 2, p. 12–17. **PB**
- Bell, G. J., and Wiman, S. K., 1985, Second Deep Seam Project well in western Colorado tests drilling and fracturing techniques in deep seams: Quarterly Review of Methane from Coal Seams Technology, v. 3, no. 1, p. 23–34. **PB**
- Bell, G. J., Jones, A. H., and Morales, R. H., 1988, Spalling and the development of a hydraulic fracturing strategy for coal—semiannual report (August 1987–January 1988): Report prepared for the Gas Research Institute under contract no. 5087-214-1460. GR, PB, PR, RB, SJ
- Belt, E. S., Flores, R. M., Warwick, P. D., Conway, K. M., Johnson, K. R., and Waskowitz, R. S., 1984, Relationship of fluviodeltaic facies to coal deposition in the Lower Fort Union Formation (Palaeocene), southwestern North Dakota, in Rahmani, R. A., and Flores, R. M., eds., Sedimentology of coal and coal-bearing sequences: International Association of Sedimentologists, Special Publication 7, p. 177–195. PR
- Bench, B. M., 1979, Drilling of methane gas in the Fishers Peak Area, Las Animas County, Colorado: Unpub-

- lished U.S. Bureau of Mines Information Circular, 26 p. ${\bf SI}$
- Bendix Field Engineering Corporation, 1976, Uranium favorability of the Fort Union and Wasatch Formations in the northern Powder River Basin, Wyoming and Montana: Bendix Field Engineering Corporation, report prepared for the U.S. Energy Research and Development Administration under contract no. E(05-1)1664, 30 p. **PR**
- Benson, A. K., 1989, Depth imaging seismic data to help delineate gas reservoirs in southwest Wyoming, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 231–239. **GR**
- Berg, R. R., 1961, Laramide tectonics of the Wind River Mountains, *in* Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 70–80. **GR**, **PR**
- Berg, R. R., 1962, Mountain flank thrusting in Rocky Mountain foreland, Wyoming and Colorado: American Association of Petroleum Geologists Bulletin, v. 46, no. 11, p. 2019–2033. **GR**
- Berg, R. R., 1983, Geometry of the Wind River thrust, Wyoming, *in* Lowell, J. D., ed., Rocky Mountain foreland basins and uplifts: Rocky Mountain Association of Geologists, p. 257–262. **GR**
- Berg, R. R., Larberg, G. M., and Recker, L. D., 1985, Hydrodynamic flow in the Lower Cretaceous Muddy Formation, northeast Powder River Basin, Wyoming and Montana, *in* Nelson, G. E., ed., The Cretaceous geology of Wyoming: Wyoming Geological Association Guidebook, 36th field conference, p. 149–156. **PR**
- Berner, R., and Briggs, L. I., 1958, Continental Eocene sedimentation in Huerfano Park, Colorado (abs.): Geological Society of America Bulletin, v. 69, no. 12, part 2, p. 1533–1534. **RB**
- Berry, F. A. F., 1959, Hydrodynamics and geochemistry of the Jurassic and Cretaceous systems in the San Juan Basin, northwestern New Mexico and southwestern Colorado: Stanford University, Ph.D. dissertation, 192 p. **SJ**
- Berry, G. W., 1959, Divide Creek field, Garfield and Mesa Counties, Colorado, *in* Huan, J. D., and Weimer, R. J., eds., Cretaceous rocks of Colorado and adjacent areas: Rocky Mountain Association of Geologists Symposium, p. 89–91. **PB**
- Berryhill, H. L., Jr., Brown, D. M., Brown, Andrew, and Taylor, D. A., 1950, Coal resources of Wyoming: U.S. Geological Survey Circular 81, 78 p. **GR**, **PR**
- Bertrand, Philippe, Behar, Francoise, and Durand, Bernard, 1986, Composition of potential oil from humic coals in relation to their petrographic nature: Organic Geochemistry, v. 10, p. 601–608. GR, PB, PR, RB, SJ

Best, W., and Rich, F. J., 1986, A sedimentologic, stratigraphic, and paleoenvironmental study of the Paleocene Fort Union Formation in the south Cave Hills of Harding County, South Dakota: American Association of Petroleum Geologists Bulletin, v. 70, no. 8, p. 1031. **PR**

- Bickel, D. L., and Donato, D. A., 1988, In situ horizontal stress determinations in the Yampa coalfield, northwestern Colorado: U.S. Bureau of Mines Report of Investigations 9147, 43 p. **PB**
- Billingsley, L. T., 1977, Stratigraphy of the Trinidad sandstone and associated formations—Walsenburg area, Colorado, *in* Veal, H. K., ed., Exploration frontiers of the central and southern Rockies: Rocky Mountain Association of Geologists, p. 235–246. **RB**
- Billingsley, L. T., 1978, Stratigraphy of the Pierre Shale, Trinidad Sandstone, and Vermejo Formation, Walsenburg area, Colorado: a deltaic model for sandstone and coal deposition, *in* Hodgson, H. E., ed., Proceedings of the second symposium on the geology of Rocky Mountain coal: Colorado Geological Survey Resources Series 4, p. 23–24. **RB**
- Blackstone, D. L., Jr., 1979, Geometry of the Prospect-Darby and La Barge faults at their junction with the La Barge Platform, Lincoln and Sublette Counties, Wyoming: Wyoming Geological Survey Report of Investigations 18, 34 p. **GR**
- Blackstone, D. L., Jr., 1980, Foreland deformation: compression as a cause: University of Wyoming Contributions to Geology, v. 18, p. 83–100. **GR, PB, PR, RB, SI**
- Blackstone, D. L., Jr., 1981, Compression as an agent in deformation of the east-central flank of the Bighorn Mountains, Sheridan and Johnson Counties, Wyoming, *in* Boyd, D. W., and Lillegraven, J. A., eds., Rocky Mountain foreland basement tectonics: Contributions to Geology, v. 19, no. 2, p. 105–122. **PR**
- Blackstone, D. L., Jr., 1988, Thrust faulting: southern margin Powder River Basin, Wyoming, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 35–44. **PR**
- Bohor, B. F., and Pillmore, C. L., 1976, Tonstein occurrences in the Raton coal field, Colfax County, New Mexico, *in* Ewing, R. C., and Kues, B. S., eds., Vermejo Park, northeastern New Mexico: New Mexico Geological Society Guidebook, twenty-seventh field conference, p. 177–183. **RB**
- Bond, W. A., 1984, Application of Lopatins 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, *in* Woodward, J., and others, eds., Hydrocarbon source rocks of the greater Rocky Mountain region: Denver,

- Rocky Mountain Association of Geologists, p. 433–447. **SJ**
- Boreck, D. L., 1984, Origin and control of methane in a coal bed of the Paleocene Fort Union Formation, Johnson County, Wyoming (abs.), *in* Houghton, R. L., and Clausen, E. N., eds., 1984 Symposium on the geology of Rocky Mountain coal: North Dakota Geological Society Publication 84-1, p. 77. **PR**
- Boreck, D. L., and Murray, D. K., 1979, Colorado coal reserves depletion data and coal mine summaries: Colorado Geological Survey Open-File Report 79-1, p. 47–50. **PB**, **RB**, **SJ**
- Boreck, D. L., and Strever, M. T., 1980, Conservation of methane from Colorados mine/mineable coalbeds a feasibility study: Colorado Geological Survey Open-File Report 80-5, 101 p. **PB**, **RB**, **SJ**
- Boreck, D. L., and Weaver, J. N., 1984, Coalbed methane study of the Anderson coal deposit, Johnson County, Wyoming—a preliminary report: U.S. Geological Survey Open-File Report 84-831, p. 1–16. **PR**
- Boreck, D. L., Tremain, C. M., Sitowitz, Linda, and Lorenson, T. D., 1981, The coal bed methane potential of the Sand Wash Basin, Green River coal region, Colorado: Colorado Geological Survey Open-File Report 81-6, 25 p. **GR**
- Bostick, N. H., and Freeman, V. L., 1984, Tests of vitrinite reflectance and paleotemperature models at the mutiwell experiment site, Piceance Creek Basin, Colorado, *in* Spencer, C. W., and Keighin, C. W., eds., Geological studies in support of the U.S. Department of Energy Multiwell Experiment, Garfield County, Colorado: U.S. Geological Survey Open-File Report 84-757, p. 110–120. **PB**
- Bowman, K. C., 1978b, Ignacio Blanco Mesaverde (gas), *in* Fassett, J. E., ed., Oil and gas fields of the Four Corners area: Four Corners Geological Society, v. 1, p. 137–139. **SJ**
- Boyce, B. C., and Levine, J. R., 1991, Reservoir heterogeneity and gas production characteristics of oil-rich Fruitland coals, San Juan Basin, Colorado (abs.): Geological Society of America Abstracts with Programs, v. 23, no. 5, p. A39. SJ
- Boyce, B. C., Harr, C. L., and Kelso, B. S., 1991, Road log through southeastern Piceance Basin, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 313–336. **PB**
- Boyd, H. A., Bauer, J. A., Gaskill, C. H., Holm, M. R., and Specht, R. G., 1989, Problems in stratigraphic nomenclature, southwest Wyoming, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 123–142. **GR**
- Boyer, R. E., 1962, Petrology and structure of the southern Wet Mountains, Colorado: Geological Society of America Bulletin, v. 73, p. 1047–1070. **RB**

Boyles, J. M., and Scott, A. J., 1981, Depositional systems Upper Cretaceous Mancos Shale and Mesaverde Group, northwestern Colorado, *in* Boyles, J. M., Kauffman, E. G., Kiteley, L. W., and Scott, A. J., Depositional systems Upper Cretaceous Mancos Shale and Mesaverde Group, northwestern Colorado: Rocky Mountain Section, Society of Economic Paleontologists and Mineralogists, field trip guidebook, part 1, 82 p. **PB**

- Bozzuto, R. T., 1977, Geology of the Skull Point Mine area, Lincoln County, Wyoming, *in* Heisey, E. L., and others, eds., Rocky Mountain Thrust Belt: Wyoming Geological Association Guidebook, twenty-ninth field conference, p. 673–678. **GR**
- Brace, W. F., 1964, Brittle fracture of rocks, *in* Judd, W. R., ed., State of stress in the Earth's crust: New York, Elsevier, p. 111–180. **GR**, **PB**, **PR**, **RB**, **SJ**
- Bradley, J. S., 1975, Abnormal formation pressure: American Association of Petroleum Geologists Bulletin, v. 59, no. 6, p. 957–973. **GR, PB, PR, RB, SJ**
- Bradley, W. C., 1963, Large-scale exfoliation in massive sandstones of the Colorado Plateau: Geological Society of America Bulletin, v. 74, p. 519–528. **GR**, **PB**, **PR**, **RB**, **SJ**
- Bradley, W. H., 1945, Geology of the Washakie Basin, Sweetwater and Carbon Counties, Wyoming, and Moffat County, Colorado: U.S. Geological Survey Oil and Gas Investigations Preliminary Map OM-32, scale 1:190,080. **GR**
- Bradley, W. H., 1961, Geologic map of a part of southwestern Wyoming and adjacent states: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-332, scale 1:250,000. **GR**
- Bradley, W. H., 1964, Geology of Green River Formation and associated Eocene rocks in southwestern Wyoming and adjacent parts of Colorado and Utah: U.S. Geological Survey Professional Paper 496-A, 86 p. **GR**
- Branagan, P. T., 1987, Well testing, analysis, and reservoir analysis, *in* Multiwell experiment final report: 1. The marine interval of the Mesaverde Formation: Sandia National Laboratories, report SAND 87-0327, p. 7-1–7-44. **PB**
- Branagan, P. T., Cipolla, C. L., Lee, S. J., and Wilmer, R., 1985, Comprehensive well testing and modeling of pre- and post-frac performance of the MWX lenticular tight gas sand: Society of Petroleum Engineers, SPE Paper 13867, p. 19–22. **PB**
- Branagan, P. T., Cipolla, C. L., Lee, S. J., and Yan, L., 1987, Case history of hydraulic fracture performance in the naturally fractured paludal zone: the transitory effects of damage: Society of Petroleum Engineers, SPE Paper 16397, p. 61–71.
- Branagan, P. T., Cotner, G., and Lee, S. J., 1984, Interference testing of the naturally fractured Cozzette Sandstone: a case study at the DOE MWX site: Society of

- Petroleum Engineers Symposium on Unconventional Gas Recovery, p. 359–363. **PB**
- Breckenridge, R. M., Glass, G. B., Rot, F. K., and Wendell, W. G., 1974, Campbell County, Wyoming: Wyoming Geological Survey County Resource Series CRS-3. **PR**
- Bredehoeft, J. D., Wolff, R. G., Keys, W. S., and Shuter, Eugene, 1976, Hydraulic fracturing to determine the regional in situ stress field, Piceance Basin, Colorado: Geological Society of America Bulletin, v. 87, no. 2, p. 250–258. **PB**
- Bridwill, R. J., 1990, A mechanical model of keystone structures and reverse faulting for the southern Sangre de Cristo Mountains, *in* Bauer, P. W., and others, eds., Tectonic development of the southern Sangre de Cristo Mountains, New Mexico: New Mexico Geological Society Guidebook, forty-first field conference, p. 133–144. **RB**
- Briggs, L. I., and Goddard, E. N., 1956, Geology of Huerfano Park, Colorado, *in* McGinnis, C. J., ed., Geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists Guidebook, p. 40–45. **RB**
- Briscoe, F. H., Camp, B. S., Lottman, L. K., and Malone, P. G., 1988, A study of coal-bed methane production trends as related to geologic features, Warrior Basin, Alabama, *in* Fasset, J. E., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 237–246. **SJ**
- Britten, R. A., Smyth, M., Bennett, A. J. R., and Shibaoka, M., 1975, Environmental interpretations of Gondwana coal measure sequence in the Sydney Basin of New South Wales, *in* Campbell, K. S. W., ed., Gondwana geology: Canberra, Australian National University Press, p. 233–247. **GR**, **PB**, **PR**, **RB**, **SJ**
- Broadhead, R. F., 1982, Oil and gas discovery wells drilled in New Mexico in 1981: New Mexico Geology, v. 4, no. 2, p. 17–19. **RB**
- Broadhead, R. F., 1989, Petroleum production and frontier exploration in New Mexico, *in* Lorenz, J. C., and Lucas, S. G., eds., Energy frontiers in the Rockies: Albuquerque Geological Society, p. 35–46. **PB**
- Brown, C. A., Smagala, T. M., and Haefele, G. R., 1986, Southern Piceance Basin model—Cozzette, Corcoran, and Rollins sandstones, *in* Spencer, C. W., and Mast, R. F., eds., Geology of tight gas reservoirs: American Association of Petroleum Geologists Studies in Geology 24, p. 207–219. **PB**
- Brown, C. F., 1973, A history of the development of the Pictured Cliffs sandstone in the San Juan Basin of northwestern New Mexico, *in* Fassett, J. E., ed., Cretaceous and Tertiary rocks of the southern Colorado plateau: Four Corners Geological Society Memoir, p. 178–184. **SJ**
- Brown, R. G., and Shannon, L. T., 1989, The #2-3 Bighorn: an ultra-deep confirmation well on the Madden

(Brown, R. G., and Shannon, L. T., 1989, continued) anticline, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 181–187. **GR**, **PR**

- Brown, R. W., 1958, Fort Union Formation in the Powder River Basin, Wyoming, *in* Strickland, John, ed., Powder River Basin: Wyoming Geological Association Guidebook, thirteenth field conference, p. 111–113. PR
- Brownfield, M. E., and Affolter, R. H., 1988, Characterization of coals in the lower part of the Williams Fork Formation, Twentymile Park district, eastern Yampa coal field, Routt County, Colorado (abs.): U.S. Geological Survey Circular 1025, p. 6. **GR**, **PB**
- Brownfield, M. E., and Johnson, E. A., 1986, 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, *in* Stone, D. S., and Johnson, K. S., eds., New interpretations of northwest Colorado geology: Rocky Mountain Association of Geologists, p. 165–169. **GR**, **PB**
- Bryson, R. P., 1952, The Coalwood coal field, Powder River County, Montana: U.S. Geological Survey Bulletin 973-B, p. 23–106. **PR**
- Bryson, R. P., and Bass, N. W., 1973, Geology of Moorhead coal field, Powder River, Big Horn, and Rosebud Counties, Montana: U.S. Geological Survey Bulletin 1338, p. 116. **PR**
- Budai, C. M., 1983, Depositional model of the Antelope coal field, Wyoming: Portland State University, Masters thesis, 85 p. **PR**
- Budai, C. M., and Cummings, M. L., 1987, A depositional model of the Antelope coal field, Powder River Basin, Wyoming: Journal of Sedimentary Petrology, v. 57, no. 1, p. 30–38. **PR**
- Burbank, W. S., and Goddard, E. N., 1937, Thrusting in Huerfano Park, Colorado, and related problems of orogeny in the Sangre de Cristo Mountains: Geological Society of America Bulletin, v. 48, p. 931–976. **RB**
- Burchfiel, B. C., and Davis, G. A., 1975, Nature and controls of Cordilleran orogenesis, western United States: extensions of an earlier synthesis: American Journal of Science, v. 275 A, p. 363–396. GR, PB, PR, RB, SJ
- Bureau of Reclamation, 1966, Final construction geologic report, Tunnel No. 1, Navajo Indian Irrigation Project: Report available for inspection at the Bureau of Reclamation, Navajo Indian Irrigation Project Office, Farmington, New Mexico. **SJ**
- Bureau of Reclamation, 1967, Final construction geologic report, Tunnel No. 2, Navajo Indian Irrigation Project: Report available for inspection at the Bureau of Reclamation, Navajo Indian Irrigation Project Office, Farmington, New Mexico. **SJ**
- Burgener, J. A., 1953, The stratigraphy and sedimentation of the Pictured Cliffs Sandstone and Fruitland

- Formation, Upper Cretaceous of the San Juan Basin: University of Illinois, Masters thesis, 59 p. SJ
- Burger, J. A., 1965, Cyclic sedimentation in the Rock Springs Formation: Mesaverde Group, on the Rock Springs Uplift, *in* DeVoto, R. H., Bitter, R. K., and Austin, A. C., eds., Sedimentation of Late Cretaceous and Tertiary outcrops, Rock Springs Uplift, Wyoming: Wyoming Geological Association Guidebook, nineteenth field conference, p. 55–60. **GR**
- Burger, J. A., 1969, Stratigraphic problems in the Cretaceous System along the north flank of the Uinta Mountains: Intermountain Association of Geologists, 16th field conference, p. 193–194. **GR**
- Burtner, R. L., and Warner, M. A., 1984, Hydrocarbon generation in Lower Cretaceous Mowry and Skull Creek Shales of the northern Rocky Mountain area, *in* Woodward, Jane, Meissner, F. F., and Clayton, J. L., eds., Hydrocarbon source rocks of the greater Rocky Mountain region: Rocky Mountain Association of Geologists, p. 449–467. **GR**, **PB**
- Butler, D. L., 1986, General surface- and ground-water quality in a coal-resource area near Durango, southwestern Colorado: U.S. Geological Survey Water Resources Investigation Report 86-4073, 53 p. **SJ**
- Byers, C. W., and Larson, D. W., 1979, Paleoenvironments of Mowry Shale (Lower Cretaceous), western and central Wyoming: American Association of Petroleum Geologists Bulletin, v. 63, no. 3, p. 354–375. **GR**
- Byrer, C. W., Covatch, G. L., and Mroz, T. H., 1984, Production potential for coalbed methane in U.S. Basins: Society of Petroleum Engineers/Department of Energy, SPE Paper 12832. **GR, PB, PR, RB, SJ**
- Byrer, C. W., Hunt, A. E., and Malone, R. D., 1982, Preliminary resource assessment of coalbed methane in the U.S.: Society of Petroleum Engineers/Department of Energy, SPE Paper 10799, p. 99–116. **GR**, **PB**, **PR**, **RB**, **SJ**
- Byrer, C. W., Mroz, T. H., and Covatch, G. L., 1987, Coalbed methane production potential in U.S. basins: Journal of Petroleum Technology, v. 39, no. 7, p. 821–834. GR, PB, PR, RB, SJ
- Byrer, C. W., Mroz, T. H., and Ryan, J. G., 1983, Methane recovery from coalbeds: a potential energy source: Technical report DOE/METC8376, 456 p. GR, PB, PR, RB, SJ

(

- Cain, M. R., 1986, Depositional environment of Upper Cretaceous sandstones of the Lewis Shale, Sand Wash Basin, Colorado, *in* Stone, D. S., ed., New interpretations of northwest Colorado geology: Rocky Mountain Association of Geologists, p. 171–181. **GR**
- Callender, J. F., Seager, W. R., and Swanberg, C. A., 1983, Late Tertiary and Quaternary tectonics and volcanism: Geothermal resources of New Mexico: New Mexico State University Energy Institute, Scientific Map

Series; work performed under U.S. Department of Energy contract number AS07-781D01717, scale 1:500,000. **SJ**

- Campbell, F. W., 1985, Chemical characteristics of the coals, *in* Roybal, G. H., Campbell, F. W., Beaumont, E. C., Cohen, A. D., Kuellmer, F. J., and Kottlowski, F. E., Quality assessment of strippable coals in the San Juan Basin of northwestern New Mexico: New Mexico Bureau of Mines and Mineral Resources, Division of New Mexico Energy Research and Development Institute, Report No. 2-73-4304, 89 p. **SJ**
- Campbell, Frank, and McCord, Cecilia, 1988, Chemical composition of the coals from the San Juan Basin, New Mexico: Journal of Coal Quality, v. 7, no. 2 (April-June), p. 71–76. **SJ**
- Campen, Betsy, 1990, Exploring the coalbeds of Montana: Western Oil World, v. 47, no. 7, p. 24–26. **PR**
- Campen, E. B., and Gruber, J. R., Jr., 1991, Coal and coalbed methane resources of Montana, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 265–272. **PR**
- Canavello, D. A., 1980, Geology of some Paleocene coalbearing strata of the Powder River Basin, Wyoming and Montana: North Carolina State University, Masters thesis, 63 p. **PR**
- Carlson, C. G., 1983, Geology of Billings, Golden Valley, and Slope Counties, North Dakota, North Dakota Geological Survey Bulletin 76, part 1, 40 p. **PR**
- Carmichael, V. W., 1975, The Sentinel Butte Member of the Fort Union Formation, Powder River County, Montana: Energy resources of Montana, Montana Geological Society 22nd Annual Publication, p. 125–141. PR
- Carothers, W. W., and Kharaka, Y. K., 1978, Aliphatic acid anions in oil field waters—implications for origin of natural gas: American Association of Petroleum Geologists Bulletin, v. 62, p. 2441–2453. GR, PB, PR, RB, SJ
- Carothers, W. W., and Kharaka, Y. K., 1980, Stable carbon isotopes of HCO₃⁻ in oil-field waters—implications for the origin of CO₂: Geochimica et Cosmochimica Acta, v. 44, p. 323–332. **GR**, **PB**, **PR**, **RB**, **SJ**
- Carter, D. A., 1956, Coal deposits of the Raton Basin, *in* McGinnis, C. J., ed., Geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists Guidebook, p. 89–92. **RB**
- Carter, L. M., ed., 1986, U.S. Geological Survey research on energy resources: U.S. Geological Survey Circular 974, 82 p. GR, PB, PR, RB, SJ
- Cascia, M. C., 1980, A petrographic study of coals from the Trinidad coal field, Colorado, including a comparison of fluorescence spectra with rank parameters: Southern Illinois University, Masters thesis, 90 p. **RB**
- Cashion, W. B., compiler, 1973, Geologic and structure map of the Grand Junction quadrangle, Colorado and

- Utah: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-736, scale 1:250,000. **GR**
- Cathcart, J. D., 1984, Bibliography of U.S. Geological Survey reports on coal drilling and geophysical logging projects, and related reports on geologic uses, Powder River Basin, Montana and Wyoming, 1973–1983: U.S. Geological Survey Open-File Report 84-518, 15 p. **PR**
- Cathcart, J. D., Babcock, R. N., and Hobbs, R. G., 1983, Geophysical logs of water wells logged for coal occurrences in northern Campbell and eastern Sheridan Counties, Wyoming: U.S. Geological Survey Open-File Report 83-411, 119 p. **PR**
- Century, J. R., 1991, Structural controls on coalbed methane in the San Juan and western Canada sedimentary basins (abs.), *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 67. **SJ**
- Chadwick, R. A., Rice, R. C., Bennett, C. M., and Woodriff, R. A., 1975, Sulfur and trace elements in the Rosebud and McKay coal seams, Colstrip field, Montana: Energy resources of Montana, Montana Geological Society 22nd Annual Publication, p. 167–175. **PR**
- Chancellor, R. E., 1977, Mesaverde hydraulic fracture stimulation, northern Piceance Basin—progress report, *in* Veal, H. K., ed., Exploration frontiers of the central and southern Rockies: Rocky Mountain Association of Geologists Symposium, p. 285–291. **PB**
- Chancellor, R. E., and Johnson, R. C., 1986, Geologic and engineering implications of production history from five Mesaverde wells in central Piceance Creek Basin, northwest Colorado: Society of Petroleum Engineers, SPE Paper 15237, p. 351–364. **PB**
- Chancellor, R. E., Barksdale, W. L., and Dolezal, George, Jr., 1974, Occurrence of oil and gas in the Tertiary System, Rio Blanco Unit, Rio Blanco County, Colorado, *in* Murray, D. K., ed., Energy resources of the Piceance Creek Basin, Colorado: Rocky Mountain Association of Geologists, twenty-fifth field conference, p. 225–233. **PB**
- Chao, E. C. T., Minkin, J. A., and Back, J. M., 1984, Petrographic characteristics and depositional environment of the Paleocene 61-m-thick subbituminous Big George coal bed, Powder River Basin, Wyoming, in Houghton, R. L., and Clausen, E. N., eds., 1984 Symposium on the geology of Rocky Mountain coal: North Dakota Geological Society Publication 84-1, p. 41–60. **PR**
- Chapin, C. E., 1983, An overview of Laramide wrench faulting in the southern Rocky Mountains with emphasis on petroleum exploration, *in* Lowell, J. D., ed., Foreland basins and uplifts: Rocky Mountain Association of Geologists, p. 169–179. **GR**, **PB**, **RB**, **SJ**
- Chapin, C. E., and Cather, S. M., 1981, Eocene tectonics and sedimentation in the Colorado Plateau-Rocky

(Chapin, C. E., and Cather, S. M., 1981, continued) Mountain area, *in* Dickinson, W. R., and Payne, M. D., eds., Relations of tectonics to ore deposits in the southern Cordillera: Arizona Geological Society Digest, v. 14, p. 173–198; also in Lowell, J. D., ed., Rocky Mountain foreland basins and uplifts: Rocky Mountain Association of Geologists, 1983 field conference guidebook, p. 33–56. **GR**, **PB**, **PR**, **RB**, **SJ**

- Chapman, D. S., Keho, T. H., Bauer, M. S., and Picard, M. D., 1983, Heat flow in the Uinta Basin determined from bottom hole temperature (BHT) data: Geophysics, v. 49, no. 4, p. 453–466. **PB**, **UB**
- Charpentier, R. R., Law, B. E., and Prensky, S. E., 1987, Quantitative model of overpressured gas resources of the Pinedale Anticline, Wyoming: Society of Petroleum Engineers/Department of Energy Joint Symposium on Low-Permeability Reservoirs, SPE Paper, p. 153–164. **GR**
- Charpentier, R. R., Law, B. E., and Prensky, S. E., 1989, Quantitative model for overpressured gas resources of the Pinedale Anticline, Wyoming, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. I1–I13. **GR**
- Choate, Raoul, and Johnson, C. A., 1980, Geologic overview, coal deposits, and potential for methane recovery from coalbeds—Powder River Basin: TRW Energy Systems Planning Division, report prepared for U.S. Department of Energy under contract no. DE-AC21-78MCO8089, 177 p. **PR**
- Choate, Raoul, and McCord, J. P., 1983, Piceance Basin: Quarterly Review of Methane from Coal Seams Technology, v. 0, no. 0, p. 9–10. **PB**
- Choate, Raoul, and McCord, J. P., 1983, Piceance Basin: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 1, p. 7–8. **PB**
- Choate, Raoul, and McCord, J. P., 1983, Piceance Basin: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 2, p. 7. **PB**
- Choate, Raoul, and McCord, J. P., 1983, Piceance Basin: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 3, p. 7–8. **PB**
- Choate, Raoul, and McCord, J. P., 1983, Raton Mesa Basin: Quarterly Review of Methane from Coal Seams Technology, v. 0, no. 0, p. 8–9. **RB**
- Choate, Raoul, and McCord, J. P., 1983, Raton Mesa Basin: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 1, p. 5–6. **RB**
- Choate, Raoul, and McCord, J. P., 1983, Raton Mesa Basin: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 3, p. 8–9. **RB**
- Choate, Raoul, and McCord, J. P., 1983, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 2, p. 22. **RB**

- Choate, Raoul, and McCord, J. P., 1984, Piceance Basin: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 4, p. 5–6. **PB**
- Choate, Raoul, and McCord, J. P., 1984, Piceance Basin: Quarterly Review of Methane from Coal Seams Technology, v. 2, no. 2, p. 5–6. **PB**
- Choate, Raoul, and McCord, J. P., 1984, Raton Mesa Basin: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 4, p. 6–7. **RB**
- Choate, Raoul, and McCord, J. P., 1984, Raton Mesa Basin: Quarterly Review of Methane from Coal Seams Technology, v. 2, no. 1, p. 5. **RB**
- Choate, Raoul, and McCord, J. P., 1984, Raton Mesa Basin: Quarterly Review of Methane from Coal Seams Technology, v. 2, no. 2, p. 6. **RB**
- Choate, Raoul, and Rightmire, C. T., 1982, Influence of the San Juan Mountain geothermal anomaly and other Tertiary igneous events on the coalbed methane potential in the Piceance, San Juan and Raton Basins, Colorado and New Mexico, *in* Proceedings of the Unconventional Gas Recovery Symposium, May 16–18, 1982, Pittsburgh, Pennsylvania: Society of Petroleum Engineers/U.S. Department of Energy, SPE Paper 10805, p. 151–164. **PB**, **RB**, **SJ**
- Choate, Raoul, Johnson, C. A., and McCord, J. P., 1978, Powder River basin report—a study of Early Tertiary geology, coal and the potential for methane recovery from coalbeds in Montana and Wyoming: Report by TRW Inc. for U.S. Department of Energy, p. 3-11, 3-12, 4-3, 4-4, 5-5, 5-6, 5-7. **PR**
- Choate, Raoul, Johnson, C. A., and McCord, J. P., 1984, Geologic overview, coal deposits, and potential for methane recovery from coalbeds—Powder River Basin, *in* Rightmire, C. T., Eddy, G. E., and Kirr, J. N., eds., Coalbed methane resources of the United States: American Association of Petroleum Geologists Studies in Geology 17, p. 335–351. **PR**
- Choate, Raoul, Jurich, D., Saulnier, G. J., 1984, Geologic overview, coal deposits and potential for methane recovery from coalbeds, Piceance Basin, Colorado, *in* Rightmire, C. T., Eddy, G. E., and Kirr, J. N., eds., Coalbed methane resources of the United States: American Association of Petroleum Geologists Studies in Geology 17, p. 223–251. **PB**
- Choate, Raoul, Lent, J., and Rightmire, C. T., 1984, Upper Cretaceous geology, coal, and the potential for methane recovery from coalbeds in San Juan Basin—Colorado and New Mexico, *in* Rightmire, C. T., Eddy, G. E., and Kirr, J. N., eds., Coalbed methane resources of the United States: American Association of Petroleum Geologists Studies in Geology Series No. 17, p. 185–222. SJ
- Christiansen, R. L., and Lipman, P. W., 1972, Cenozoic volcanism and plate-tectonic evolution of the Western United States; II. Late Cenozoic: Philosophical Transactions, Royal Society of London, A 271, p. 249–284. GR, PB, PR, RB, SJ

Clair, J. R., and Bradish, B. B., 1956, Garcia gas field, Las Animas County, Colorado, *in* McGinnis, C. J., ed., Geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists Guidebook, p. 75–79. **RB**

- Clair, J. R., and Bradish, B. B., 1956, Model dome gas field, Las Animas County, Colorado, *in* McGinnis, C. J., ed., Geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists Guidebook, p. 80–81. **RB**
- Clark, J. A., 1983, The prediction of hydraulic fracture azimuth through geological, core, and analytical studies: SPE/DOE Joint Symposium on Low Permeability Reservoirs, SPE/DOE Paper 11611, p. 107–114.
- Clark, W. F., and Hemler, Tom, 1988, Completing, equipping, and operating Fruitland Formation coal-bed methane wells in the San Juan Basin, New Mexico and Colorado, *in* Fassett, J. E., ed., Geology and coalbed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 125–132. **SJ**
- Clarke, R. T., 1965, Fungal spores from Vermejo Formation coal beds of central Colorado: Mountain Geologist, v. 2, p. 85–93.
- Clarkson, Gerry, and Reiter, Marshall, 1987, The thermal regime of the San Juan Basin since late Cretaceous times and its relationship to San Juan Mountain thermal sources: Journal of Volcanology and Geothermal Research, v. 31, nos. 3 and 4, p. 217–237. SJ
- Clarkson, Gerry, and Reiter, Marshall, 1988, An overview of geothermal studies in the San Juan Basin, New Mexico and Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 285–291. **SJ**
- Claypool, G. E., and Kaplan, I. R., 1974, The origin and distribution of methane in marine sediments, *in* Kaplan, I. R., ed., Natural gases in marine sediments: New York, Plenum Press, p. 99–139. **GR**, **PB**, **PR**, **RB**, **SJ**
- Clayton, J. L., and Ryder, R. T., 1984, Organic geochemistry of black shales and oils in the Minnelusa Formation (Permian and Pennsylvanian), Powder River Basin, Wyoming, *in* Woodward, Jane, Meissner, F. F., and Clayton, J. L., eds., Hydrocarbon source rocks of the greater Rocky Mountain region: Rocky Mountain Association of Geologists, p. 231–253. **PR**
- Clement, J. H., 1983, North flank of the Uinta Mountains, Utah, *in* Bally, A. W., ed., Seismic expression of structural styles: American Association of Petroleum Geologists Studies in Geology 15, v. 3, p. 3.2.2.29–3.2.2.32. **GR**, **PB**, **PR**, **RB**, **SJ**
- Clement, J. H., 1986, Cedar Creek: a significant paleotectonic feature of the Williston Basin, *in* Peterson, J. A., ed., Paleotectonics and sedimentation in the Rocky Mountain region, United States: American Association of Petroleum Geologists Memoir 41, p. 213–240. **PR**

- Clementz, D. M., 1979, Effect of oil and bitumen saturation on source-rock pyrolysis: American Association of Petroleum Geologists Bulletin, v. 63, p. 2227–2232. GR, PB, PR, RB, SJ
- Close, J. C., 1988, Coalbed methane potential of the Raton Basin, Colorado and New Mexico: Southern Illinois University-Carbondale, Ph.D. dissertation, 432 p. **RB**
- Close, J. C., and Dutcher, R. R., 1990, Prediction of permeability trends and origins in coalbed methane reservoirs of the Raton Basin, New Mexico and Colorado, *in* Bauer, P. W., and others, eds., Tectonic development of the southern Sangre de Cristo Mountains, New Mexico: New Mexico Geological Society Guidebook, forty-first field conference, p. 387–395. **RB**
- Close, J. C., and Dutcher, R. R., 1990, Update on coalbed methane potential of Raton Basin, Colorado and New Mexico: Society of Petroleum Engineers, Proceedings, 65th Technical Conference, SPE Paper 20667, p. 497– 512. **RB**
- Close, J. C., and Erwin, T. M., 1989, Significance and determination of gas content data as related to coalbed methane reservoir evaluation and production implications, *in* Proceedings of the 1989 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, April 17–20, 1989, p. 37–55. **GR, PB, PR, RB, SJ**
- Close, J. C., and Mavor, M. J., 1991, Importance, genesis and recognition of fracture permeability in Fruitland coalbed methane reservoirs of the northern San Juan Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 8, no. 2, p. 44–45. [Abstracted from CIM/SPE Paper 90-106.] SI
- Close, J. C., and Mavor, M. J., 1991, Influence of coal composition and rank on fracture development in Fruitland coal gas reservoirs of San Juan Basin, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 108–121. **SJ**
- Close, J. C., Mavor, M. J., and McBane, R. A., 1990, Importance, genesis and recognition of fracture permeability in Fruitland coalbed methane reservoirs of the northern San Juan Basin, Colorado and New Mexico: CIM/SPE Paper 90-106. [Presented at the Petroleum Society of CIM and Society of Petroleum Engineers International Technical Meeting, Calgary, Alberta, Canada, June 10–13, 1990.] SJ
- Close, J. C., Mavor, M. J., Dhir, R., Pratt, T. J., and Hughes, B., 1990, Western Cretaceous coal seam project preliminary evaluation of the co-operative research well FC Federal #12 operated by Mesa Operating Limited Partnership: Preliminary report submitted to Gas Research Institute under contract 5088-214-1657. **SJ**

Cobban, W. A., 1956, The Pierre shale and older Cretaceous rocks in southeastern Colorado, *in* McGinnis, C. J., ed., Geology of the Raton Basin: Rocky Mountain Association of Geologists Guidebook, p. 25–27. **PB**, **RB**, **SJ**

- Cobban, W. A., and Reeside, J. B., Jr., 1952, Frontier Formation: Wyoming and adjacent areas: American Association of Petroleum Geologists Bulletin, v. 36, no. 10, p. 1913–1961. **GR**
- Cohen, A. D., 1984, The Okefenokee Swamp: a low sulphur end-member of a shoreline-related depositional model for coastal plain coals, *in* Rahmani, R. A., and Flores, R. M., eds., Sedimentology of coal and coalbearing sequences: International Association of Sedimentologists Special Publication No. 7, p. 231–240. **GR, PB, PR, RB, SJ**
- Collins, B. A., 1970, Geology of the coal-bearing Mesaverde Formation (Cretaceous), Coal Basin area, Pitkin County, Colorado: Colorado School of Mines, Masters thesis, 116 p. **PB**
- Collins, B. A., 1976, Coal deposits of the Carbondale, Grand Hogback, and Southern Danforth Hills coal fields, eastern Piceance Basin, Colorado: Quarterly of the Colorado School of Mines, v. 71, no. 1, 138 p. **PB**
- Collins, B. A., 1977, Geology of the coal basin area, Pitkin County, Colorado, *in* Veal, H. K., ed., Exploration frontiers of the central and southern Rockies: Rocky Mountain Association of Geologists Symposium, p. 363–377. **PB**
- Collins, E. W., Laubach, S. E., and Vendeville, B. C., 1990, Faults and fractures in the Balcones Fault Zone, Central Texas: Austin Geological Society Guidebook 13, 34 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Colorado Oil and Gas Conservation Commission, 1980, Cause no. NG-5, application by Coseka Resources (U.S.A.), Limited, for designation of the Mancos B Formation in parts of Garfield and Rio Blanco Counties, Colorado, as a tight gas sand. **PB**
- Colorado Oil and Gas Conservation Commission, 1980, Cause no. NG-6, application by Chandler and Associates, Incorporated, for designation of the Mancos B Formation in part of Rio Blanco County, Colorado, as a tight gas sand. **PB**
- Colorado Oil and Gas Conservation Commission, 1980, Cause no. NG-9, application by Rio Blanco Natural Gas Company for designation of the Fort Union Formation, the Mesaverde (Group), and the Mancos Shale (to base of Mancos B Shale) in part of Rio Blanco County, Colorado, as a tight gas sand. **PB**
- Colorado Oil and Gas Conservation Commission, 1980, Cause no. NG-15-1, application by American Resources Management Corporation for designation of the Mancos B Formation in parts of Garfield and Rio Blanco Counties, Colorado, as a tight gas sand. **PB**
- Colorado Oil and Gas Conservation Commission, 1980, Cause no. NG-17, application by Dome Petroleum

- Corporation for designation of the Rollins, Cozzette, and Corcoran Formations in part of Garfield County, Colorado, as tight gas sands. **PB**
- Colorado Oil and Gas Conservation Commission, 1981, Cause no. NG-21, application by Northwest Exploration Company for designation of the Mesaverde Formation in part of Garfield County, Colorado, as a tight gas sand. **PB**
- Colorado Oil and Gas Conservation Commission, 1982, Cause no. NG-26, application by Snyder Oil Company for designation of the upper Mancos (Shale) and lower Mesaverde (Group) in part of Mesa County, Colorado, as a tight gas sand. **PB**
- Colorado Oil and Gas Conservation Commission, 1986, Oil and gas statistics: State of Colorado Oil and Gas Conservation Commission, Department of Natural Resources, 519 p. **PB**, **RB**, **SJ**
- Colpitts, R. M., Jr., and Smith, C. T., 1990, Geology of the Moreno Valley, Colfax County, New Mexico, *in* Bauer, P. W., Lucas, S. G., Mawer, C. K., and McIntosh, W. L., eds., Tectonic development of the southern Sangre de Cristo Mountains, New Mexico: New Mexico Geological Society Guidebook, forty-first field conference, p. 219–228. **RB**
- Colson, C. T., 1969, Stratigraphy and production of the Tertiary formations in the Sand Wash and Washakie Basins, *in* Barlow, J. A., Jr., ed., Tertiary rocks of Wyoming: Wyoming Geological Association Guidebook, twenty-first field conference, p. 121–128. **GR**
- Condon, S. M., 1988, Joint patterns on the northwest side of the San Juan Basin (Southern Ute Indian Reservation), southwest Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 61–68. **SJ**
- Condon, S. M., 1990, Geologic and structure contour map of the Southern Ute Indian Reservation and adjacent areas, southwest Colorado and northwest New Mexico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-1958, scale 1:1,000,000. **SJ**
- Coney, P. J., 1976, Plate tectonics and the Laramide orogeny, *in* Woodward, L. A., and Northrop, S. A., eds., Tectonics and mineral resources of southwestern North America: New Mexico Geological Society Special Publication no. 6, p. 5–11. **GR**, **PB**, **PR**, **RB**, **SJ**
- Coney, P. J., 1978, Mesozoic-Cenozoic plate tectonics: Geological Society of America Memoir 152, p. 33–50.
- Coney, P. J., and Harms, T. A., 1984, Cordilleran metamorphic core complexes: Cenozoic extensional relicts of Mesozoic compression: Geology, v. 12, no. 9, p. 550–554. **GR, PB, PR, RB, SJ**
- Coney, P. J., and Reynolds, S. J., 1977, Cordilleran Benioff zones: Nature, v. 270, p. 403–406. GR, PB, PR, RB, SJ
- Connor, C. W., 1984, Ash-fall sequences in a Paleocene coal—potential indicator of synchroneity between Montana and Wyoming basins (abs.), *in* Houghton,

R. L., and Clausen, E. N., eds., 1984 Symposium on the geology of Rocky Mountain coal: North Dakota Geological Society Publication 84-1, p. 137. **PR**

- Connor, C. W., 1988, Maps showing outcrop, structure contours, cross sections, and isopachs of partings—Mammoth coal bed, Paleocene Tongue River Member of the Fort Union Formation, Bull Mountain coal field, south-central Montana: U.S. Geological Survey Coal Investigations Map C-126-A, scale 1:50,000. **PR**
- Connor, C. W., 1989, Maps showing coal-split boundaries, isopachs of coal splits, coal resources, and coal quality, Mammoth coal bed, Paleocene Tongue River Member of the Fort Union Formation, Bull Mountain coal field, south-central Montana: U.S. Geological Survey Coal Investigations Map C-126-B, scale 1:50,000. PR
- Connor, C. W., and Biewick, L. R. 1989, Drill-hole and surface-section data, Fort Union Formation, Bull Mountain coal field, south-central Montana (209 records as entered in the National Coal Resources Data System): U.S. Geological Survey Open-File Report 89-6, 305 p. [Accompanies Coal Investigation Maps C-0126-A and C-0126-B.] **PR**
- Connor, J. J., Denson, N. M., and Hamilton, J. C., 1976, Geochemical discrimination of sandstones of the basal Wasatch and uppermost Fort Union Formations, Powder River Basin, Wyoming and Montana, in Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and energy resources of the Powder River, Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 291–297. **PR**
- Cooley, S. A., and Ellman, R. C., 1975, Analyses of coal and ash from lignites and subbituminous coals of eastern Montana: Energy resources of Montana, Montana Geological Society 22nd Annual Publication, p. 143–154. **PR**
- Cooper, K. R., 1975, Final construction geologic report of Tunnel No. 4, Navajo Indian Irrigation Project: Report available for public inspection at the Bureau of Reclamation, Navajo Indian Irrigation Project Office, Farmington, New Mexico. **SJ**
- Cooper, K. R., no date, Final construction geology report of Tunnels No. 3 and 3A, Navajo Indian Irrigation Project: Report available for public inspection at the Bureau of Reclamation, Navajo Indian Irrigation Project Office, Farmington, New Mexico. **SJ**
- Corbitt, L. L., and Woodward, L. A., 1973, Tectonic framework of Cordilleran foldbelt in southwestern New Mexico: American Association of Petroleum Geologists Bulletin, v. 57, no. 11, p. 2207–2216. **PB**, **SJ**
- Cordell, Lindrith, 1983, Composite residual total intensity aeromagnetic map of New Mexico: New Mexico State University Energy Institute, scale 1:500,000. SJ
- Cordell, Lindrith, and Grauch, V. J. S., 1985, Mapping basement magnetization zones from aeromagnetic data in the San Juan Basin, New Mexico, *in* Hinze,

- W. J., ed., The utility of regional gravity and magnetic anomaly maps: Society of Exploration Geophysicists, p. 181–197. **SJ**
- Coss, J. M., 1985, Paleoenvironments of the upper Fort Union Formation at Pine Ridge, western Powder River Basin, Wyoming: University of Colorado, Masters thesis. **PR**
- Coss, J. M., and Flores, R. M., 1984, Paleoenvironments of upper Fort Union Formation (Paleocene) at Pine Ridge, western Powder River Basin, Wyoming: Geological Society of America Abstracts with Programs, v. 16, p. 219. **PR**
- Craney, D. L., 1978, Ignacio Blanco Fruitland-Pictured Cliffs, *in* Fassett, J. E., Thomaidis, N. D., and Matheny, M. L., eds., Oil and gas fields of the Four Corners area: Four Corners Geological Society, v. 1, p. 134– 136. **SJ**
- Creely, R. S., and Saterdal, A. O., 1956, Badito-Alamo area, Huerfano County, Colorado, *in* McGinnis, C. J., ed., Geology of the Raton Basin: Rocky Mountain Association of Geologists Guidebook, p. 71–74. **RB**
- Creely, R. S., and Saterdal, A. O., 1956, Ojo anticline; Huerfano County, Colorado, *in* McGinnis, C. J., ed., Guidebook to the geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists, p. 68–70. **RB**
- Crelling, J. C., and Dutcher, R. R., 1968, A petrologic study of a thermally altered coal from the Purgatoire River Valley of Colorado: Geological Society of America Bulletin, v. 79, p. 1375–1368. **RB**
- Crews, G. C., Barlow, J. A., Jr., and Haun, J. D., 1973, Natural gas resources, Green River Basin, Wyoming, *in* Schell, E. M., ed., Core seminar on the geology and mineral resources of the Greater Green River Basin: Wyoming Geological Association Guidebook, twenty-fifth field conference, p. 103–113. **GR**
- Crews, G. C., Barlow, J. A., Jr., and Haun, J. D., 1976, Upper Cretaceous Gammon, Shannon, and Sussex sandstones, central Powder River Basin, Wyoming, *in* Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and energy resources of the Powder River: Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 9. **PR**
- Crist, T. E., Boyer, C. M., and Kelso, B. S., 1989, A geologic and coalbed methane resource analysis of the Menefee Formation in the San Juan Basin, southwestern Colorado and northwestern New Mexico, *in* Proceedings, 1989 SPE Joint Rocky Mountain Regional/Low Permeability Reservoirs Symposium and Exhibition, March 6–8, 1989, SPE Paper 18945, p. 153–160. **SJ**
- Cronoble, J. M., 1969, South Baggs-West Side Canal gas field, Carbon County, Wyoming and Moffat County, Colorado, *in* Barlow, J. A., Jr., ed., Tertiary Rocks of Wyoming: Wyoming Geological Association Guidebook, twenty-first field conference, p. 129–137. **GR**

Cross, T. A., and Pilger, R. H., Jr., 1978, Tectonic controls of Late Cretaceous sedimentation, Western Interior, U.S.A.: Nature, v. 274, no. 5672, p. 653–657. **GR**, **PB**, **PR**, **RB**, **SJ**

- Crowley, S. S., Stanton, R. W., and Warwick, P. D., 1989, Coal quality of a core from the Wyodak-Anderson coal bed, southeastern Powder River Basin, Wyoming—a preliminary study: U.S. Geological Survey Open-File Report 89-0081, 32 p. **PR**
- Crutcher, W. A., 1962, Economic aspects of oil and gas in northwestern Colorado: in Amuedo, C. L., and Mott, M. R., eds., Exploration for oil and gas in northwestern Colorado: Rocky Mountain Association of Geologists, p. 119–122. **PB**
- Culbertson, W. C., 1987, Diagrams showing proposed correlation and nomenclature of Eocene and Paleocene coal beds underlying the Birney 30' x 60' quadrangle, Big Horn, Rosebud, and Powder River Counties, Montana, U.S. Geological Survey Coal Investigations Map C-113. **PR**
- Culbertson, W. C., and Mapel, W. J., 1976, Coal in the Wasatch Formation, northwest part of the Powder River Basin near Sheridan, Sheridan County, Wyoming, *in* Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and energy resources of the Powder River, Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 193–201. **PR**
- Cullender, M. H., and Smith, R. V., 1956, Practical solutions of gas-flow equation for wells and pipelines with large temperature gradients: American Institute of Mining, Metallurgical, and Petroleum Engineers, Transactions, v. 207, p. 281–287. GR, PB, PB, RB, SJ
- Cumella, S. P., 1981, Sedimentary history and diagenesis of the Pictured Cliffs Sandstone, San Juan Basin, New Mexico and Colorado: The University of Texas at Austin, Texas Petroleum Research Committee Report No. UT 81-1, 219 p. SJ
- Cumella, S. P., 1983, Relation of Upper Cretaceous regressive sandstone units of the San Juan Basin to source area tectonics, *in* Reynolds, M. W., and Dolly, E. D., eds., Mesozoic paleogeography of west-central United States: Denver, Colorado, Rocky Mountain Section, Society of Economic Paleontologists and Mineralogists, p. 189–199. **SJ**
- Cummings, S. G., 1987, Natural gas drilling methods and practice-San Juan Basin, New Mexico: SPE/IADC Paper 16167. SJ
- Cunningham, K. I., 1988, Preliminary interpretation of soil-gas data and relationships to other hydrocarbon microseepage indicators, Four Corners Platform-San Juan Basin transitional area, southwest Colorado and northwest New Mexico, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 305–315. **SJ**

- Curry, W. H., III, 1969, Synthetic electric logs in subsurface mapping, *in* Barlow, J. A., Jr., ed., Tertiary rocks of Wyoming: Wyoming Geological Association Guidebook, twenty-first field conference, p. 93–98. **PR**
- Curry, W. H., III, 1971, Laramide structural history of the Powder River Basin, Wyoming, *in* Renfro, A. R., ed., Wyoming Geological Association Guidebook, twentythird field conference, p. 49–60. **PR**
- Curry, W. H., III, 1972, Resistivity mapping of sandstone stratigraphic traps: Wyoming Geological Association Earth Science Bulletin, December, p. 3–11. **GR**
- Curry, W. H., III, 1973, Late Cretaceous and early Tertiary rocks southwestern Wyoming, *in* Schell, E. M., ed., Core seminar on the geology and mineral resources of the Greater Green River Basin: Wyoming Geological Association Guidebook, twenty-fifth field conference, p. 79–86. **GR**
- Curry, W. H., III, 1986, Clinoform slope geometry of a Wall Creek sandstone, Salt Creek oil field, Wyoming, *in* Noll, J. H., and Doyle, K. M., eds., Rocky Mountain oil and gas fields: Wyoming Geological Association Symposium, p. 189–198. **PR**
- Curry, W. H., III, 1986, Subtle middle Cretaceous paleotectonic deformation of Frontier and lower Cody rocks in Wyoming, *in* Peterson, J. A., ed., Paleotectonics and sedimentation in the Rocky Mountain region, United States: American Association of Petroleum Geologists Memoir 41, p. 469–479. **GR**

D

- Dabbous, M. K., Reznik, A. A., Mody, B. G., Fulton, P. F., and Taber, J. J., 1976, Gas-water capillary pressure in coal at various overburden pressures: Society of Petroleum Engineers Journal, v. 16, no. 5, p. 261–268. **GR, PB, PR, RB, SJ**
- Daddow, P. B., 1986, Potentiometric surface map of the Wyodak-Anderson coal bed, Powder River structural basin, Wyoming, 1973–84: U.S. Geological Survey Water Resources Investigations Report 85-4305, scale 1:250,000. **PR**
- Dahl, A. R., and Hagmaier, J. L., 1976, Genesis and characteristics of the southern Powder River Basin uranium deposits, Wyoming, *in* Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and energy resources of the Powder River: Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 243–252. **PR**
- Dana, G. F., and Smith, J. W., 1973, Artesian aquifer, New Fork Tongue of the Wasatch Formation, northern Green River Basin, *in* Schell, E. M., ed., Core seminar on the geology and mineral resources of the Greater Green River Basin: Wyoming Geological Association Guidebook, twenty-fifth field conference, p. 201–206. **GR**

Dane, C. H., 1936, The La Ventana-Chacra Mesa coal field, pt. 3A. Geology and fuel resources of the southern part of the San Juan Basin, New Mexico: U.S. Geological Survey Bulletin 860-C, p. 81–161. **SJ**

- Dane, C. H., and Bachman, G. O., compilers, 1965, Geologic map of New Mexico: United States Geological Survey, scale 1:500,000. **RB**
- Danilchik, Walter, 1978, Preliminary results of 1978 coal exploratory drilling in the Trinidad-Raton coal region, Las Animas County, Colorado: U.S. Geological Survey Open-File Report 78-1101, 17 p. **RB**
- Danilchik, Walter, 1979, Content of methane in coal from four core holes in the Raton and Vermejo Formations, Las Animas County, Colorado: Colorado Geological Survey Open-File Report 79-3, 19 p. **RB**
- Danilchik, Walter, Schultz, J. E., and Tremain, C. M., 1979, Content of absorbed methane in coal from four core holes in the Raton and Vermejo Formations, Las Animas County, Colorado: Colorado Geological Survey Open-File Report 79-3, 19 p. **RB**
- Danilchik, Walter, Schultz, J. E., and Tremain, C. M., 1979, Methane from coal cores taken from four U.S. Geological Survey coreholes drilled during 1978 in Las Animas County, Colorado: U.S. Geological Survey Open-File Report 70-762. **RB**
- Das, B. M., Nikols, D. J., Das, Z. U., and Hucka, V. J., 1991, Factors affecting rate and total volume of methane desorption from coalbeds, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 69–76. **GR**, **PB**, **PR**, **RB**, **SJ**
- Daub, G. J., 1982, Stratigraphy and geology of some coal mines along the North Fork of the Gunnison River, Somerset coal field, Colorado, *in* Averett, W. R., ed., 1982 field trip guide: Grand Junction Geological Society, p. 69–77. **PB**
- Davis, G. H., 1984, Joints, *in* Structural geology of rocks and regions (chap. 10): New York, John Wiley, p. 325–353. **GR**, **PB**, **PR**, **RB**, **SJ**
- Davis, J. A., 1912, Little Powder River coal field, Campbell County, Wyoming: U.S. Geological Survey Bulletin 471-F, p. 423–440. **PR**
- Davis, R. W., 1976, Hydrologic factors related to coal development in the eastern Powder River Basin, *in* Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and energy resources of the Powder River: Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 203–207. **PR**
- DeBruin, R. H., 1989, Wyomings oil and gas industry in the 1980s: a time of change: Wyoming Geological Survey Public Information Circular 28, 27 p. **GR**, **PR**
- DeBruin, R. H., and Jones, R. W., 1989, Coalbed methane in Wyoming, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 97–103. **GR**

- de Chadenedes, J. F., 1975, Frontier deltas of the western Green River Basin, Wyoming, *in* Bolyard, D. W., ed., Deep drilling frontiers in the central Rocky Mountains: Rocky Mountain Association of Geologists, p. 149–157. **GR**
- de Vries, J. L., and Mullen, D. M., 1988, Powder River Basin discoveries 1981–1988, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 85–88. **PR**
- Decker, A. D., 1985, Appropriate stratigraphic nomenclature for coal reservoirs in Piceance Basin, Colorado (abs.): American Association of Petroleum Geologists Bulletin, v. 69, no. 5, p. 846. **PB**
- Decker, A. D., and Horner, D. M., 1987, Origin and production implications of abnormal coal reservoir pressure, *in* Proceedings of the 1987 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, p. 51–62. **GR**, **PB**, **PR**, **RB**, **SJ**
- Decker, A. D., and Seccombe, J. C., 1986, Geologic parameters controlling natural gas production from a single deeply buried coal reservoir in the Piceance Basin, Mesa County, Colorado: Society of Petroleum Engineers preprint 15221. **PB**
- Decker, A. D., Close, J. C., and McBane, R. A., 1989, The use of remote sensing, curvature analysis, and coal petrology as indicators of higher coal reservoir permeability, *in* Proceedings of the 1989 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, p. 325–340. **GR**, **PB**, **PR**, **RB**, **SJ**
- Decker, A. D., Jeu, S. J., Cooper, J. D., and Wicks, D. E., 1988, Geology, geochemistry, reservoir engineering, and completion methods at the Cedar Hill field, San Juan County, New Mexico: a field study of classic coal degasification behavior, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 221–235. SJ
- Decker, A. D., Klusman, R., and Horner, D. M., 1987, Geochemical techniques applied to the identification and disposal of connate coal water, *in* Proceedings of the 1987 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, p. 229–242. **GR**, **PB**, **PR**, **RB**, **SJ**
- Deischl, D. G., 1973, The characteristics, history, and development of the Basin Dakota Gas Field, San Juan Basin, New Mexico, *in* Fassett, J. E., ed., Cretaceous and Tertiary rocks of the southern Colorado Plateau: Four Corners Geological Society Memoir, p. 168–173. **SJ**
- Delaney, P. T., Pollard, D. D., Ziony, J. I., and McKee, E. H., 1986, Field relationships between dikes and joints: emplacement processes and paleostress analysis: Journal of Geophysical Research, v. 91, no. B5, p. 4920–4938. **RB**

Denson, N. M., and Keefer, W. R., 1974, Map of the Wyodak-Anderson coal bed in the Gillette area, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Geological Investigations Map I-848-D, scale 1:24,000. **PR**

- Denson, N. M., Keefer, W. R., and Horn, G. H., 1973, Coal resources of the Gillette area, Wyoming: U.S. Geological Survey Miscellaneous Geological Investigations Map I-848-C. **PR**
- Devine, P. E., 1980, Depositional patterns in the Point Lookout Sandstone, northwest San Juan Basin, New Mexico: The University of Texas at Austin, Masters thesis, 238 p. **SJ**
- Dhir, Rahul, Mavor, M. J., and Close, J. C., 1991, Evaluation of Fruitland coal properties and development economics, San Juan Basin, Colorado and New Mexico, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 287–295. **SJ**
- Diamond, W. P., and Levine, J. R., 1981, Direct method determination of the gas content of coal—Procedures and results: U.S. Bureau of Mines Report of Investigations 8515, 36 p. **GR**
- Diamond, W. P., McCulloch, C. M., and Bench, B. M., 1976, Use of surface joint and photolinear data for predicting subsurface coal cleat orientation: United States Bureau of Mines Report of Investigations 8120, 13 p. GR, PB, PR, RB, SJ
- Dickinson, W. R., and Snyder, W. S., 1978, Plate tectonics of the Laramide orogeny, *in* Matthews, Vincent, III, ed., Laramide folding associated with basement block faulting in the western United States: Geological Society of America Memoir 151, p. 355–366. **GR**, **PB**, **PR**, **RB**, **SJ**
- Dickinson, W. R., and Yarborough, Hunter, 1977, Plate tectonics and hydrocarbon accumulation: American Association of Petroleum Geologists Continuing Education Course Note Series 1, 108 p. GR, PB, PR, RB, SI
- Dickinson, W. R., Klute, M. A., Hayes, M. J., Janecke, S. U., Lundin, E. R., McKittrick, M. A., and Olivares, M. D., 1988, Paleogeographic and paleotectonic setting of Laramide sedimentary basins in the central Rocky Mountain region: Geological Society of America Bulletin, v. 100, p. 1023–1039. **GR, PB, PR, RB, SJ**
- Dickinson, W. W., 1989, Analysis of vitrinite maturation and Tertiary burial history, northern Green River Basin, Wyoming, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. F1–F17. **GR**
- Diemer, J. A., 1988, Paleohydraulic reconstruction of the early Paleocene Lebo Member of the Fort Union Formation, southeastern Montana: Society of Economic

- Paleontologists and Mineralogists annual midyear meeting abstracts, p. 14. **PR**
- Dilworth, O. L., 1960, Upper Cretaceous Farmington Sandstone of northeastern San Juan County, New Mexico: New Mexico University, Masters thesis. **SJ**
- Dix, O. R., and Jackson, M. P. A., 1981, Statistical analysis of lineaments and their relation to fracturing, faulting, and halokinesis in the East Texas Basin: The University of Texas at Austin, Bureau of Economic Geology Report of Investigations No. 110, 30 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Dixon, J. M., and Jake, T., 1979, Coal cleat intensity, *in* Donaldson, A. C., Presley, M. W., and Renton, J. J., eds., Carboniferous coal guidebook: West Virginia Geological and Economic Survey Bulletin B-37-1, p. 38–46. **GR**, **PB**, **PR**, **RB**, **SJ**
- Dixon, J. S., 1982, Regional structural synthesis, Wyoming salient of western overthrust belt: American Association of Petroleum Geologists Bulletin, v. 66, no. 10, p. 1560–1580. **GR**
- Dobbin, C. E., 1929, The Forsyth coal field, Rosebud, Treasure, and Bighorn Counties, Montana, U.S. Geological Survey Bulletin 812-A, p. 1–55. **PR**
- Doelger, M. J., and Barlow, J. A., 1989, Wyoming and the central Rocky Mountain area natural gas supply: a United States perspective, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 21–29. **GR**, **PB**, **PR**, **RB**, **SJ**
- Doeringsfeld, W. W., Jr., Amuedo, C. L., and Ivey, J. B., 1956, Structure contour map of Raton Basin showing major tectonic features and local structural axes, *in* McGinnis, C. J., ed., Geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists, guidebook. **RB**
- Dolly, E. D., and Meissner, F. F., 1977, Geology and gas exploration potential, Upper Cretaceous and lower Tertiary strata, northern Raton Basin, Colorado, *in* Veal, H. K., ed., Exploration frontiers of the central and southern Rockies: Rocky Mountain Association of Geologists, p. 247–270. **RB**
- Domenico, P. A., and Robbins, G. A., 1985, The displacement of connate water from aquifers: Geological Society of America Bulletin, v. 96, p. 328–335. **RB**
- Donaldson, A. C., 1979, Origin of coal seam discontinuities, *in* Donaldson, A. C., Presley, M. W., and Renton, J. J., eds., Carboniferous coal guidebook, volume 1—carboniferous coal short course: West Virginia Geological and Economic Survey Bulletin B-37-1, p. 102–132. **GR**, **PB**, **PR**, **RB**, **SJ**
- Donaldson, A. C., Presley, M. W., and Renton, J. J., eds., 1979, Carboniferous coal guidebook: West Virginia Geological and Economic Survey Bulletin B-37-1, 301 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Donnell, J. R., 1981, Geology and coal resources of the Carbondale area, Garfield, Pitkin, and Gunnison Counties,

Colorado: U.S. Geological Survey Open-File Report 62-38, 2 p. **PB**

- Dorr, J. A., Jr., and Gingerich, P. D., 1980, Early Cenozoic mammalian paleontology, geologic structure and tectonic history of the overthrust belt near La Barge, Wyoming: University of Wyoming Contributions to Geology, v. 18, no. 2, p. 101–115. **GR**
- Dorr, J. A., Jr., Spearing, D. R., and Steidtmann, J. R., 1977, Deformation and deposition between a foreland uplift and an impinging thrust belt, Hoback Basin, Wyoming: Geological Society of America Special Paper 177, 82 p. **GR**
- Douglass, W. B., Jr., and Blazzard, T. R., 1961, Facies relationships of the Blair, Rock Springs, and Ericson Formations of the Rock Springs Uplift and Washakie Basin, *in* Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 81–86. **GR**
- Dowdle, W. L., and Cobb, W. M., 1975, Static formation temperature from well logs—an empirical method: Journal of Petroleum Technology, v. 28, p. 1326–1330. GR, PB, PR, RB, SJ
- Drewes, Harold, 1982, Some general features of the El Paso-Wickenburg transect of the Cordilleran orogenic belt, Texas to Arizona, *in* Drewes, Harold, ed., Cordilleran overthrust belt, Texas to Arizona: Rocky Mountain Association of Geologists, 32nd field conference, p. 87–96. **PB**
- DuChene, H. R., 1989, Fracture reservoirs in the San Juan Basin, Colorado and New Mexico, *in* Lorenz, J. C., and Lucas, S. G., eds., Energy frontiers in the Rockies: Albuquerque Geological Society, p. 101–109. **SJ**
- Duell, G. A., 1969, Pacific Power & Lights coal operations, Converse County, Wyoming: Wyoming Geological Association Guidebook, twenty-first field conference, p. 155–159. PR
- Dugan, T. A., and Williams, B. L., 1988, History of gas produced from coal seams in the San Juan Basin, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 1–9. **SJ**
- Dula, W. F., Jr., 1981, Correlation between deformation lamellae, microfractures, and in situ stress measurements, White River Uplift, Colorado: Geological Society of America Bulletin, v. 92, no. 1, p. 37–46. **PB**
- Dunlap, C. M., 1958, The Lewis, Fox Hills and Lance Formations of the Upper Cretaceous age in the Powder River Basin, Wyoming, *in* Strickland, John, ed., Powder River Basin: Wyoming Geological Association Guidebook, thirteenth field conference, p. 109–110. **PR**
- Dunn, H. L., 1974, Geology of petroleum in the Piceance Creek Basin, northwest Colorado, *in* Murray, D. K.,

- ed., Energy resources of the Piceance Creek Basin, Colorado: Rocky Mountain Association of Geologists Guidebook, twenty-fifth field conference, p. 217–224. **PB**
- Dunn, H. L., and Irwin, D., 1977, Subsurface correlation of Upper Cretaceous rocks, Sand Wash and Piceance Basins, Colorado: Cross sections compiled for the Rocky Mountain Research Committee. **GR**, **PB**
- Dunne, W. M., and North, C. P., 1990, Orthogonal fracture systems at the limits of thrusting: an example from southwestern Wales: Journal of Structural Geology, v. 12, no. 2, p. 207–216. **GR**, **PB**, **PR**, **RB**, **SJ**
- Dunnewald, J. B., 1969, Big Piney-La Barge Tertiary oil and gas field, *in* Barlow, J. A., Jr., ed., Tertiary rocks of Wyoming: Wyoming Geological Association Guidebook, twenty-first field conference, p. 139–143. **GR**
- Dunrud, C. R., 1989, Geologic map and coal stratigraphic framework of the Cedaredge area, Delta County, Colorado: U.S. Geological Survey Coal Investigations Map C-0116, scale 1:50,000. **PB**
- Dunrud, C. R., 1989, Geologic map and coal stratigraphic framework of the Paonia area, Delta and Gunnison Counties, Colorado: U.S. Geological Survey Coal Investigations Map C-0115, scale 1:50,000. **PB**
- Dwights Energydata Company, 1990, Anderman/Smith slates another coalbed methane test in Wyoming: Dwights ActionLine, Rocky Mountain Edition, v. 90, no. 29, p. 5. **PR**
- Dwights Energydata Company, 1990, Dekalb target Adaville coal along Wyomings overthrust belt: Dwights ActionLine, Rocky Mountain Edition, v. 60, no. 30, p. 7–8. **GR**
- Dwights Energydata Company, 1990, GlG slates southeastern Sand Wash Basin, Colorado: Dwights Action-Line, Rocky Mountain Edition, v. 90, no. 28, p. 3. GR
- Dwights Energydata Company, 1990, Metfuel takes over operations at Anderman/Smith wildcats, Wyoming: Dwights ActionLine, Rocky Mountain Edition, v. 90, no. 30, p. 5. **PR**
- Dwights Oil and Gas Reports, 1990, Natural gas well production histories: Colorado Statewide Coal Bed Methane Report, v. 1, 373 p. **GR, PB, RB, SJ**
- Dwights Oil and Gas Reports, 1990, Natural gas well production histories: New Mexico Statewide Coal Bed Methane Report, v. 1, 853 p. **GR**, **PB**, **RB**, **SJ**

E

- Eddy, G. E., Rightmire, C. T., and Byrer, C. W., 1982, Relationship of methane content of coal rank and depth: theoretical vs. observed: Society of Petroleum Engineers/Department of Energy Joint Symposium on Unconventional Gas Recovery, p. 117-122. GR, PB, PR, RB, SJ
- El-Etr, H. A., 1976, Proposed terminology for natural linear features, *in* Hodgson, R. A., and others, eds.,

(El-Etr, H. A., 1976, continued) Proceedings, 1st International Conference on the New Basement Tectonics: Utah Geological Association Publication No. 5, p. 480–489. **GR**, **PB**, **PR**, **RB**, **SJ**

- Ellis, M. S., 1989, Geologic map of the Powder River Basin and surrounding area, Wyoming, Montana, South Dakota: U.S. Geological Survey Miscellaneous Field Studies Map MF-2095, scale 1:500,000. **PR**
- Ellis, M. S., and Gabaldo, Virginia, 1989, Geologic map and cross sections of parts of the Grand Junction and Delta 30'x 60' quadrangles, west-central Colorado: U.S. Geological Survey Investigations Map C-0124, scale 1:100,000. **PB**
- Ellis, M. S., and Kelso, B. S., 1987, 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: U.S. Geological Society Miscellaneous Field Studies Map MF-2008-A. **PB**
- Ellis, M. S., Freeman, V. L., and Donnell, J. R.,1988, Cross sections showing correlation of coal beds and coal zones in the Mesaverde Formation in the Carbondale 30' by 60' quadrangle, west-central Colorado [southeastern Piceance Basin]: U.S. Geological Survey Coal Investigations Map C-0097-B, scale 1:100,000. **PB**
- Ely, J. W., Holditch, S. A., and Carter, R. H., 1988, Improved hydraulic fracturing strategy for Fruitland Formation coal-bed methane recovery, San Juan Basin, New Mexico and Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 155–158. **SJ**
- Emmendorfer, Alan, 1989, Fracture orientation use in the dipmeter type fracture log: The Mountain Geologist, v. 26, p. 63-67. **GR**, **PB**, **PR**, **RB**, **SJ**
- Energy Reserves Group, 1981, Well report type III production test; Robert A. Van Dorn no. 1 well, Greater Green River Basin, Moffat County, Colorado: Morgantown Energy Technology Center, U.S. Department of Energy report DE-AC21-78MC 08089. **GR**
- Engelder, Terry, 1985, Loading paths to joint propagation during a tectonic cycle: an example from the Appalachian Plateau, U.S.A.: Journal of Structural Geology, v. 7, no. 3/4, p. 459–476. GR, PB, PR, RB, SJ
- Epis, R. C., and Chapin, C. E., 1975, Geomorphic and tectonic implications of the post-Laramide, late Eocene erosion surface in the southern Rocky Mountains, *in* Curtis, B. F., ed., Cenozoic history of the southern Rocky Mountains: Geological Society of America Memoir 144, p. 45–74. **GR**, **PB**, **PR**, **RB**, **SJ**
- Erpenbeck, M. F., 1979, Stratigraphic relationships and depositional environments of the Upper Cretaceous Pictured Cliffs Sandstone and Fruitland Formation, southwestern San Juan Basin, New Mexico: Texas Tech University, Masters thesis, 78 p. SJ

Espitalie, J., Laporte, J. L., Madec, M., Leplat,

- P., Paulet, J., Boutfeu, A., 1977, Méthode rapide de caractérisation des roches méres, de leur potentiel pétrolier et de leur degré dévolution: Revue de Institut Français du Pétrole, v. 32, p. 23–42. **GR**, **PB**, **PR**, **RB**, **SJ**
- Ethridge, F. G., and Jackson, T. J., 1980, Regional depositional framework of the uranium- and coal-bearing Wasatch (Eocene) and Fort Union (Paleocene) Formations, Powder River Basin, Wyoming, *in* Glass, G. B., ed., Guidebook to the coal geology of the Powder River coal basin, Wyoming: Wyoming Geological Society Public Information Circular 14, p. 3–30. **PR**
- Ethridge, F. G., Jackson, T. J., and Youngberg, A. D., 1981, Floodbasin sequence of a fine-grained meander belt subsystem: the coal-bearing lower Wasatch and upper Fort Union Formations, southern Powder River Basin, Wyoming, *in* Ethridge, F. G., and Flores, R. M., eds., Recent and ancient nonmarine depositional environments: models for exploration: Society of Economic Paleontologists and Mineralogists Special Publication 31, p. 191–209. **PR**

F

- Fassett, J. E., 1967, Core description from GB-1 (Gasbuggy 1) in the northeastern part of the San Juan Basin, Rio Arriba County, New Mexico: U.S. Geological Survey Open-File Report, 37 p. **SJ**
- Fassett, J. E., 1968, Summary of geologic data obtained from borehole GB-1, Project Gasbuggy, *in* San Juan-San Miguel-La Plata Region: New Mexico Geological Society, 19th field conference guidebook, p. 24–27. **SJ**
- Fassett, J. E., 1976, What happened during Late Cretaceous time in the Raton and San Juan Basins with some thoughts about the area in between, *in* Ewing, R. C., and Kues, B. S., eds., Vermejo Park, northeastern New Mexico: New Mexico Geological Society Guidebook, twenty-seventh field conference, p. 185–190. **RB**, **SJ**
- Fassett, J. E., 1977, Geology of the Point Lookout, Cliff House and Pictured Cliffs Sandstones of the San Juan Basin, New Mexico and Colorado, *in* Fassett, J. E., ed., San Juan Basin III: New Mexico Geological Society, 28th field conference guidebook, p. 193-197. **SJ**
- Fassett, J. E., 1983, Stratigraphy and oil and gas production of northwest New Mexico updated through 1983, *in* Fassett, J. E., Oil and gas fields of the Four Corners area: Four Corners Geological Society, p. 849–863. **SJ**
- Fassett, J. E., 1985, Early Tertiary paleogeography and paleotectonics of the San Juan Basin area, New Mexico and Colorado, *in* Flores, R. M., and Kaplan, S. S., eds., Cenozoic paleogeography of the west-central United States: Society of Economic Paleontologists and Mineralogists, Rocky Mountain Section, Rocky Mountain Paleogeography Symposium 3, p. 317–334. SJ
- Fassett, J. E., 1986, The non-transferability of a Cretaceous coal model in the San Juan Basin of New Mexico and Colorado, *in* Lyons, P. C., and Rice, C. L., eds., Paleo-

environmental and tectonic controls in coal-forming basins in the United States: Geological Society of America Special Paper 210, p. 155–171. **SJ**

- Fassett, J. E., 1987, Geometry and depositional environments of Fruitland Formation coalbeds, San Juan Basin, New Mexico and Colorado: anatomy of a giant coal-bed methane deposit, *in* Proceedings of the 1987 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, p. 19–35. SJ
- Fassett, J. E., 1987, 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, *in* Fassett, J. E., and Rigby, J. K., Jr., eds., The Cretaceous-Tertiary boundary in the San Juan and Raton basins, New Mexico and Colorado: Geological Society of America Special Paper 209, p. 5–16. **SJ**
- Fassett, J. E., 1988, 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, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 317–335. **SJ**
- Fassett, J. E., ed., 1988, Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, 351 p. **SJ**
- Fassett, J. E., 1988, Geometry and depositional environment of Fruitland Formation coal beds, San Juan Basin, New Mexico and Colorado: anatomy of a giant coal-bed methane deposit, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 23-38. SJ
- Fassett, J. E., 1988, 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, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 337–351. **SJ**
- Fassett, J. E., and Hinds, J. S., 1971, Geology and fuel resources of the Fruitland Formation and Kirtland Shale of the San Juan Basin, New Mexico and Colorado: U.S. Geological Survey Professional Paper 676, 76 p. SJ
- Fassett, J. E., and Nuccio, V. F., 1990, Vitrinite reflectance values of coals from drill-hole cuttings from the Fruitland and Menefee Formations, San Juan Basin, New Mexico: U.S. Geological Survey Open-File Report 90–290, 22 p. **SJ**
- Fassett, J. E., and Rigby, J. K., Jr., eds., 1987, The Cretaceous-Tertiary boundary in the San Juan and Raton

- Basins, New Mexico and Colorado: Geological Society of America Special Paper 209, 200 p. **RB**, **SJ**
- Fassett, J. E., Arnold, E. C., Hill, J. M., Hatton, K. S., Martinez, L. B., and Donaldson, D. A., 1978, Stratigraphy and oil and gas production of northwest New Mexico, *in* Fassett, J. E., Thomaidis, N. D., and Matheny, M. L., eds., Oil and gas fields of the Four Corners area: Four Corners Geological Society, v. 1, p. 46–61. SJ
- Fassett, J. E., Lucas, S. G., and ONeill, F. M., 1987, Dinosaurs, pollen and spores, and the age of the Ojo Alamo Sandstone, San Juan Basin, New Mexico, *in* Fassett, J. E., and Rigby, J. K., Jr., eds., The Cretaceous-Tertiary boundary in the San Juan and Raton Basins, New Mexico and Colorado: Geological Society of America Special Paper 209, p. 1734. **SJ**
- Federal Energy Regulatory Commission, 1977, Colorado natural gas pipelines as of February, 1977: U.S. Department of Energy map, scale 1:1,360,000. **PB**, **RB**, **SI**
- Federal Energy Regulatory Commission, 1977, New Mexico natural gas pipelines as of February, 1977: U.S. Department of Energy map, scale 1:530,000. **PB**, **RB**, **SJ**
- Federal Energy Regulatory Commission, 1982, Major natural gas pipelines, January 1, 1982: U.S. Department of Energy map, scale 1:5,000,000. GR, PB, PR, RB, SJ
- Fender, H. B., and Murray, D. K., 1978, Data accumulation on the methane potential of the coal beds of Colorado: Colorado Geological Survey Open-File Report 78-2, 25 p. **PB**, **RB**, **SJ**
- Fertl, W. H., Rieke, H. H., and Rightmire, C. T., 1981, Evaluation of gas-bearing coal seams: Journal of Petroleum Technology, v. 33, no. 1, p. 195–204. **GR**, **PB**, **PR**, **RB**, **SJ**
- Fidlar, M. M., 1962, Church Buttes gas field, Sweetwater and Uinta Counties, Wyoming, in Enyert, R. L., and Curry, W. H., III, eds., Early Cretaceous rocks of Wyoming and adjacent areas: Wyoming Geological Association Guidebook, seventeenth field conference, p. 280-281. GR
- Finley, R. J., 1984, Geology and engineering characteristics of selected low-permeability gas sandstones: a national survey: The University of Texas at Austin, Bureau of Economic Geology Report of Investigations No. 138, 220 p. **GR**, **PB**
- Finley, R. J., 1985, Reservoir properties and gas productivity of the Corcoran and Cozzette tight sandstones, Colorado: Society of Petroleum Engineers, Society of Petroleum Engineers / Department of Energy Paper 13852, p. 33–39. **PB**
- Finley, R. J., and Ladwig, L. R., 1985, Depositional systems of a tight gas-productive barrier-strandplain sequence: Corcoran and Cozzette Sandstones, northwest Colorado (abs.): American Association of Petroleum Geologists Bulletin, v. 69, no. 2, p. 255. **PB**
- Finley, R. J., Garrett, C. M., Han, J. H., Lin, Z.-S., Seni, S. J., Saucier, A. E., and Tyler, Noel, 1983, Geologic

(Finley, R. J. and others, 1983, continued) analysis of primary and secondary tight gas sand objectives: The University of Texas at Austin, Bureau of Economic Geology, annual report prepared for the Gas Research Institute under contract no. 5082-211-0708, 334 p. GR, PB

- Finley, R. J., Laubach, S. E., Holtz, M. H., and Tyler, Noel, 1990, Opportunities for horizontal drilling in Texas: The University of Texas at Austin, Bureau of Economic Geology Geological Circular 90–2, 32 p.
- First Boston, 1988, E & P perspectives—Fruitland coal seam gas: an unconventional resource revitalizes the San Juan Basin, 28 p. SJ
- Fisher, D. J., 1936, The Book Cliffs coal field in Emery and Grand Counties, Utah: U.S. Geological Survey Bulletin 852, 102 p. **PB**
- Fisher, D. J., Erdman, C. E., and Reeside, J. B., Jr., 1960, Cretaceous and Tertiary formations of the Book Cliffs, Carbon, Emery, and Grand Counties, Utah, and Garfield and Mesa Counties, Colorado: U.S. Geological Survey Professional Paper 332, 80 p. **PB**
- Fisher, W. L., Brown, L. F., Scott, A. J., and McGowen, J. H., 1969, Delta systems in the exploration for oil and gas: The University of Texas at Austin, Bureau of Economic Geology Research Colloquium, 212 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Fisher, W. L., Parker, J. M., and Riggs, E. A., 1977, San Juan III northwestern New Mexico oil and gas potential of the San Juan Basin: New Mexico Geological Society Guidebook, twenty-eighth field conference, p. 227–234.
- Flores, R. M., 1979, Coal depositional models in some Tertiary and Cretaceous coal fields in the U.S. Western Interior: Organic Geochemistry, v. 1, p. 225–235. PR
- Flores, R. M., 1980, Comparison of depositional models of Tertiary and Upper Cretaceous coal-bearing rocks in some Western Interior basins of the United States, *in* Carter, L. M., ed., Proceedings of the fourth symposium on the geology of Rocky Mountain coal: Colorado Geological Survey Resource Series 10, p. 17–20. PR, RB
- Flores, R. M., 1980, Fluvial coal settings of the Tongue River Member of the Fort Union Formation in the Powder River—Clear Creek area, Wyoming, *in* Glass, G. B., ed., Guidebook to the coal geology of the Powder River coal basin, Wyoming: Geological Survey of Wyoming Public Information Circular 14, p. 71–95. PR
- Flores, R. M., 1981, Coal deposition in fluvial paleoenvironments of the Paleocene Tongue River Member of the Fort Union Formation, Powder River area, Powder River Basin, Wyoming and Montana, *in* Ethridge, F. G., and Flores, R. M., eds., Recent and ancient nonmarine depositional environments: models for exploration: Society of Economic Paleontologists and Mineralogists Special Publication 31, p. 169–190. **PR**

- Flores, R. M., 1983, Basin facies analysis of coal-rich Tertiary fluvial deposits, northern Powder River Basin, Montana and Wyoming, *in* Collinson, J. D., and Lewin, J., eds., Modern and ancient fluvial systems: International Association of Sedimentologists Special Publication 6, p. 501–515. **PR**
- Flores, R. M., 1984, Comparative analysis of coal accumulation in Cretaceous alluvial deposits, southern United States Rocky Mountain basins, *in* Stott, D. F., and Glass, D. J., eds., The Mesozoic of Middle North America: Canadian Association of Petroleum Geologists Memoir 9, p. 373–385. **GR**, **PB**, **PR**, **RB**, **SJ**
- Flores, R. M., 1984, Dynamics of coal deposition in intermontane alluvial paleoenvironment, Eocene Wasatch Formation, Powder River Basin, Wyoming (abs.), *in* Houghton, R. L., and Clausen, E. N., eds., 1984 Symposium on the geology of Rocky Mountain coal: North Dakota Geological Society Publication 84-1, p. 184. **PR**
- Flores, R. M., 1986, Styles of coal deposition in Tertiary alluvial deposits, Powder River Basin, Montana and Wyoming, *in* Lyons, P. C., and Rice, C. L., eds., Paleoenvironmental and tectonic controls in coal-forming basins in the United States: Geological Society of America Special Paper 210, p. 79–104. **PR**
- Flores, R. M., 1987, Sedimentology of Upper Cretaceous and Tertiary siliciclastics and coals in the Raton Basin, New Mexico and Colorado, *in* Lucas, S. G., and Hunt, A. P., eds., Northeastern New Mexico: New Mexico Geological Society Guidebook, thirty-eighth field conference, p. 255–264. **RB**
- Flores, R. M., 1989, Guide to the Wasatch Plateau Cretaceous coal field, Utah, *in* Flores, R. M., Warwick, P. D., and Moore, T. A., eds., Tertiary and Cretaceous coals in the Rocky Mountain region: American Geophysical Union, 28th International Geological Congress field trip guidebook T132, p. 40–47. **UB**
- Flores, R. M., and Danilchik, Walter, 1978, Sedimentary structures and interpretations of depositional environments of Pierre Shale, Trinidad Sandstone, and Vermejo Formation in the vicinity of Trinidad Dam, Las Animas County, Colorado: Rocky Mountain Section, Society of Economic Paleontologists and Mineralogists guidebook, p. 1–8. **RB**
- Flores, R. M., and Erpenbeck, M. F., 1981, Differentiation of delta front and barrier lithofacies of the Upper Cretaceous Pictured Cliffs Sandstone, southwestern San Juan Basin, New Mexico: The Mountain Geologist, v. 18, no. 2, p. 23–34. **SJ**
- Flores, R. M., and Ethridge, F. G., 1985, Evolution of intermontane fluvial systems of Tertiary Powder River Basin, Montana and Wyoming, *in* Flores, R. M., and, Kaplan, S. S., eds., Cenozoic paleogeography of the west-central United States: Rocky Mountain Section, Society of Economic Paleontologists and Mineralogists, Rocky Mountain Paleogeography Symposium 3, p. 107–126. **PR**

Flores, R. M., and Hanley, J. H., 1984, Anastomosed and associated coal-bearing fluvial deposits: upper Tongue River Member, Paleocene Fort Union Formation, northern Powder River Basin, Wyoming, U.S.A., *in* Rahmani, R. A., and Flores, R. M., eds., Sedimentology of coal and coal-bearing sequences: International Association of Sedimentologists Special Publication 7, p. 85–103. **PR**

- Flores, R. M., and Pillmore, C. L., 1987, Tectonic control on alluvial paleoarchitecture of Cretaceous and Tertiary Raton Basin, Colorado and New Mexico, *in* Ethridge, F. G., Flores, R. M., and Harvey, M. D., eds., Recent developments in fluvial sedimentology: Society of Economic Paleontologists and Mineralogists Special Publication no. 39. **RB**
- Flores, R. M., and Tur, S. M., 1982, Characteristics of deltaic deposits in the Cretaceous Pierre Shale, Trinidad Sandstone and Vermejo Formation, Raton Basin, Colorado: Mountain Geologist, v. 19, no. 1, p. 25–40. **RB**
- Flores, R. M., Belt, E. S., Canavello, D. A., Lynn, L. R., Pait, E. D., TOAR(o,¢)th, J. C., and Warwick, V. V., 1982, Depositional continuum of Paleocene fluvial coals from Powder River Basin to Williston Basin, Montana, Wyoming, and North Dakota (abs.): American Geophysical Union, 11th International Congress on Sedimentology, abstracts of papers, p. 56. **PR**
- Flores, R. M., Pillmore, C. L., and Merewether, E. A., 1985, Overview of depositional systems and energy potential of Raton Basin, Colorado and New Mexico, *in* Macke, D. L., and Maughan, E. K., eds., Rocky Mountain Section field trip guidebook: American Association of Petroleum Geologists, Society of Economic and Paleontologic Mineralogists and Rocky Mountain Association of Geologists, p. 41–61. **RB**
- Flores, R. M., TOAR(o,¢)th, J. C., and Moore, T. A., 1982, Use of geophysical logs in recognizing depositional environments in the Tongue River Member of the Fort Union Formation, Powder River area, Wyoming and Montana: U.S. Geological Survey Open-File Report 82-576, 40 p. **PR**
- Flores, R. M., Warwick, P. D., and Moore, T. A., 1989, Depositional aspects and a guide to Paleocene coal-bearing sequences, Powder River Basin, *in* Flores, R. M., Warwick, P. D., and Moore, T. A., eds., Tertiary and Cretaceous coals in the Rocky Mountain region: American Geophysical Union, 28th International Geological Congress field trip guidebook T132, p. 1–10. PR
- Flores, R. M., Warwick, P. D., Moore, T. A., and Weaver, J. N., 1987, Field geology of Tertiary coals in the Powder River Basin, *in* Canadian Society of Petroleum Geologists, Geology of Tertiary coals in the Powder River Basin, Wyoming and Montana: Canadian Society of Petroleum Geologists coal group field trip 3, p. 1–36. **PR**

- Fogg, G. E., and Senger, R. K., 1985, Automatic generation of flow nets with conventional ground-water modeling algorithms: Ground Water, v. 23, no. 3, p. 336–344. GR, PB, PR, RB, SJ
- Foh, Stephen, 1983, Selection of drilling fluids for minimizing coalbed damage: Quarterly Review of Methane from Coal Seams Technology, v. 0, no. 0, p. 12.
- Foster, R. W., 1966, Oil and gas exploration in Colfax county, *in* Northrop, S. A., and Read, C. B., eds., Guidebook of Taos-Raton-Spanish Peaks county, New Mexico and Colorado: New Mexico Geological Society Guidebook, p. 80–87. **RB**
- Fouch, T. D., Lawton, T. F., Nichols, D. J., Cashion, W. B., and Cobban, W. A., 1983, Patterns and timing of synorogenic sedimentation in Upper Cretaceous rocks of central and northeast Utah, *in* Reynolds, M. W., and Dolly, E. D., eds., Mesozoic paleogeography of the west-central United States: Rocky Mountain Section, Society of Paleontologists and Mineralogists, Rocky Mountain Paleogeography Symposium 2, p. 305–336. UB
- Franczyk, K. J., 1989, Depositional controls on the Late Campanian Sego Sandstone and implications for associated coal-forming environments in the Uinta and Piceance Basins: U.S. Geological Survey Bulletin 1787-F, 17 p. **PB**
- Franczyk, K. J., Pitman, J. K., Cashion, W. B., Dyni, J. R., Fouch, T. D., Johnson, R. C., Chan, M. A., Donnell, J. R., Lawton, T. F., and Remy, R. R., eds., 1989, Evolution of resource-rich foreland and intermontane basins in eastern Utah and western Colorado: American Geophysical Union, 28th International Geological Congress field trip guidebook T324, 53 p. UB
- Frank, J. R., and Gavlin, Suzanne, 1981, Painter Reservoir, East Painter Reservoir, and Clear Creek fields, Uinta County, Wyoming, *in* Reid, S. G., and Miller, D. D., eds., Energy resources of Wyoming: Wyoming Geological Association Guidebook, thirty-second field conference, p. 83–97. **GR**, **UB**
- Freeman, V. L., 1979, Preliminary report on rank of deep coals in part of the southern Piceance Creek Basin, Colorado: U.S. Geological Survey Open-File Report 79-725, 11 p. **PB**
- Freeze, R. A., and Cherry, J. A., 1979, Groundwater: Englewood Cliffs, New Jersey, Prentice-Hall, 604 p. GR, PB, PR, RB, SJ
- Friedman, Irving, ONeil, J. R., and Fleischer, Michael (tech. ed.), 1977, Compilation of stable carbon isotope fractionation factors of geochemical interest: U.S. Geological Survey Professional Paper 440-KK, 12 p. GR, PB, PR, RB, SJ
- Fryberger, S. G., and Koelmel, M. H., 1986, Rangely field: eolian system-boundary trap in the Permo-Pennsylvanian Weber Sandstone of northwest Colorado, *in* Stone, D. S., ed., New interpretations of northwest

(Fryberger, S. G., and Koelmel, M. H., 1986, continued) Colorado geology: Rocky Mountain Association of Geologists, p. 129–149. **PB**

G

- Gabelman, J. W., 1956, Tectonic history of the Raton Basin region, *in* McGinnis, C. J., ed., Geology of the Raton Basin: Rocky Mountain Association of Geologists Guidebook, p. 35–39. **RB**
- Galimov, E. M., 1988, Sources and mechanisms of formation of gaseous hydrocarbons in sedimentary rocks: Chemical Geology, v. 71, p. 77–95. **GR, PB, PR, RB, SJ**
- Galloway, W. E., 1979, Early Tertiary—Wyoming intermontane basins, *in* Galloway, W. E., Kreitler, C. W., and McGowen, J. H., eds., Depositional and groundwater flow systems in the exploration for uranium: The University of Texas at Austin, Bureau of Economic Geology Research Colloquium, p. 197–213. **GR**, **PR**
- Ganow, H. C., 1979, In situ coal gasification at the Hoe Creek, Wyoming field site—an overview: Wyoming Geological Association Earth Science Bulletin, v. 12, no. 3, p. 1-17. **GR**, **PR**
- Garing, J. D., and Tainter, P. A., 1985, Greater Green River Basin regional seismic line, *in* Gries, R. R., and Dyer, R. C., eds., Seismic exploration of the Rocky Mountain region: Rocky Mountain Association of Geologists and Denver Geophysical Society, p. 233–238. **GR**
- Garrett, C. H., and Lorenzo, J. C., 1990, Fracturing along the Grand Hogback, Garfield County, Colorado, *in* Bauer, P. W., Lucas, S. G., Mawer, C. K. and McIntosh, W. C., eds., Tectonic development of the southern Sangre de Cristo Mountains, New Mexico, New Mexico Geological Society, forty-first field conference, p. 145–150. **PB**
- Garrett, H. L., 1963, Fossil slump features of the Tertiary Paleocene Fort Union: Billings Geological Society Papers, p. 1-17. **PR**
- Garven, G., 1986, The role of regional fluid flow in the genesis of the Pine Point deposit, western Canada sedimentary basin—a reply: Economic Geology, v. 81, p. 1015-1020. GR, PB, PR, RB, SJ
- Gas Marketing Newsletter, 1989, Pennzoil purchases additional Raton basin acreage: New Mexico Oil Conservation Division newsletter, v. 3, no. 7, p. 11. **RB**
- Gas Marketing Newsletter, 1990, Meridian leases more acreage in Raton basin: New Mexico Oil Conservation Division, v. 4, no. 3, p. 9-10. **RB**
- Gas Research Institute, 1986, 27th U.S. symposium on rock mechanics: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 2, p. 50–52. [Abstracts.] GR, PB, PR, RB, SJ
- Gas Research Institute, 1986, American Association of Petroleum Geologists annual convention: Quarterly Re-

- view of Methane from Coal Seams Technology, v. 4, no. 2, p. 49–50. [Abstracts.] **GR**, **PB**, **PR**, **RB**, **SJ**
- Gas Research Institute, 1986, Multiple coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 1, p. 33-39.
- Gas Research Institute, 1986, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 3, nos. 3 and 4, p. 2–19. RB
- Gas Research Institute, 1986, Society of Petroleum Engineers unconventional gas technology symposium: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 2, p. 45–49. [Abstracts.] **GR**, **PB**, **PR**, **RB**, **SJ**
- Gas Research Institute, 1986, Society of Petroleum Engineers: Quarterly Review of Methane from Coal Seams Technology, v. 3, nos. 3 and 4, p. 50-52. [Abstracts.] GR, PB, PR, RB, SJ
- Gas Research Institute, 1986, U.S. Geological Survey McKelvey Forum: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 1, p. 49–51. [Abstracts.] GR, PB, PR, RB, SJ.
- Gas Research Institute, 1987, American Association of Petroleum Geologists Rocky Mountain Section: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 3, p. 51. [Abstracts.] **PB**
- Gas Research Institute, 1987, Geological Society of America: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 3, p. 50–51. [Abstracts.] **PB**, **RB**
- Gas Research Institute, 1987, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 3, p. 26-27. **RB**
- Gas Research Institute, 1987, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 2, p. 9–11. **RB**
- Gas Research Institute, 1987, Society of Petroleum Engineers/U.S. Department of Energy low permeability reservoirs symposium: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 2, p. 49–51. [Abstracts.] GR, PB, PR, RB, SJ
- Gas Research Institute, 1988, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 5, nos. 3 and 4, p. 13–18. RB
- Gas Research Institute, 1988, Society of Petroleum Engineers: Quarterly Review of Methane from Coal Seams Technology, v. 6, no. 2, p. 50. [Abstracts.] GR, PB, PR, RB, SJ
- Gas Research Institute, 1989, American Association of Petroleum Geologists: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 48–49. [Abstracts.] **GR**, **PB**, **PR**, **RB**, **SJ**
- Gas Research Institute, 1989, Greater Green River Basin, Wyoming and Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 3–4. **GR**

Gas Research Institute, 1989, Powder River Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 2–3. **PR**

- Gas Research Institute, 1989, Raton Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 7. **RB**
- Gas Research Institute, 1990, Greater Green River Basin, Wyoming and Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 3–4. **GR**
- Gas Research Institute, 1990, Greater Green River Basin, Wyoming and Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 4, p. 3–6. GR
- Gas Research Institute, 1990, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 3, p. 6–7. **RB**
- Gas Research Institute, 1990, The United States coalbed methane resource: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 3, p. 21. **GR**, **PB**, **PR**, **RB**, **SJ**
- Gas Research Institute, 1991, Coalbed methane workshop: 1991 Society of Petroleum Engineers Rocky Mountain Regional/Low Permeability Reservoirs Symposium, April 14, 1991, variously paginated. GR, PB, PR, RB, SI
- Gas Research Institute, 1991, Greater Green River coal region, Wyoming and Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 8, no. 3, p. 4-5. **GR**
- Gas Research Institute, 1991, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 8, no. 2, p. 6-7. **PB**
- Gas Research Institute, 1991, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 8, no. 3, p. 7. **PB**
- Gas Research Institute, 1991, Powder River Basin, Wyoming and Montana: Quarterly Review of Methane from Coal Seams Technology, v. 8, no. 3, p. 2. PR
- Gas Research Institute, 1991, Powder River Basin, Wyoming: Quarterly Review of Methane from Coal Seams Technology, v. 8, no. 2, p. 4. **PR**
- Gas Research Institute, 1991, Proceedings of the 1991 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, Gas Research Institute, U.S. Mine Safety and Health Administration, and Geological Survey of Alabama, May 13-17, 1991, variously paginated. GR, PB, PR, RB, SJ
- Geldon, A. L., 1986, Hydrostratigraphic characterization of Paleozoic formations in northwestern Colorado, *in* Stone, D. S., ed., New interpretations of northwest Colorado geology: Rocky Mountain Association of Geologists Symposium, p. 265–281. **PB**

- Geldon, A. L., 1990, Ground-water hydrology of the Central Raton Basin, Colorado and New Mexico: U.S. Geological Survey Water-Supply Paper 2288, 81 p. RB
- Geological Services of Tulsa, Inc., 1980, Geological framework and potential structural control of methane in coal beds of southeast Piceance Creek Basin, Colorado: Geological Services of Tulsa, Inc., final contract report prepared for TRW Energy Systems Group under contract no. J44432JJOE, 34 p. **PB**
- Gies, R. M., 1984, Case history for a major Alberta deep basin gas trap; the Cadomin Formation, *in* Masters, J. A., ed., Elmsworth; case study of a deep basin gas field: American Association of Petroleum Geologists Memoir 38, p. 115–140.
- Gill, J. R., and Cobban, W. A., 1966, Regional unconformity in Late Cretaceous, Wyoming: U.S. Geological Survey Professional Paper 550-B, p. B20–B27. **GR**, **PB**, **PR**
- Gill, J. R., and Hail, W. J., 1975, Stratigraphic section across Upper Cretaceous Mancos Shale Mesaverde Group boundary, eastern Utah and western Colorado: U.S. Geological Survey Oil and Gas Investigation Chart OC-68. **PB**
- Gjelsteen, T. W., and Collings, S. P., 1988, Relationship between groundwater flow and uranium mineralization in the Chadron Formation, northwest Nebraska, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 271. **PR**
- Glass, G. B., 1975, Analyses and measured sections of 54 Wyoming coal samples: Wyoming Geological Survey Report of Investigations No. 11, 219 p. **PR**
- Glass, G. B., 1976, Review of Wyoming coal fields: Wyoming Geological Survey Public Information Circular 4, 21 p. **GR**, **PR**
- Glass, G. B., 1976, Update on the Powder River coal basin, *in* Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and energy resources of the Powder River: Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 209–220. **PR**
- Glass, G. B., 1976, Wyoming coal deposits, *in* Murray, D. K., ed., Geology of Rocky Mountain coal: Colorado Geological Survey Resource Series 1, p. 73–84. **GR**, **PR**
- Glass, G. B., 1980, Coal resources of the Powder River coal basin, *in* Glass, G. B., ed., Guidebook to the coal geology of the Powder River coal basin, Wyoming: Geological Survey of Wyoming Public Information Circular 14, p. 97–131. **PR**
- Glass, G. B., 1980, The Rawhide coal mine, Campbell County, Wyoming, *in* Glass, G. B., ed., Guidebook to the coal geology of the Powder River coal basin, Wyoming: Geological Survey of Wyoming Public Information Circular 14, p. 159–184. **PR**

Glass, G. B., ed., 1980, Guidebook to the coal geology of the Powder River Basin, Wyoming: Geological Survey of Wyoming Public Information Circular 14, 184 p. PR

- Glass, G. B., 1981, Coal deposits of Wyoming, *in* Epis, R. C., and Callender, J. F., eds., Western Slope Colorado: New Mexico Geological Society Guidebook, thirty-second field conference, p. 181–236. **GR**, **PR**
- Glass, G. B., 1987, Coal resources of the Powder River coal basin, *in* Canadian Society of Petroleum Geologists, Geology of Tertiary coals in the Powder River Basin, Wyoming and Montana: Canadian Society of Petroleum Geologists coal group field trip 3, p. 97–131. **PR**
- Glass, G. B., and Roberts, J. T., 1978, Update on the Wind River coal basin, *in* Resources of the Wind River Basin: Wyoming Geological Association Guidebook, thirtieth annual field conference, p. 209–220. **WR**
- Goodell, H. G., 1962, The stratigraphy and petrology of the Frontier Formation of Wyoming, *in* Enyert, R. L., and Curry, W. H., III, eds., Early Cretaceous rocks of Wyoming and adjacent areas: Wyoming Geological Association Guidebook, seventeenth field conference, p. 173–210. **GR**
- Goodrum, C., 1983, A paleoenvironmental and stratigraphic study of the Paleocene Fort Union Formation in the Cave Hills area of Harding County: South Dakota School of Mines and Technology, 142 p. **PR**
- Goolsby, S. M., Reade, N. S., and Murray, D. K., 1979, Evaluation of coking coals in Colorado: Colorado Geological Survey Resource Series 7, 72 p. **PB**, **RB**
- Gorham, F. D., Jr., Woodward, L. A., Callender, J. F., and Greer, A. R., 1979, Fractures in Cretaceous rocks from selected areas of San Juan Basin, New Mexico—exploration implications: American Association of Petroleum Geologists Bulletin, v. 63, p. 598–607. **SJ**
- Granica, M. P., and Johnson, R. C., 1980, Structure contour and isochore map of the nonmarine part of the Mesaverde Group, Piceance Creek Basin, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1189, scale 1:250,000. **PB**
- Gras, V. B., 1968, Church Buttes gas field, Wyoming, *in* Beebe, W. A., and Curtis, B. F., eds., Natural gases of North America: American Association of Petroleum Geologists Memoir 9, v. 1, p. 798–802. **GR**
- Gray, T. D., Bowen, C. E., and Trummel, J. E., 1982, Depositional studies of the early Paleocene Jim Bridger coal deposits and its application to surface mine problems: Utah Geological and Mineral Survey Bulletin 118, p. 102–114. **GR**
- Green, M. W., and Pierson, C. T., 1977, A summary of the stratigraphy and depositional environments of Jurassic and related rocks in the San Juan Basin, Arizona, Colorado, and New Mexico, *in* Fassett, J. E., ed., San Juan Basin III: New Mexico Geological Society, 28th field conference guidebook, p. 147–152. **SJ**

- Greene, J., and Langefeld, R. M., 1956, Correlation chart—Raton Basin and adjacent areas, *in* McGinnis, C. J., ed., Guidebook to the geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists, p. 7. **RB**
- Gries, R. R., 1981, Oil and gas prospecting beneath the Precambrian of foreland thrust plates in the Rocky Mountains: Mountain Geologist, v. 18, p. 1–18. **GR**, **PB**, **PR**, **RB**, **SI**
- Gries, Robbie, 1983, North-south compression of Rocky Mountain foreland structures, *in* Lowell, J. D., ed., Rocky Mountain foreland basins and uplifts: Rocky Mountain Association of Geologists, p. 9–32. **GR**, **PB**, **PR**, **RB**, **SJ**
- Gries, Robbie, 1983, Oil and gas prospecting beneath Precambrian of foreland thrust plates in Rocky Mountains: American Association of Petroleum Geologists Bulletin, v. 67, p. 1–28. **GR, PB, PR, RB, SJ**
- Gries, Robbie, 1985, Seismic lines in the San Luis Valley, south-central Colorado, *in* Gries, R. R., and Dyer, R. C., eds., Seismic exploration of the Rocky Mountain region: Rocky Mountain Association of Geologists and Denver Geophysical Society, p. 267–274. **RB**
- Groenewold, G. H., Rehm, B. W., and Cherry, J. A., 1981, Depositional setting and groundwater quality in coalbearing sediments and spoils in western North Dakota, *in* Ethridge, F. G., and Flores, R. M., eds., Recent and ancient nonmarine depositional environments: models for exploration: Society of Economic Paleontologists and Mineralogists Special Publication 31, p. 157–167. **PR**
- Grose, L. T., 1972 Tectonics, *in* Mallory and others, eds., Geologic atlas of the Rocky Mountain region: Rocky Mountain Association of Geologists, p. 35–44. **PB**, GR
- Grossman, E. L., Coffman, B. K., Fritz, S. J., and Wada, W., 1989, Bacterial production of methane and its influence on ground-water chemistry in east-central Texas aquifers: Geology, v. 17, no. 6, p. 495–499. GR, PB, PR, RB, SJ
- Grout, M. A., 1985, Fracture history of the Plateau Creek and adjacent Colorado River Valleys, southern Piceance Basin—implications for predicting joint patterns at depth: U.S. Geological Survey Open-File Report 85-744, 17 p. **PB**
- Grout, M. A., 1987, Regional joint sets unrelated to major folds—example from the Piceance Basin, northeastern Colorado Plateau: Geological Society of America Abstracts with Programs, v. 19, no. 5, p. 279. **PB**
- Grout, M. A., 1988, Fracture data for the Divide Creek and Wolf Creek anticlines area, southern Piceance Basin, northwestern Colorado: U.S. Geological Society Open-File Report 88–204, 66 p. **PB**
- Grout, M. A., 1989, Prediction of fracture networks at depth in low-permeability reservoir rocks, Piceance and Washakie Basins, western U.S.: American Asso-

ciation of Petroleum Geologists Bulletin, v. 73, no. 9, p. 1158. **PB**, **GR**

- Grout, M. A., 1990, Fracture data for the Divide Creek and Wolf Creek Anticlines areas, southern Piceance Basin, northwestern Colorado: Colorado Geological Survey, report prepared for DOE under contract no. DE-AC-21-78MC08089. **PB**
- Grout, M. A., 1991, Cleats in coalbeds of southern Piceance Basin, Colorado—correlation with regional and local fracture sets in associated clastic rocks, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 35–47. **SJ**
- Grout, M. A., 1991, Coal cleats in the southern Piceance Basin, Colorado: correlation with both regional and local fold-related sets: U.S. Geological Survey, Rocky Mountain Association of Geologists, 32 p. **PB**
- Grout, M. A., Abrams, G. A., Tang, R. L., Hainsworth, T. J., and Verbeek, E. R., 1991, Late Laramide thrust-related and evaporite-domed anticlines in the southern Piceance Basin, northeastern Colorado Plateau: American Association of Petroleum Geologists Bulletin, v. 75, no. 2, p. 205–218. **PB**
- Grout, M. A., and Verbeek, E. R., 1983, Field studies of joints—insufficiencies and solutions, with examples from the Piceance Creek Basin, Colorado, *in* Gary, J. H., ed., Proceedings of the 16th Oil Shale Symposium: Colorado School of Mines, p. 68–80. **PB**
- Grout, M. A., and Verbeek, E. R., 1985, Fracture history of the Plateau Creek and adjacent Colorado River valleys, southern Piceance Basin: implications for predicting joint patterns at depth: U.S. Geological Survey Open-File Report 85-744, 17 p. **PB**
- Grout, M. A., and Verbeek, E. R., 1989, Prediction of fracture networks at depth in low-permeability reservoir rocks, Piceance and Washakie basins, western U.S. (abs.): American Association of Petroleum Geologists Bulletin, v. 73, no. 9, p. 1158. **PB**
- Grout, M. A., and Verbeek, E. R., *in* press, Fracture history of the Divide Creek and Wolf Creek anticlines and its relation to Laramide basin-margin tectonism, southern Piceance basin, northwestern Colorado, *in* Evolution of sedimentary basins—Uinta and Piceance Basins: U.S. Geological Survey Bulletin 1787-Z. **PB**
- Gunter, C. E., 1962, Oil and gas potential of Upper Cretaceous sediments, southern Piceance Creek Basin, *in* Bolyard, D. W., ed., Deep drilling frontiers in the central Rocky Mountains: Rocky Mountain Association of Geologists, p. 114–118. **PB**
- Gustason, E. R., 1988, Depositional and tectonic history of the Lower Cretaceous Muddy Sandstone, Lazy B field, Powder River Basin, Wyoming, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 129. **PR**

- Gustason, E. R., Ryer, T. A., and Odland, S. K., 1986, Unconformities and facies relationships of Muddy Sandstone, northern Powder River Basin, Wyoming and Montana: American Association of Petroleum Geologists Bulletin, v. 70, no. 8, p. 1042. **PR**
- Gwynn, T. A., and Kasper, Jack, 1963, Billy Creek field, Johnson County, Wyoming, *in* Cooper, G. C., Cardinal, D. F., Lorenz, H. W., and Lynn, J. R., eds., Northern Powder River Basin Wyoming and Montana: Wyoming Geological Association and Billings Geological Society Guidebook, first joint field conference, p. 158–167. **PR**

H

- Haas, M. R., and Crist, T. E., 1991, The impact of improved technology on potential tight gas reserves in the San Juan Basin: a case study: Society of Petroleum Engineers, SPE Paper 21484, p. 17–31. **SJ**
- Hacquebard, P. A., and Donaldson, J. R., 1974, Rank studies of coals in the Rocky Mountains and Inner Foothills Belt, Canada, *in* Dutcher, R. R., Hacquebard, P. A., Schopf, J. M., and Simon, J. A., eds., Carbonaceous materials as indicators of metamorphism: Geological Society of America Special Paper 153, p. 75–94. **GR**, **PB**, **PR**, **RB**, **SJ**
- Haimson, B. C., 1978, Near surface and deeper hydrofracturing stress measurements in the Waterloo Quartzite (abs.): American Geophysical Union Transactions, v. 59, p. 327–328. **GR**, **PB**, **PR**, **RB**, **SJ**
- Haimson, B. C., 1979, New hydrofracturing measurements in the Sierra Nevada Mountains and the relationship between shallow stresses and surface topography: 20th U.S. Symposium on Rock Mechanics, Austin, Texas, p. 675-682. **GR**, **PB**, **PR**, **RB**, **SJ**
- Hale, B. W., and Firth, C. H., 1988, Production history of the San Juan Unit No. 6 well, northern San Juan Basin, New Mexico, *in* Fassett J. E., ed., Geology and coalbed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 199–204. SJ
- Hale, L. A., 1950, Stratigraphy of the Upper Cretaceous Montana Group in the Rock Springs Uplift, Sweetwater County, Wyoming: Wyoming Geological Association Guidebook, fifth field conference, p. 49–58. GR
- Hale, L. A., 1961, Late Cretaceous (Montanan) stratigraphy eastern Washakie Basin Carbon County, *in* Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 129–137.
- Hale, L. A., 1962, Frontier Formation—Coalville, Utah and nearby areas of Wyoming and Colorado, *in* Enyert, R. L., and Curry, W. H., III, eds., Early Cretaceous rocks of Wyoming and adjacent areas: Wyoming

(Hale, L. A., 1962, continued) Geological Association Guidebook, seventeenth field conference, p. 211–220. GR, PB

- Hamilton, Warren, 1978, Mesozoic tectonics of the western United States, *in* Howell, D. G., and McDougall, K. A., eds., Mesozoic paleogeography of the western United States: Pacific Section, Society of Economic Paleontologists and Mineralogists, Pacific Coast Paleogeography Symposium 2, p. 33–70. **GR**, **PB**, **PR**, **RB**, **SI**
- Hamilton, Warren, 1981, Plate tectonic mechanism of Laramide deformation, *in* Boyd, D. W., and Lillegraven, J. A., eds., Rocky Mountain foreland tectonics: University of Wyoming Contributions to Geology, v. 19, p. 87–92. **GR**, **PB**, **PR**, **RB**, **SJ**
- Hamilton, Warren, 1987, Plate tectonic evolution of the western U.S.A.: Episodes, v. 10, no. 4, p. 271-276. **GR**, **PB**, **PR**, **RB**, **SJ**
- Hamlin, H. S., 1991, Stratigraphy and depositional systems of the Frontier Formation and their controls on reservoir development, Moxa Arch, southwestern Wyoming: The University of Texas at Austin, Bureau of Economic Geology topical report prepared for the Gas Research Institute under contract no. 5082-211-0708 (GRI-91/0128), 44 p. **GR**
- Hancock, E. T., 1925, Geology and coal resources of the Axial and Monument Butte quadrangles, Moffat County, Colorado: U.S. Geological Survey Bulletin 757, 134 p. **PB**
- Hancock, P. L., 1985, Brittle microtectonics: principles and practice: Journal of Structural Geology, v. 7, no. 3/4, p. 437-459. **GR**, **PB**, **PR**, **RB**, **SJ**
- Hancock, P. L., and Bevan, T. G., 1987, Brittle modes of foreland extension, in Coward, M. P., Dewey, J. F., and Hancock, P. L., eds., Continental extensional tectonics: Geological Society of London Special Publications No. 28, p. 127–138. GR, PB, PR, RB, SJ
- Hanks, T. L., 1962, Geology and coal deposits, Ragged-Chair Mountain area, Pitkin and Gunnison Counties, Colorado: Brigham Young University Geological Studies, v. 9, part 2, p. 137–160. **PB**
- Hansen, D. E., 1986, Laramide tectonics and deposition of the Ferris and Hanna Formations, south-central Wyoming, in Peterson, J. A., ed., Paleotectonics and sedimentation in the Rocky Mountain region, United States: American Association of Petroleum Geologists Memoir 41, p. 481–495.
- Hansen, W. R., 1965, Geology of the Flaming Gorge area, Utah-Colorado-Wyoming: United States Geological Survey Professional Paper 490, 196 p. **GR**
- Hansen, W. R., 1984, Post-Laramide tectonic history of the eastern Uinta Mountains, Utah, Colorado, and Wyoming: Mountain Geologist, v. 21, p. 5–29. **GR**, **PB**
- Hansley, P. L., 1981, Mineralogy, diagenesis, and provenance of Upper Cretaceous sandstone from the Ral-

- ston Production Company Federal No. 31 well, Piceance Creek Basin, northwestern Colorado: U.S. Geological Survey Open-File Report 81-1295, 23 p. PR
- Hansley, P. L., and Johnson, R. C., 1980, Mineralogy and diagenesis of low-permeability sandstones of Late Cretaceous age, Piceance Creek Basin, northwestern Colorado: Mountain Geologist, v. 17, no. 4, p. 88–106. **PB**
- Hanson, M. E., 1985, Develop hydraulic fracture models for application to coal seam methane drainage: Quarterly Review of Methane from Coal Seams Technology, v. 3, no. 1, p. 43. **GR**, **PB**, **PR**, **RB**, **SJ**
- Hanson, W. B., 1983, Channeling in Paleocene coals, northern Powder River Basin, Montana (abs.), American Association of Petroleum Geologists Bulletin, v. 67, no. 8, p. 1340. PR
- Hanson, W. B., 1990, Chemistry of western interior USA coal-bed gases based upon desorption of subsurface coal samples (abs.): American Association of Petroleum Geologists Bulletin, v. 74, p. 1326. GR, PB, PR, RB, SJ
- Hanson, W. B., Kemp, R. G., and Steer, B. L., 1991, Stratigraphic methods used to explore and exploit Fruitland Formation coalbed methane gas, San Juan Basin (abs.): Geological Society of America Abstracts with Programs, v. 23, no. 5, p. A38. SJ
- Harbour, R. L., and Dixon, G. H., 1956, Geology of the Trinidad-Aguilar area, Las Animas and Huerfano Counties, Colorado: U.S. Geological Survey Oil and Gas Investigations Map OM-174, scale 1:31,680. **RB**
- Harbour, R. L., and Dixon, G. H., 1959, Coal resources of the Trinidad-Aguilar area, Las Animas and Huerfano Counties, Colorado: U.S. Geological Survey Bulletin 1072-G, p. 445–489. **RB**
- Hardie, J. K., and Van Gosen, B. S., 1986, Fence diagram showing coal bed correlations within upper part of Fort Union Formation in and adjacent to the eastern part of the Kaycee 30' x 60' quadrangle, Johnson and Campbell Counties, Wyoming: U.S. Geological Survey Coal Investigations Map C-107. **PR**
- Hardie, J. K., in press, Coal stratigraphy of the southwestern Powder River Basin, Wyoming: U.S. Geological Survey Miscellaneous Investigations Map C-1959-C. PR
- Harpalani, Satya, 1989, Permeability changes resulting from gas desorption: Quarterly Review of Methane from Coal Seams Technology, v. 6, nos. 3 and 4, p. 58– 61. **GR, PB, PR, RB, SJ**
- Harr, C. L., 1988, The Ignacio Blanco gas field, northern San Juan Basin, Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 205-219. **SJ**
- Harris, H. D., 1959, Late Mesozoic positive area in western Utah: American Association of Petroleum Geologists Bulletin, v. 43, no. 12, p. 2636-2652. **UB**

Harris, S. A., 1976, Fall River (Dakota) oil entrapment, Powder River Basin, *in* Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and energy resources of the Powder River: Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 147. **PR**

- Harrison, H. L., and Tilden, Joan, 1988, Predictive model for fracture distribution and intensity in sandstone and carbonate reservoirs, Wertz and Lost Soldier fields, Wyoming (abs.): American Association of Petroleum Geologists Bulletin, v. 72, no. 2, p. 194. **GR**
- Hattin, D. E., 1965, Stratigraphy of the Graneros Shale (Upper Cretaceous) in central Kansas: Kansas Geological Survey Bulletin 178, 83 p. GR, PB, PR, RB, SJ
- Haun, J. D., 1958, Early Upper Cretaceous stratigraphy, Powder River Basin, Wyoming, *in* Strickland, John, ed., Powder River Basin: Wyoming Geological Association, thirteenth field conference, p. 84–85. **PR**
- Haun, J. D., 1961, Stratigraphy of post-Mesaverde Cretaceous rocks, Sand Wash Basin and vicinity, Colorado and Wyoming, *in* Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 116–124. **GR**, **PR**
- Haun, J. D., 1962, Introduction to the geology of northwest Colorado, *in* Amuedo, C. L., and Mott, M. R., eds., Exploration for oil and gas in northwestern Colorado: Rocky Mountain Association of Geologists, p. 7–14. **GR**, **PB**
- Haun, J. D., and Barlow, J. A., 1962, Lower Cretaceous stratigraphy of Wyoming, *in* Enyert, R. L., and Curry, W. H., III, eds., Early Cretaceous rocks of Wyoming and adjacent areas: Wyoming Geological Association, seventeenth field conference, p. 15–22. **GR**
- Haun, J. D., and Weimer, R. J., 1960, Cretaceous stratigraphy of Colorado, *in* Weimer, R. J., and Haun, J. D., eds., Guide to the geology of Colorado: Geological Society of America, Rocky Mountain Association of Geologists and Colorado Scientific Society Guidebook, p. 58–65. **GR**, **PB**
- Hawkins, C. M., 1980, Barrier bar sands in the Second Frontier Formation, Green River Basin, Wyoming, *in* Harrison, A., ed., Stratigraphy of Wyoming: Wyoming Geological Association Guidebook, thirty-first field conference, p. 155–161. **GR**
- Hawkins, C. M., and Formhals, S., 1985, Geology and engineering aspects of Buck Draw field, Campbell and Converse Counties, Wyoming, *in* Nelson, G. E., ed., The Cretaceous geology of Wyoming: Wyoming Geological Association Guidebook, 36th field conference, p. 33. **PR**
- Headley, J. B., Jr., 1958, Oil in Mesaverde, Powder River Basin, Wyoming, *in* Strickland, John, ed., Powder River Basin: Wyoming Geological Association Guidebook, thirteenth field conference, p. 103. **PR**

Heasler, H. P., Hinckley, B. S., Buelow, K. G., Spencer, S. A., and Decker, E. R., 1983, Geothermal resources of Wyoming: National Oceanic and Atmospheric Administration map, scale: 1:500,000. **GR**, **PR**

- Heinse, D. M., 1983, Mineralogy and petrology aspects of Mesaverde Formation at Rifle Gap, Colorado, specific to the sedimentary and gas-bearing intervals in the subsurface: Albuquerque, New Mexico, Sandia National Laboratories Report SAND 83-0287, 38 p. **PB**
- Heller, P. L., Bowdler, S. S., Chambers, H. P., Coogan, J. C., Hagen, E. S., Shuster, M. W., Winslow, N. S., and Lawton, T. F., 1986, Time of initial thrusting in the Sevier orogenic belt, Idaho, Wyoming and Utah: Geology, v. 14, no. 5, p. 388–391. GR, PB, PR, RB, SJ
- Henderson, J. D., 1991, Evaluation of coalbed methane potential of Recluse Muddy Field, Campbell County, Wyoming, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 191–200. **PR**
- Henderson, R. G., 1960, A comprehensive system of automatic computation in magnetic and gravity interpretation: Geophysics, v. 25, p. 569-585. **GR**, **PB**, **PR**, **RB**, **SI**
- Hendricks, M. L., 1983, Stratigraphy and tectonic history of the Mesaverde Group (Upper Cretaceous), east flank of the Rock Springs Uplift, Sweetwater County, Wyoming: Colorado School of Mines, Ph.D. dissertation, 213 p. **GR**
- Henkle, W. R., Jr., Muhm, J. R., and DeBuyl, M. H. F., 1977, Cleat orientation in some subbituminous coals of the Powder River and Hanna Basins, Wyoming, *in* Hodgson, H. E., ed., Proceedings of the second symposium on the geology of the Rocky Mountain coal: Colorado Geologic Survey Resource Series 4, p. 129–144. **PR**
- Henry, M. E., 1988, A Preliminary interpretation of carbon and oxygen isotopic data from surface rocks, Southern Ute Indian Reservation, southwestern Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 297–303. **SJ**
- Hettinger, R. D., and Kirschbaum, M. A., 1991, Chart showing correlations of some Upper Cretaceous and Lower Tertiary rocks, from the east flank of the Washakie Basin to the east flank of the Rock Springs Uplift, Wyoming: U.S. Geological Survey Miscellaneous Investigations Series Map I-2152. **GR**
- Hettinger, R. D., Honey, J. G., and Nichols, D. J., 1991, Chart showing correlations of Upper Cretaceous Fox Hills sandstone and Lance Formation, and Lower Tertiary Fort Union, Wasatch, and Green River Formations, from the eastern flank of the Washakie Basin to the southeastern part of the Great Divide Basin,

(Hettinger, R. D.. and others, 1991, continued) Wyoming: U.S. Geological Survey Miscellaneous Investigations Series Map I-2151. **GR**

- Hickling, N. L., Warlow, R. C., and Windolph, J. F., 1987, Geology of the Upper Cretaceous and Tertiary coalbearing rocks in the western part of the Wind River Basin, Wyoming: U.S. Geological Survey Bulletin 1813, 128 p. **WR**
- Hickman, S. H., Healy, J. H., and Zoback, M. D., 1985, In situ stress, natural fracture distribution, and borehole elongation in the Auburn geothermal well, Auburn, New York: Journal of Geophysical Research, v. 90, no. B7, p. 5497–5512. **GR**, **PB**, **PR**, **RB**, **SJ**
- High, Laura, 1990, Green River Basin offers a full plate: Western Oil World, v. 47, no. 9, p. 39. **GR**
- Hills, R. C., 1888, The recently discovered Tertiary beds of the Huerfano River Basin, Colorado: Proceedings of the Colorado Scientific Society, v. 3, p. 148–164. **RB**
- Hinds, J. S., 1965, Btu values of Fruitland Formation coal deposits in Colorado and New Mexico, as determined from rotary-drill cuttings, *in* Geological Survey Research 1964: U.S. Geological Survey Professional Paper 501-D, p. D90–D94. **SJ**
- Hobbs, R. G., 1978, Methane occurrences, hazards, and potential resources, Recluse geological analysis area, northern Campbell County, Wyoming: U.S. Geological Survey Open-File Report 78-401, 20 p. **PR**
- Hobbs, R. G., Cathcart, J. D., Roberts, S. B., and Babcock, R. N., 1986, A detailed stratigraphic and quality analysis of the Anderson coal deposit, Johnson County, Wyoming: U.S. Geological Survey Open-File Report 86-0436, 39 p. PR
- Hobbs, R. G., Mallotte, D. G., Sanchez, J. D., and Windolph, J. F., Jr., 1977, Core description logs, 1975
 U.S.G.S. drilling, Recluse area, northern Campbell County, Wyoming: U.S. Geological Survey Open-File Report 77-717, 46 p. PR
- Hobbs, W. H., 1904, Lineaments of the Atlantic border region: Geological Society of America Bulletin, v. 15, p. 483–506. **GR**, **PB**, **PR**, **RB**, **SJ**
- Hodson, W. G., Pearl, R. H., and Druse, S. A., 1973, Water resources of the Powder River Basin and adjacent areas, northeastern Wyoming, *in* Hydrologic investigations: U.S. Geological Survey. **PR**
- Hoffman, G. K., 1990, Coal geology and mining history in the Dawson area, southeastern Raton coal field, New Mexico, *in* Bauer, P. W., and others, eds., Tectonic development of the southern Sangre de Cristo Mountains, New Mexico: New Mexico Geological Society Guidebook, forty-first field conference, p. 397–403. RB
- Hoffman, G. K., 1990, Coal-bearing formations and available coal data in the eastern and southern San Juan Basin on the Navajo Reservoir, Chama, Abiquie, Los Alamos, Albuquerque, Acoma Pueblo and Fence Lake 1:100,000 quadrangles: New Mexico Bureau of Mines

- and Mineral Resources Open-File Report 369, 20 p., 14 maps, scale 1:100,000. **SJ**
- Hogle, D. G., and Jones, R. W., 1991, Subsurface geology of Upper Cretaceous and lower Tertiary coal-bearing rocks, Wind River Basin, Wyoming: Mountain Geologist, v. 28, p. 13–25. **WR**
- Holbrook, J. M., Wright, Robyn, and Kietzke, K. K., 1987, Stratigraphic relationships at the Jurassic-Cretaceous boundary in east-central New Mexico, *in* Lucas, S. G., and Hunt, A. P., eds., Northeastern New Mexico: New Mexico Geological Society Guidebook, thirtyeighth field conference, p. 161–165. **RB**
- Hollenshead, C. T., and Pritchard, R. L., 1961, Geometry of producing Mesaverde Sandstone, San Juan Basin, *in* Peterson, J. A., and Osmond, J. C., eds., Geometry of sandstone bodies: American Association of Petroleum Geologists Symposium, p. 98–118. **SJ**
- Holmes, C. W., Flores, R. M., Pocknall, D. T., *in* press, Carbon isotope distribution in Tertiary coals of the Powder River Basin: a measure of swamp evolution: Geology. **PR**
- Holton, J., 1989, Seismic detection of upper Almond gas sandstones—Dripping Rock field, Washakie Basin, Wyoming, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 189–198. **GR**
- Honey, J. G., and Hettinger, R. D., 1989, 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: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-1964. **GR**
- Honey, J. G., and Hettinger, R. D., 1989, Stratigraphic sections showing coal correlations within the lower coal zone of the Fort Union Formation, Fillmore Ranch and Seaverson Reservoir Quadrangles, Carbon County, Wyoming: U.S. Geological Survey Coal Investigations Map C-0127. **GR**
- Honey, J. G., and Roberts, L. N., 1989, Stratigraphic sections showing coal correlations within the lower part of the Fort Union Formation in the Baggs area, Carbon County, Wyoming: U.S. Geological Survey Coal Investigations Map C-0135, scale 1:24,000. **GR**
- Hoppin, R. A., and Jennings, T. W., 1971, Cenozoic tectonic elements, Bighorn Mountain region, Wyoming-Montana, in Renfro, A. R., ed., Wyoming Geological Association Guidebook, twenty-third field conference, p. 39–47.
- Horn, G. H., and Gere, W. C., 1959, Geology of the Rifle Gap coal district, Garfield County, Colorado: U.S. Geological Survey Open-File Report 59-63. **PB**
- Hornbaker, A. L., Holt, R. D., Murray, D. K., 1976, 1975 summary of coal resources in Colorado: Colorado Geological Survey Special Publication 9, 17 p. **PB**

Horne, J. C., Ferm, J. C., Caruccio, F. T., and Baganz, B. P., 1978, Depositional models in coal exploration and mine planning in Appalachian region: American Association of Petroleum Geologists Bulletin, v. 62, p. 2379–2411.

- Horne, J. C., McKenna, L. L., Levey, R. A., and Petranoff, T. V., 1980, Wave-dominated deltas: an important economic depositional model for the Upper Cretaceous of southwestern Wyoming, *in* Carter, L. M., ed., Proceedings of the fourth symposium on the geology of Rocky Mountain coal: Colorado Geological Survey Resource Series 10, p. 7–12. **GR**, **PB**, **PR**, **RB**, **SJ**
- Horner, D. M., 1986, Methane from coal seams results—deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 2, p. 19–27. **RB**
- Horner, D. M., 1987, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 4, p. 30–36. **PB**
- Horner, D. M., 1987, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 1, p. 17-24. **PB**
- Horner, D. M., 1987, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 2, p. 19–25. **PB**
- Horner, D. M., 1987, Methane from coal seams results—deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 3, p. 28–33. **RB**
- Houseknecht, D. W., and Iannacchione, A. T., 1982, Anticipating facies-related coal mining problems in Hartshorne Formation, Arkoma Basin: American Association of Petroleum Geologists Bulletin, v. 66, no. 7, p. 923-946.
- Howard, J. D., 1969, Depositional control of Upper Cretaceous coal units: Mountain Geologist, v. 6, no. 3, p. 143–146. **GR**, **PB**, **PR**, **RB**, **SJ**
- Howard, W. B., 1982, The hydrogeology of the Raton Basin, south-central Colorado: Indiana University, Masters thesis. **RB**
- Hubert, J. F., Butera, J. G., and Rice, R. F., 1972, Sedimentology of Upper Cretaceous Cody-Parkman delta, southwestern Powder River Basin, Wyoming: Geological Society of America Bulletin, v. 83, p. 1649–1670. **PR**
- Hucka, B. P., 1989, Analysis of cleats in Utah coal seams: Utah Geological and Mineral Survey Open-File Report 154, 156 p. **GR**, **PB**
- Hucka, B. P., 1990, Cleat and joint system evaluation and coal characterization of the Lower Sunnyside coal, Sunnyside Mines, Carbon County, Utah: Utah Geological and Mineral Survey Open-File Report 190, 30 p. **UB**
- Hucka, B. P., 1991, Cleat and joint system evaluation and coal characterization of the Castlegate "A" coal, Beaver Creek No. 8 Mine, Carbon County, Utah: Utah Geological and Mineral Survey Open-File Report 202, 25 p. **UB**

- Hucka, B. P., 1991, Cleat and joint system evaluation and coal characterization of the Sunnyside coal, Soldier Canyon Mine, Carbon County, Utah: Utah Geological and Mineral Survey Open-File Report 203, 25 p. **UB**
- Hucka, B. P., Sommer, S. N., and Keith, A. C., 1990, Cleat and joint system evaluation and coal characterization of the B-bed coal, Dutch Creek Mine, Pitkin County, Colorado: Utah Geological and Mineral Survey Open-File Report 171, 36 p. **PB**
- Hucka, B. P., Sommer, S. N., and Keith, A. C., 1990, Cleat and joint system evaluation and coal characterization of the Sub-3 seam coal, Castle Gate No.3 Mine, Carbon County, Utah: Utah Geological and Mineral Survey Open-File Report 170, 29 p. **UB**
- Hudson, R. E., 1963, Halverson Ranch field, Minnelusa production, Campbell County, Wyoming: northern Powder River Basin Wyoming and Montana, *in* Cooper, G. C., and others, eds., Northern Powder River Basin, Wyoming and Montana: Wyoming Geological Association and Billings Geological Society Guidebook, first joint field conference, p. 123–124. **PR**
- Huffman, A. C., Jr., 1976, Preliminary geological map of the Sand Springs quadrangle, San Juan County, New Mexico: U.S. Geological Survey Open-File Report 76-408. **SJ**
- Huffman, A. C., Jr., 1979, Preliminary geological map of the Mitten Rock quadrangle, San Juan County, New Mexico: U.S. Geological Survey Open-File Report 79-723. SJ
- Huffman, A. C., Jr., 1987, Petroleum geology and hydrocarbon plays of the San Juan Basin petroleum province: U.S. Geological Survey Open-File Report 87-450-B, 67 p. SJ
- Hugman, R. H., Vidas, E. H., and Woods, T. J., 1989, Potential infill reserve additions by interval—San Juan Basin: American Association of Petroleum Geologists Bulletin, v. 73, p. 365–366. SJ
- Huntoon, P. W., 1976, Permeability and ground water circulation in the Madison aquifer along the eastern flank of the Bighorn Mountains of Wyoming, *in* Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and energy resources of the Powder River: Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 283. **PR**
- Hutchinson, E. C., and Brogden, R. E., 1976, Water-quality data for the southern Ute Indian Reservation, southwestern Colorado: U.S. Geological Survey Open-File Report 76-16, 58 p. SJ
- Hutchinson, R. M., and Vine, J. D., 1987, Alteration zones related to igneous activity, Spanish Peaks area, Las Animas and Huerfano Counties, Colorado, *in* Bues, S. S., ed., Centennial Field Guide: Rocky Mountain Section, Geological Society of America, v. 2, p. 357–360. **RB**

I

- ICF-Lewin Energy Division, 1988, Resource analysis and technology evaluation for the tight gas sands project area: Presentation to the Gas Research Institute Project Advisors Group, Shreveport, Louisiana, April 27, 1988. **GR, PB**
- ICF-Lewin Energy Division, 1988, Site selection for GRI cooperative tight gas field research, v. 1: Screening of candidate tight gas formations: Topical report prepared for the Gas Research Institute under contract no. 5083-211-817 (GRI-89/0018), 66 p. GR, PB
- ICF Resources, Inc. [now ARI, Inc.], compiler, 1990, The United States coalbed methane resources: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 3, p. 10–28. **GR**, **PB**, **PR**, **RB**, **SJ**
- ICF Resources, Inc. [now ARI, Inc.], 1991, Geologic assessment of natural gas from coal seams in the Raton Basin: Geologic peer review prepared for the Gas Research Institute, 93 p. **RB**
- Irving, E., 1979, Paleopoles and paleolatitudes of North America and speculations about displacement terrains: Canadian Journal Earth Sciences, v. 16, p. 669– 694. **GR, PB, PR, RB, SJ**
- Irwin, C. D., 1986, Upper Cretaceous and Tertiary cross sections, Moffat County, Colorado, in Stone, D. S., ed.,
 New interpretations of northwest Colorado geology:
 Rocky Mountain Association of Geologists, p. 151–156. GR
- Isbell, E. B., Spencer, C. W., and Seitz, Tommie, 1976, Petroleum geology of the Well Draw field, Converse County, Wyoming, *in* Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and energy resources of the Powder River: Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 165. **PR**
- Izett, G. A., and Pillmore, C. L., 1985, Shock-metamorphic minerals at the Cretaceous-Tertiary boundary, Raton Basin, Colorado and New Mexico (abs.): EOS, v. 66, no. 46, p. 1149. **RB**

J

- Jacka, A. D., 1965, Depositional dynamics of the Almond Formation, Rock Springs Uplift, Wyoming, *in* DeVoto, R. H., and Bitter, R. K., eds., Sedimentation of Late Cretaceous and Tertiary outcrops, Rock Springs Uplift, Wyoming: Wyoming Geological Association Guidebook, nineteenth field conference, p. 81–100.
- Jacka, A. D., and Brand, J. P., 1972, An analysis of the Dakota Sandstone in the vicinity of Las Vegas, New Mexico, and eastward to the Canadian River Valley: New Mexico Geological Society Guidebook, twenty-third field conference, p.105–107. **RB**
- Jackson, T. J., and Ethridge, F. G., 1979, Floodplain sequences of a fine-grained meanderbelt system: the lower Wasatch and upper Fort Union Formations,

- central Powder River Basin, Wyoming (abs.): American Association of Petroleum Geologists Bulletin, v. 63, no. 5, p. 831–832. **PR**
- Jaeger, J. C., and Cook, N. G. W., 1979, Fundamentals of rock mechanics: London, Methuen, 593 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- James, T. A., and Burns, B. J., 1984, Microbial alteration of subsurface natural gas accumulations: American Association of Petroleum Geologists Bulletin, v. 68, p. 957–960. GR, PB, PR, RB, SJ
- Jamison, W. R., and Stearns, D. W., 1982, Tectonic deformation of Wingate Sandstone, Colorado National Monument: American Association of Petroleum Geologists Bulletin, v. 66, no. 12, p. 2584–2608. PB
- Jenden, P. D., 1985, Analysis of gases in the Earths crust: Report prepared for the Gas Research Institute under contract no. 5081-360-0533 (GRI-85/0106), 110 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Jentgen, R. W., 1977, Pennsylvanian rocks in the San Juan Basin, New Mexico and Colorado, *in* Fassett, J. E., ed., Sand Juan Basin III: New Mexico Geological Society, 28th field conference guidebook, p. 129–132. **SJ**
- Jeu, S. J., Logan, T. L., Decker, A. D., and Counsil, J., 1988, Development and evaluation of the technology for methane production from a deep coal seam in the Piceance Basin: Resource Enterprises, Inc., final report prepared for the Gas Research Institute under contract no. 5083-214-0844, 35 p. PB
- Johnson, A. M., 1970, Dike patterns at Spanish Peaks, Colorado, in Johnson, A. M., ed., Physical processes in geology: San Francisco, Freeman and Cooper, p. 401–428. RB
- Johnson, D. J., and Scholes, P. L., 1991, Predicting cleats in coal seams from mineral and maceral composition with wireline logs, in Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 123–136. GR, PB, PR, RB, SJ
- Johnson, R. B., 1958, Geology and coal resources of the Walsenburg area, Huerfano County, Colorado: U.S. Geological Survey Bulletin 1042-O, p. 557–581. **RB**
- Johnson, R. B., 1959, Geology of the Huerfano Park area, Huerfano and Custer Counties, Colorado: U.S. Geological Survey Bulletin 1071-D, p. 87–119. **RB**
- Johnson, R. B., 1961, Coal resources of the Trinidad coal field in Huerfano and Las Animas Counties, Colorado: U.S. Geological Survey Bulletin 1112-E, p. 129– 180. **RB**
- Johnson, R. B., 1961, Patterns and origin of radial dike swarms associated with west Spanish Peak and Dike Mountain, south-central Colorado: Geological Society of America Bulletin, v. 72, p. 579–590. **RB**
- Johnson, R. B., 1964, Walsen composite dike near Walsenburg, Colorado: U.S. Geological Survey Professional Paper 501-B, p. 69–73. **RB**

Johnson, R. B., 1968, Geology of the igneous rocks of the Spanish Peaks region, Colorado: U.S. Geological Survey Professional Paper 594-G, p. 1–47. **RB**

- Johnson, R. B., 1969, Geologic map of the Trinidad Quadrangle, south-central Colorado: U.S. Geological Survey Miscellaneous Geological Investigations Map I-558, scale 1:250,000. **RB**
- Johnson, R. B., and Stephens, J. G., 1954, Coal resources of the La Veta area, Huerfano County, Colorado: U.S. Geological Survey Coal Investigations Map C-20, scale: 1:31,680. **RB**
- Johnson, R. B., and Stephens, J. G., 1954, Geology of the La Veta area, Huerfano County, Colorado: U.S. Geological Survey Oil and Gas Investigations Map OM-146, scale 1:31,680. RB
- Johnson, R. B., and Wood, G. H., Jr., 1956, Stratigraphy of Upper Cretaceous and Tertiary rocks of Raton Basin, Colorado and New Mexico, in McGinnis, C. J., ed., Guidebook to the geology of the Raton Basin: Rocky Mountain Association of Geologists, p. 28–34. RB
- Johnson, R. B., and Wood, G. H., Jr., 1956, Stratigraphy of Upper Cretaceous and Tertiary rocks of Raton Basin, Colorado and New Mexico: American Association of Petroleum Geologists Bulletin, v. 40, no. 4, p. 707–721. RB
- Johnson, R. B., Bolyard, D. W., and Thurston, W. R., 1969, Second days road log: Walsenburg to Black Hills, Gardner, Pass Creek, Russell, La Veta Pass, La Veta, Cucharas Pass, Apishipa Pass, Aguilar, Walsenburg: Mountain Geologist, v. 6, no. 3, p. 167–182. **RB**
- Johnson, R. B., Dixon, G. H., and Wanek, A. A., 1966, Late Cretaceous and Tertiary stratigraphy of the Raton Basin of New Mexico and Colorado, in Northrop, S. A., and Read, C. B., eds., Taos-Raton-Spanish Peaks Country New Mexico and Colorado: New Mexico Geological Society, seventeenth field conference, p. 88–98. RB
- Johnson, R. B., Wood, G. H., Jr., and Harbour, R. L., 1958, Preliminary geologic map of the northern part of the Raton Mesa region and Huerfano Park in parts of Las Animas, Huerfano, and Custer Counties, Colorado: U.S. Geological Survey Oil and Gas Investigations Map OM-183, scale 1:63,360. **RB**
- Johnson, R. C., 1979, Cross section A-A of Upper Cretaceous and lower Tertiary rocks, northern Piceance Creek Basin, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1129-A. PB
- Johnson, R. C., 1979, Cross section B-B of Upper Cretaceous and lower Tertiary rocks, northern Piceance Creek Basin, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1129-B. PB
- Johnson, R. C., 1979, Cross section C-C of Upper Cretaceous and lower Tertiary rocks, northern Piceance Creek Basin, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1129-C. **PB**

- Johnson, R. C., 1982, Measured section of the Late Cretaceous Mesaverde Group and lower part of the lower Tertiary Wasatch Formation, Rifle Gap, Colorado: U.S. Geological Survey Open-File Report 82-590, 11 p. PB
- Johnson, R. C., 1983, 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: U.S. Geological Survey Miscellaneous Field Studies Map MF-1667, scale 1:253,440. PB
- Johnson, R. C., 1984, New names for units in the lower part of the Green River Formation, Piceance Creek Basin, Colorado: U.S. Geological Survey Bulletin 1529-I, 20 p. **PB**
- Johnson, R. C., 1985, Early Cenozoic history of the Uinta and Piceance Creek Basins, Utah and Colorado, with special reference to the development of Eocene Lake Uinta, in Flores, R. M., and Kaplin, S. S., eds., Cenozoic paleogeography of the west-central United States: Rocky Mountain Section, Society of Economic Paleontologists and Mineralogists, Rocky Mountain Paleogeography Symposium 3, p. 247–276. PB
- Johnson, R. C., 1985, Preliminary geologic map of the Baxter Pass quadrangle, Garfield County, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1813, scale 1:24,000. **PB**
- Johnson, R. C., 1986, Structure contour map of the top of the Castlegate sandstones, eastern part of the Uinta Basin and western part of the Piceance Creek Basin, Utah and Colorado: U.S. Geological Survey Miscellaneous Field Studies Map Series MF-1826, scale 1:233,440. PB
- Johnson, R. C., 1987, Geologic history and hydrocarbon potential of late Cretaceous-age, low-permeability reservoirs, Piceance Basin, western Colorado: U.S. Geological Survey, final report prepared for the U.S. Department of Energy, Office of Fossil Energy under contract no. DE-AC21-83MC20422, 97 p. PB
- Johnson, R. C., 1989, Detailed cross sections correlating Upper Cretaceous and lower Tertiary rocks between the Uinta Basin of eastern Utah and western Colorado and the Piceance Basin of western Colorado: U.S. Geological Survey Miscellaneous Investigations Map I-1974. PB
- Johnson, R. C., 1989, Geologic history and hydrocarbon potential of Late Cretaceous-age, low-permeability reservoirs, Piceance Basin, western Colorado: U.S. Geological Survey Bulletin 1787-E, 51 p. PB
- Johnson, R. C., and Finn, T. M., 1985, Age of the Douglas Creek Arch, Colorado and Utah (abs.): American Association of Petroleum Geologists, v. 69, no. 3, p. 270. **PB**
- Johnson, R. C., and Finn, T. M., 1986, Cretaceous through Holocene history of the Douglas Creek arch, Colorado and Utah, *in* Stone, D. S., ed., New interpretations of

(Johnson, R. C., and Finn, T. M., 1986, continued) northwest Colorado geology: Rocky Mountain Association of Geologists, p. 77–95. **PB**

- Johnson, R. C., and Keighin, C. W., 1981, Cretaceous and Tertiary history and resources of the Piceance Creek Basin, western Colorado, in Epis, R. C., and Callender, J. F., eds., Western Slope Colorado: New Mexico Geological Society Guidebook, thirty-second field conference, p. 199–210. PB
- Johnson, R. C., and May, F., 1980, A study of the Cretaceous-Tertiary unconformity in the Piceance Creek Basin, Colorado: the underlying Ohio Creek Formation redefined as a member of the Hunter Canyon of Mesaverde Formation: U.S. Geological Survey Bulletin 1482-B, 27 p. PB
- Johnson, R. C., and Nuccio, V. F., 1983, Structural and thermal history of the Piceance Creek Basin, western Colorado, in relation to hydrocarbon occurrence in the Mesaverde Group: American Association of Petroleum Geologists Bulletin, v. 67, no. 3, p. 490–491. PB
- Johnson, R. C., and Nuccio, V. F., 1986, Structural and thermal history of the Piceance Creek Basin, western Colorado, in relation to hydrocarbon occurrence in the Mesaverde Group, in Spencer, C. W., and Mast, R. F., eds., Geology of tight gas reservoirs: American Association of Petroleum Geologists Studies in Geology 24, p. 165–205. PB
- Johnson, R. C., and Rice, D. D., 1990, Occurrence and geochemistry of natural gases, Piceance Basin, northwest Colorado: American Association of Petroleum Geologists Bulletin, v. 74, no. 6, p. 805-829. PB
- Johnson, R. C., Barker, C. E., Pawlewicz, M. J., Crysdale, B. L., Clark, A. C., and Rice, D. D., 1991, Preliminary results of a coalbed methane assessment of Wind River Indian Reservation, Wyoming, in Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 273–284. GR, PR
- Johnson, R. C., Crovelli, R. A., Spencer, C. W., and Mast, R. F., 1987, An assessment of gas resources in low-permeability sandstones of the Upper Cretaceous Mesaverde Group, Piceance Basin, Colorado, U.S. Geological Survey Open-File Report 87-357, 165 p. PB
- Johnson, R. C., Granica, M. P., and Dessenberger, N. C., 1979, Cross section A-A of Upper Cretaceous and lower Tertiary rocks, southern Piceance Creek Basin, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1130-A. PB
- Johnson, R. C., Granica, M. P., and Dessenberger, N. C., 1979, Cross section B-B of Upper Cretaceous and lower Tertiary rocks, southern Piceance Creek Basin, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1130-B. PB
- Johnson, R. C., Granica, M. P., and Dessenberger, N. C., 1979, Cross section C-C of Upper Cretaceous and lower

- Tertiary rocks, southern Piceance Creek Basin, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1130-C. **PB**
- Johnson, R. C., May, F., Hansley, P. L., Pitman, J. K., and Fouch, T. D., 1980, Petrography and palynology of a measured section of the Upper Cretaceous Mesaverde Group in Hunter Canyon, western Colorado: U.S. Geological Survey Oil and Gas Investigation Chart OC-91.
- Johnson, Sandra, 1989, Piceance players take cameo roles: Western Oil World, v. 46, no. 12, p. 22–23, 25. **PB**
- Johnson, Sandra, 1990, Raton switches to gas lure: Western Oil World, v. 47, no. 2, p. 26, 28, and 30. **RB**
- Johnson, V. H., 1948, Geology of the Paonia coal field, Delta and Gunnison Counties, Colorado: U.S. Geological Survey Preliminary Map, scale 1:48,000. PB
- Jones, A. H., 1985, Methane production characteristics of deeply buried coalbed reservoirs: Final report (February 1982-December 1984) prepared for the Gas Research Institute under contract no. NTIS PB85-223386 (GRI-85/0033), 144 p. GR, PB, PR, RB, SJ
- Jones, A. H., 1987, Hydraulic fracture design rationale for the recovery of methane from coal seams: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 4, p. 47–49. **RB**
- Jones, A. H., 1987, Hydraulic fracture design rationale for the recovery of methane from coal seams: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 1, p. 44–46. **GR**, **PB**, **PR**, **RB**, **SJ**
- Jones, A. H., 1987, Spalling and the development of a hydraulic fracturing strategy for coal: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 1, p. 33–34. **GR**, **PB**, **PR**, **RB**, **SJ**
- Jones, A. H., 1990, Spalling and the development of a hydraulic fracturing strategy for coal: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 3, p. 33–36. **GR**, **PB**, **PR**, **RB**, **SJ**
- Jones, A. H., Ahmed, Usman, Bush, D. D., Holland, M. T., Kelkar, S. M., Rakop, K. C., Bowman, K. C., and Bell, G. J., 1984, Methane production characteristics for a deeply buried coalbed reservoir in the San Juan Basin: Quarterly Review of Methane from Coal Seams Technology, v. 2, no. 1, p. 19–33. SJ
- Jones, A. H., Ahmed, Usman, Bush, D. D., Kelkar, S. M., Rakop, K. C., Holland, M. T., Bowman, K. C., and Bell, G. J., 1984, Experience with gas recovery from unminable coal in the San Juan Basin, in 1984 International Gas Research Conference Proceedings, Washington, D.C., Sept. 10-13, 1984, sponsored by the Gas Research Institute, American Gas Association, and U.S. Department of Energy: Rockville, Md., Government Institutes, Inc. PB, SJ
- Jones, A. H., Bell, G. J., and Schraufnagel, R. A., 1988, A review of the physical and mechanical properties of coal with implications for coalbed methane well completion and production, *in* Fassett, J. E., ed., Geology

and coal-bed methane resources of the northern San Juan basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 169–181. **SJ**

- Jones, A. H., Kelkar, S., Bush, D., Hanson, J., Rakop, K., Ahmed, U., Holland, M., Tibbitts, G., Owen, L. B., and Bowman, K. C., 1985, Methane production characteristics of deeply buried coalbed reservoirs: Report prepared for the Gas Research Institute under contract no. 5081-214-0577 (GRI-85/0033), 176 p. GR, PB, PR, RB, SJ
- Jones, J. R., Scott, A. J., and Lake, L., W., 1987, The geological aspects of reservoir characterization for numerical simulation—Mesaverde meanderbelt sandstone, northwestern Colorado: SPE Formation Evaluation, v. 2, no. 1, p. 97–107. PB
- Jones, R. W., 1990, Coal map of the Powder River Basin and adjacent areas, Wyoming: Geological Survey of Wyoming Map Series 33, scale 1:500,000. PR
- Jones, R. W., and DeBruin, R. H., 1990, Coal bed methane in Wyoming: Geological Survey of Wyoming Public Information Circular 30, 15 p. **GR**, **PR**, **WR**
- Jones, R. W., and DeBruin, R. H., 1991, Coalbed methane in Wyoming (abs.), in Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 285. GR, PR
- Jordan, T. E., 1981, Thrust loads and foreland basin evolution, Cretaceous, western United States: American Association of Petroleum Geologists Bulletin, v. 65, no. 12, p. 2506–2520. GR, PB, PR, RB, SJ
- Jurich, David, 1980, Geologic overview, coal, and coalbed methane resources of Raton Mesa region, Colorado and New Mexico, *in* TRW, Raton Mesa coal region report: TRW Energy Systems Planning Division, report prepared for the Gas Research Institute under contract no. 5011-321-0101. **RB**
- Jurich, David, 1980, Raton Mesa coal region report; a study of Upper Cretaceous and early Tertiary geology, coal and the potential coalbed methane resource of the Raton Basin in Colorado and New Mexico: Methane recovery from coalbeds projects, U.S. Department of Energy Unconventional Gas Recovery Program, 137 p. **RB**
- Jurich, David, and Adams, M. A., 1984, Geologic overview, coal, and coalbed methane resources of Raton Mesa region, Colorado and New Mexico, *in* Rightmire, C. T., Eddy, G. E., and Kirr, J. N., eds., Coalbed methane resources of the United States: American Association of Petroleum Geologists Studies in Geology 17, p. 163–184. **RB**
- Jurich, David, and Adams, M. A., 1984, Geologic overview—coal and coalbed methane resources of Raton Mesa region, Colorado and New Mexico: TRW, Inc., report prepared for Morgantown Energy Technology Center. **RB**

Jurie, C. A., and Gerhard, L. C., 1969, Colorado Raton Basin: mineral resources and geologic section: Mountain Geologist, v. 6, no. 3, p. 81–84. **RB**

K

- Kaiser, W. R., and Ayers, W. B., Jr., 1989, Geologic and hydrologic characterization of coalbed methane reservoirs, Fruitland Formation, San Juan Basin, Colorado and New Mexico: Society of Petroleum Engineers, SPE Paper 23458, p. 415–428. SJ
- Kaiser, W. R., and Swartz, T. E., 1988, Hydrology of the Fruitland Formation and coalbed methane producibility, *in* Ayers, W. B., Jr., and others, Geologic evaluation of critical production parameters for coalbed methane resources, part 1, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, annual report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-88/0332.1), p. 61–81. **SJ**
- Kaiser, W. R., and Swartz, T. E., 1989, Fruitland Formation hydrology and producibility of coalbed methane in the San Juan Basin, New Mexico and Colorado, *in* Proceedings of the 1989 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, p. 87–97. **SJ**
- Kaiser, W. R., and Swartz, T. E., 1990, Hydrodynamics of the Fruitland Formation, *in* Ayers, W. B., Jr., and others, Geologic evaluation of critical production parameters for coalbed methane resources, part 1, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, annual report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-90/0014.1), p. 99–126. **SJ**
- Kaiser, W. R., Ayers, W. B., Jr., Ambrose, W. A., Laubach, S. E., Scott, A. R., and Tremain, C. M., 1991, Geologic and hydrologic characterization of coalbed methane production, Fruitland Formation, San Juan Basin, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: Bureau of Economic Geology, The University of Texas at Austin, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 273–301. **SJ**
- Kaiser, W. R., Ayers, W. B., Jr., Ambrose, W. A., Laubach, S. E., Scott, A. R., and Tremain, C. M., 1991, Geologic and hydrologic characterization of coalbed methane production, Fruitland Formation, San Juan Basin, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 273–301.
- Kaiser, W. R., Johnston, J. E., and Bach, W. N., 1978, Sandbody geometry and the occurrence of lignite in the

(Kaiser, W. R. and others, 1978, continued) Eocene of Texas: The University of Texas at Austin, Bureau of Economic Geology Circular 78-4, 19 p. **GR**, **PB**, **PR**, **RB**, **SJ**

- Kaiser, W. R., Swartz, T. E., Ambrose, W. A., and Ayers, W. B., Jr., 1990, Hydrogeologic parameters for the producibility of coalbed methane, *in* Ayers, W. B., Jr., and others, Geologic evaluation of critical production parameters for coalbed methane resources, part 1, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, annual report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-90/0014.1), p. 127–155. **SJ**
- Kaiser, W. R., Swartz, T. E., and Hawkins, G. J., 1991, Hydrology, thermal maturity, and gas composition, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 195–241. **SJ**
- Kashfi, M. S., 1986, Timing of Upper Cretaceous gas generation, migration, alteration in San Juan Basin: Oil and Gas Journal, v. 84, no. 13 (March 31), p. 99-103. SI
- Kauffman, E. G., 1969, Cretaceous marine cycles of the Western Interior: Mountain Geologist, v. 6, no. 4, p. 227–245. **GR, PB, PR, RB, SJ**
- Kauffman, E. G., 1977, Geological and biological overview, Western Interior Cretaceous Basin: Mountain Geologist, v. 14, nos. 3–4, p. 75-99. **GR**, **PB**, **PR**, **RB**, **SJ**
- Kauffman, E. G., 1977, Geological and biological overview—Western Interior Cretaceous basin, *in* Kauffman, E. G., ed., Cretaceous facies, faunas, and paleoenvironments across the Western Interior basin: The Mountain Geologist, v. 6, p. 227–245. **GR**, **PB**, **PR**, **RB**, **SJ**
- Kauffman, E. G., 1980, Major factors influencing the distribution of Cretaceous coal in the Western Interior United States, *in* Carter, L. M., ed., Proceedings of the fourth symposium on the geology of Rocky Mountain coal: Colorado Geological Survey Resource Series 10, p. 1–3. **GR**, **PB**, **PR**, **RB**, **SJ**
- Kauffman, E. G., Powell, J. D., and Hattin, D. E., 1969, Cenomanian-Turonian facies across the Raton Basin: Mountain Geologist, v. 6, no. 3, p. 93–118. **RB**
- Keefer, W. R., 1970, Structural geology of the Wind River Basin, Wyoming, U.S. Geological Survey Professional Paper 495-D, p. 59–84. **GR**, **PR**
- Keith, A. C., Hand, J. S., and Smith, A. S., 1990, Coalbed methane resource map Castlegate A bed, Book Cliffs coal field, Utah, 1990: Utah Geological and Mineral Survey Open-File Report 176A, scale 1:100,000. **UB**

- Keith, A. C., Hand, J. S., and Smith, A. S., 1990, Coalbed methane resource map Castlegate B bed, Book Cliffs coal field, Utah, 1990: Utah Geological and Mineral Survey Open-File Report 176B, scale 1:100,000. **UB**
- Keith, A. C., Hand, J. S., and Smith, A. S., 1990, Coalbed methane resource map Castlegate C bed, Book Cliffs coal field, Utah, 1990: Utah Geological and Mineral Survey Open-File Report 176C, scale 1:100,000. **UB**
- Keith, A. C., Hand, J. S., and Smith, A. S., 1990, Coalbed methane resource map Gilson bed, Book Cliffs coal field, Utah, 1990: Utah Geological and Mineral Survey Open-File Report 176D, scale 1:100,000. **UB**
- Keith, R. E., 1965, Rock Springs and the Blair Formations on and adjacent to the Rock Springs Uplift, *in* DeVoto, R. H., and Bitter, R. K., eds., Sedimentation of Late Cretaceous and Tertiary outcrops, Rock Springs Uplift: Wyoming Geological Association Guidebook, nineteenth field conference, p. 43–53. **GR**
- Keller, G. R., Lidiak, E. G., Hinze, W. J., and Braile, L. W., 1983, The role of rifting in the tectonic development of the Midcontinent, U.S.A., *in* Morgan, Paul, ed., Processes of continental rifting: Tectonophysics, v. 94, no. 1/4, p. 391–412. **PB**
- Kelley, V. C., 1951, Tectonics of the San Juan Basin, *in* Guidebook of the south and west sides of the San Juan Basin, New Mexico and Arizona, second field conference: New Mexico Geological Society, p. 124–131. **SJ**
- Kelley, V. C., 1955, Regional tectonics of the Colorado Plateau and relationship to the origin and distribution of uranium: University of New Mexico Publications in Geology, no. 5, 120 p. **GR**, **PB**, **RB**, **SJ**
- Kelley, V. C., 1955, Tectonics of the Four Corners region, *in* Geology of parts of Paradox, Black Mesa, and San Juan Basins, first field conference guidebook: Four Corners Geological Society, p. 108–117. **SJ**
- Kelley, V. C., 1957, Tectonics of the San Juan Basin and surrounding areas, *in* Little, C. J., ed., Geology of the southwestern San Juan Basin, second field conference guidebook: Four Corners Geological Society. **SJ**
- Kelley, V. C., and Clinton, N. J., 1960, Fracture systems and tectonic elements of the Colorado Plateau: University of New Mexico Publications in Geology, no. 6, 104 p. GR, PB, RB, SJ
- Kelso, B. S., and Rushworth, Peter, 1982, Southern Ute/Department of Energy coalbed methane test wells: Colorado Geological Survey Open-File Report 82-4, 21 p. SJ
- Kelso, B. S., and Wicks, D. E., 1988, A geologic analysis of the Fruitland Formation coal-bed methane resources of the San Juan Basin, southwestern Colorado and northwestern New Mexico, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 69–80. **SJ**

Kelso, B. S., Decker, A. D., Wicks, D. E., and Horner, D. M., 1987, GRI geologic and economic appraisal of coalbed methane in the San Juan Basin, *in* Proceedings of the 1987 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, p. 119–125. **SJ**

- Kelso, B. S., Goolsby, S. M., and Tremain, C. M., 1980, Deep coalbed methane potential of the San Juan River coal region, southwestern Colorado: Colorado Geological Survey Open-File Report 80-2, 56 p. **SJ**
- Kelso, B. S., Leel, W. G., Jr., and Carr, D. L., 1991, Coalbed methane resource and producibility potential of the Rock Springs Formation, Great Divide Basin, Wyoming, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 201–208. **GR**
- Kelso, B. S., Wicks, D. E., and Kuuskraa, V. A., 1988, A geologic assessment of natural gas from coal seams in the Fruitland Formation, San Juan Basin: Topical report prepared for the Gas Research Institute (GRI 88/034), 56 p. SJ
- Kemp, J. H., and Petersen, K. M., 1988, Coal-bed gas development in the San Juan Basin: a primer for the lawyer and landman, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 257–279. **SJ**
- Kendall, P. F., and Briggs, H., 1933, The formation of rock joints and the cleat of coal, *in* Proceedings, Royal Society of Edinburgh, v. 53, p. 164–187. **GR**, **PB**, **PR**, **RB**, **SJ**
- Kent, B. H., 1980, Development of thick coal beds in the eastern Powder River Basin: U.S. Geological Survey Professional Paper 1175, p. 26–27. **PR**
- Kent, B. H., 1987, Evolution of thick coal deposits in the Powder River Basin, northeastern Wyoming, *in* Lyons, P. C., and Rice, C. L., eds., Paleoenvironmental and tectonic controls in coal-forming basins in the United States: Geological Society of America Special Paper 210, p. 105–122. **PR**
- Kent, B. H., and Arndt, H. H., 1980, Geology of the Thomas Creek coal mining area, Pitkin County, Colorado, as related to subsurface hydraulic mining potential: United States Geological Survey Open-File Report 80-507, 81 p. **PB**
- Kent, B. H., and Berlage, L. J., 1980, Geologic map of the Recluse 1° by 1/2° quadrangle, Campbell and Crook Counties, Wyoming: U.S. Geological Society Coal Investigations Map C-81-D, scale 1:100,000. **PR**
- Kent, B. H., and Munson, B. E., 1978, Isopach maps of the Canyon and associated coal beds, western half of the Recluse 1° x 1/2° quadrangle, Campbell County, Wyoming: U.S. Geological Survey Investigations Map C-81B. **PR**

- Kent, B. H., and Munson, B. E., 1978, Structure contour maps of the Canyon and associated coal beds, western half of the Recluse 1° x 1/2° quadrangle, Campbell County, Wyoming: U.S. Geological Survey Investigations Map C-81A. **PR**
- Kent, B. H., Berlage, L. J., and Boucher, E. M., 1980, Stratigraphic framework of coal beds underlying the western part of the Recluse 30' x 60'quadrangle, Campbell County, Wyoming: U.S. Geological Survey Coal Investigations Map C-81C, scale 1:100,000. **PR**
- Kent, B. H., Pierce, F. W., Molnia, C. L., and Johnson, E. A., 1986, Allocyclic controls on thick coal deposition in sedimentary basins—some Powder River Basin examples (abs.), *in* Carter, L. M. H., ed., USGS research on mineral and energy resources: U.S. Geological Survey Circular 974, p. 31–32. **PR**
- Kent, B. H., Weaver, J. N., Roberts, S B., Ming, Tian, Shu, Liu, and Bangzhuo, Mao, 1988, Geology and resource appraisal of the Felix coal deposit, Powder River Basin, Wyoming—a research project with the Peoples Republic of China: U.S. Geological Survey Bulletin 1818, 32 p. **PR**
- Kent, H. C., and Porter, K. W., 1980, Rocky Mountain region oil and gas production, Colorado Geology, in Kent, H. C., and Porter, K. W., eds., Colorado geology: Summary of Laramide orogeny in Colorado: Rocky Mountain Association of Geologists Symposium Map, plate 2, scale 1:3,000,000. GR, PB, PR, RB, SJ
- Keystone, 1986, 1986 Keystone coal industry manual: New York, McGraw-Hill [Colorado—description of seams, p. 431–452; New Mexico—description of seams, p. 514–523]. GR, PB, PR, RB, SJ
- Khalsa, N. S., 1981, Chemical analyses of coal samples from San Juan River region, *in* Colorado coal analyses, 1976-1979: Colorado Geological Survey Information Series 10, p. 214–239. **SJ**
- Khalsa, N. S., and Ladwig, L. R., 1981, Colorado coal analyses 1976-1979: Colorado Geological Survey Information Series 10, 364 p. **GR**, **PB**, **RB**
- Kharaka, Y. K., Hull, R. W., and Carothers, W. W., 1985, Water-rock interactions in sedimentary basins, *in* Gautier, D. L., and others, eds., Relationship of organic matter and mineral diagenesis: Society of Economic Paleontologists and Mineralogists, SEPM Short Course No. 17, p. 79–176. **GR**, **PB**, **PR**, **RB**, **SJ**
- Kharaka, Y. K., Law, L. M., Carothers, W. W., and Goerlitz, D. F., 1986, Role of organic species dissolved in formation waters from sedimentary basins in mineral diagenesis, *in* Gautier, D. L., ed., Roles of organic matter in sedimentary diagenesis: Society of Economic Paleontologists and Mineralogists, Special Publication No. 38, p. 111–122. **GR, PB, PR, RB, SJ**
- Khorasani, G. K., 1987, Oil-prone coals of the Walloon Coal Measures, Surat Basin, Australia, *in* Scott, A. C., ed., Coal and coal-bearing strata: Recent advances: Blackwell Scientific Publications, Geological Society Publication No. 32, p. 303–310. **GR**, **PB**, **PR**, **RB**, **SJ**

Kilmer, C. L., 1987, Water-bearing characteristics of geologic formations in northeastern New Mexico-southeastern Colorado, *in* Lucas, S. G., and Hunt, A. P., eds., Northeastern New Mexico: New Mexico Geological Society Guidebook, thirty-eighth field conference, p. 275–279. **RB**

- King, P. B., compiler, 1969, Tectonic map of North America: U.S. Geological Survey, scale 1:5,000,000. **GR**, **PB**, **PR**, **RB**, **SJ**
- Kirk, A. R., Huffman, A. C., Jr., Zech, R. S., Robertson, J. F., and Jackson, T. J., 1978, Review of the usage of the Gallup Sandstone and related units, southern and western San Juan Basin: U.S. Geological Survey Open-File Report 78-1055, 51 p. SJ
- Kiteley, L. W., 1983, Paleogeography and eustatic-tectonic model of late Campanian Cretaceous sedimentation, southwestern Wyoming and northwestern Colorado, *in* Reynolds, M. W., and Dolly, E. D., eds., Mesozoic paleogeography of the west-central United States: Rocky Mountain Section, Society of Paleontologists and Mineralogists, Rocky Mountain Paleogeography Symposium 2, p. 273–303. **GR, PB**
- Klem, R. C., and Mavor, M. J., 1991, Western Cretaceous coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 8, no. 2, p. 13-15. **SJ**
- Kluth, C. F., and Coney, P. J., 1981, Plate tectonics of the Ancestral Rocky Mountains: Geology, v. 9, p. 10–15. **GR, PB, PR, RB, SJ**
- Knepper, D. H., Jr., 1982, Lineaments derived from analysis of linear features mapped from Landsat images of the Four Corners region of the southwestern United States: U.S. Geological Survey Open-File Report 82-849, 79 p. GR, PB, PR, RB, SJ
- Knepper, D. H., Jr., 1988, Distribution of exposed limonitic rocks and soils from Landsat Multispectral Scanner data on the Southern Ute Indian Reservation, southwestern Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 295–296. **SJ**
- Knight, S. H., 1951, The Late Cretaceous-Tertiary history of the northern portion of the Hanna Basin, Carbon County, Wyoming, *in* Wyoming Geological Association Guidebook, sixth field conference, p. 45-53.
- Knight, W. C., 1902, The petroleum fields of Wyoming III: Engineering and Mining Journal, v. 72, p. 720–724. GR, PR
- Knopf, A., 1936, Igneous geology of the Spanish Peaks region, Colorado: Geological Society of America Bulletin, v. 47, p. 1727–1784. **PR**
- Knopf, Adolph, 1956, Igneous geology of the Spanish Peaks region, Colorado, *in* McGinnis, C. J., ed., Geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists, p. 56–57. **RB**
- Knowlton, F. H., 1917, Fossil flora of the Vermejo and Raton Formations of Colorado and New Mexico, in

- Lee, W. T., and Knowlton, F. H., Geology and paleontology of the Raton Mesa and other regions in Colorado and New Mexico: U.S. Geological Survey Professional Paper 101, p. 223–435. **RB**
- Knutson, C. F., Maxwell, E. L., and Millheim, K., 1971, Sandstone continuity in the Mesaverde Formation, Rulison field area, Colorado: Journal of Petroleum Technology, v. 23, p. 911–919. **PB**
- Koenig, R. A., 1988, Hydrologic characterization of coal seams for optimal dewatering and methane drainage: Quarterly Review of Methane from Coal Seams Technology, v. 6, no. 1, p. 38–39. **GR**, **PB**, **PR**, **RB**, **SJ**
- Koenig, R. A., Bell, G. J., and Way, Sao-Chih, 1984, Preliminary study of coal seam permeability in the Piceance, San Juan, and Warrior Basins, *in* 1984 International Gas Research Conference Proceedings, Washington, D.C., Sept. 10-13, 1984, sponsored by the Gas Research Institute, American Gas Association, and U.S. Department of Energy: Rockville, Md., Government Institutes, Inc. **PB**, **SJ**
- Koenig, R. A., Bumb, A. C., McKee, C. R., Murphy, C. L., Ramesh, M. S., Reverand, J. M., and Way, S. C., 1989, Application of hydrology to evaluation of coalbed methane reservoirs: Report prepared for the Gas Research Institute under contract no. 5087-214-1489 (GRI-89/0031), 114 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Komar, C. A., Overbey, W. K., Jr., Rough, R. L., and Lambert, W. G., 1971, Factors that predict fracture orientation in a gas storage reservoir: Journal of Petroleum Technology, v. 23 (May), p. 546–550. **GR**, **PB**, **PR**, **RB**, **SJ**
- Kraig, D. H., Wiltschko, D. V., and Spang, J. H., 1987, Interaction of basement uplift and thin-skinned thrusting, Moxa Arch and the western overthrust belt, Wyoming: Geological Society of America Bulletin, v. 99, no. 5, p. 654–662. **GR**
- Kraig, D. H., Wiltschko, D. V., and Spang, J. H., 1988, The interaction of the Moxa Arch (La Barge Platform) with the Cordilleran thrust belt, south of Snider Basin, southwestern Wyoming, *in* Schmidt, C. J., and Perry, W. J., Jr., eds., Interaction of the Rocky Mountain foreland and Cordilleran thrust belt: Geological Society of America Memoir 171, p. 395–411. **GR**
- Krueger, M. L., 1960, Occurrence of natural gas in the western part of the Green River Basin, *in* Overthrust belt of southwestern Wyoming: Wyoming Geological Association Guidebook, fifteenth field conference, p. 194–209. **GR**
- Krueger, M. L., 1968, Occurrence of natural gas in Green River Basin, Wyoming, *in* Beebe, W. A., and Curtis, B. F., eds., Natural gases of North America: American Association of Petroleum Geologists Memoir 9, v. 1, p. 780–797. **GR**
- Kruge, M. A., 1989, Molecular marker analysis of wax precipitates from the Mesa Hamilton No. 3 Well, Cedar Hill field, San Juan Basin, New Mexico: Report to Resource Enterprises, Inc., Salt Lake City, Utah, for the

Gas Research Institute Western Cretaceous coal seam project. SJ

- Kuhn, E. A., 1990, Directory and statistics of Colorado coal mines with distribution and electric generation map, 1989: Colorado Geological Survey Resource Series 29, 47 p. **GR**, **PB**, **RB**
- Kulander, B. R., and Dean, S. L., 1980, Fracture trends in the Allegheny Plateau of West Virginia: West Virginia Geologic and Economic Survey Map WV-11.
- Kulander, B. R., Barton, C. C., and Dean, S. L., 1979, The application of fractography to core and outcrop fracture investigations: U.S. Department of Energy, METC/SP-79/3, 174 p. GR, PB, PR, RB, SJ
- Kvenvolden, K. A., Simoneit, B. R. T., and Love, J. D., 1989, Chemical and isotopic compositions of natural gas from seeps in Yellowstone and Grand Teton National Parks, Wyoming, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 241–246. **GR**

L

- Ladeira, F. L., and Price, N. J., 1981, Relationship between fracture spacing and bed thickness: Journal of Structural Geology, v. 3, p. 179-183. **GR, PB, PR, RB, SJ**
- Lamb, G. M., 1968, Stratigraphy of the lower Mancos Shale in the San Juan Basin: Geological Society of America Bulletin, v. 79, p. 827–854. SJ
- Land, C. B., Jr., 1972, Stratigraphy of Fox Hills sandstone and associated formations, Rock Springs Uplift and Wamsutter Arch area, Sweetwater County, Wyoming: a shoreline-estuary sandstone model for the late Cretaceous: Colorado School of Mines Quarterly, v. 67, no. 2, 69 p. **GR**
- Landis, E. R., 1959, Coal resources of Colorado: U.S. Geological Survey Bulletin 1072-C, p.131-232. GR, PB, RB
- Langen, R. E., and Kidwell, A. L., 1974, Geology and geochemistry of the Highland uranium deposit, Converse County, Wyoming: Mountain Geologist, v. 11, no. 2, p. 85–93.
- LaPointe, P. R., 1988, A method to characterize fracture density and connectivity through fractal geometry: International Journal of Rock Mechanics and Geomechanics Abstracts, v. 25, no. 6, p. 421–429. GR, PB, PR, RB, SJ
- LaPointe, P. R., and Hudson, J. A., 1985, Characterization and interpretation of rock mass joint patterns: Geological Society of America Special Paper 199, 37 p. GR, PB, PR, RB, SJ
- Larsen, E. E., and Strangeway, D. W., 1969, Magnetization of the Spanish Peaks dike swarm, Colorado, and Shiprock dike, New Mexico: Journal of Geophysical Research, v. 74, p. 1505–1514. **RB**
- Larsen, E. E., Ozima, M., and Bradley, W. D., 1975, Late Cenozoic basic volcanism in northwestern Colorado

- and its implications concerning tectonism and the origin of the Colorado River system: Geological Society of America Memoir 144, p. 155–178. **PB**
- Larsen, V. E., 1985, Geology and overview of coalbed methane resources and activity in the Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 3, no. 2, p. 2–9. **PB**
- Larsen, V. E., 1985, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 3, no. 1, p. 6. **PB**
- Larsen, V. E., 1985, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 3, no. 1, p. 6–7. **RB**
- Larsen, V. E., 1985, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 3, no. 2, p. 16–17. **RB**
- Larsen, V. E., 1986, Geology and overview of coalbed methane resources and activity in the Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 3, nos. 3 and 4, p. 2–13. **RB**
- Larsen, V. E., 1986, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 3, nos. 3 and 4, p. 13–14. **PB**
- Larsen, V. E., 1986, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 1, p. 2–4. **PB**
- Larsen, V. E., 1986, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 2, p. 3–5. **PB**
- Larsen, V. E., 1986, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 1, p. 8–9. **RB**
- Larsen, V. E., 1986, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 2, p. 11–12. **RB**
- Larsen, V. E., 1987, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 3, p. 20–22. **PB**
- Larsen, V. E., 1987, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 4, p. 2–5. **PB**
- Larsen, V. E., 1987, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 1, p. 2–4. **PB**
- Larsen, V. E., 1987, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 2, p. 2–4. **PB**
- Larsen, V. E., 1987, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 3, p. 26–27. **RB**
- Larsen, V. E., 1987, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 4, p. 6, 12–13. **RB**

Larsen, V. E., 1987, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 1, p. 5, 10. **RB**

- Larsen, V. E., 1987, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 2, p. 9–10. **RB**
- Larsen, V. E., 1988, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 5, nos. 3 and 4, p. 3–5. **PB**
- Larsen, V. E., 1988, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 6, no. 1, p. 3–5. **PB**
- Larsen, V. E., 1988, Piceance Basin, Colorado: QuarterlyReview of Methane from Coal Seams Technology, v. 6, no. 2, p. 2–4.PB
- Larsen, V. E., 1988, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 5, nos. 3 and 4, p. 13–18. **RB**
- Larsen, V. E., 1988, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 6, no. 1, p. 12–13. **RB**
- Larsen, V. E., 1988, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 6, no. 2, p. 12–13. **RB**
- Larsen, V. E., 1989, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 6, nos. 3 and 4, p. 10–11. **PB**
- Larsen, V. E., 1989, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 5. **PB**
- Larsen, V. E., 1989, Powder River Basin, Wyoming and Montana: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 2–3. **PR**
- Larsen, V. E., 1989, Preliminary evaluation of coalbed methane geology and activity in the Recluse area, Powder River Basin, Wyoming: Quarterly Review of Methane from Coal Seams Technology, v. 6, nos. 3 and 4, p. 2–10. **PR**
- Larsen, V. E., 1989, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 6, nos. 3 and 4, p. 15–17. **RB**
- Larsen, V. E., 1989, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 7–8. **RB**
- Larsen, V. E., 1990, Greater Green River coal region, Wyoming and Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 3, p. 4–5. GR
- Larsen, V. E., 1990, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 3, p. 5. **PB**
- Larsen, V. E., 1990, Piceance Basin, Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 4, p. 7–8. **PB**

- Larsen, V. E., 1990, Powder River Basin, Wyoming and Montana: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 3, p. 4. **PR**
- Larsen, V. E., 1990, Powder River Basin, Wyoming and Montana: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 4, p. 2–3. **PR**
- Larsen, V. E., 1990, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 3, p. 6–7. **RB**
- Larsen, V. E., 1990, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 4, p. 10. **RB**
- Larsen, V. E., and Schwochow, S. D., 1990, Greater Green River coal regional, Wyoming and Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 4, p. 3–7. **GR**
- Laubach, S. E., 1991, Fracture patterns in low-permeability-sandstone gas reservoir rocks in the Rocky Mountain region, *in* Proceedings, Society of Petroleum Engineers Joint Rocky Mountain Regional Meeting and Low-Permeability Reservoirs Symposium, SPE Paper 21853, p. 501–510. **GR, PB, PR, RB, SJ**
- Laubach, S. E., and Tremain, C. M., 1991, Regional coal fracture patterns and coalbed methane development, *in* Roegiers, Jean-Claude, ed., Rock mechanics as a multidisciplinary science: Proceedings of the 32nd U.S. Symposium, University of Oklahoma, Norman, July 10–12, 1991: Rotterdam, Netherlands, Balkema, p. 851–859. **SJ**
- Laubach, S. E., and Tremain, C. M., 1991, Regional tectonic setting of the San Juan Basin, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 3–5. SI
- Laubach, S. E., Reynolds, S. J., Spencer, J. E., and Marshak, Stephen, 1989, Progressive deformation and superposed fabrics related to Cretaceous crustal underthrusting in western Arizona, U.S.A.: Journal of Structural Geology, v. 11, no. 6, p. 735–749. **GR**, **PB**, **PR**, **RB**, **SJ**
- Laubach, S. E., Tremain, C. M., and Ayers, W. B., 1991, Coal fracture studies: guides for coalbed methane exploration and development: Journal of Coal Quality, v. 10, no. 3, p. 81–88. **SJ**
- Laubach, S. E., Tremain, C. M., and Baumgardner, R. W., Jr., 1991, Fracture swarms in Upper Cretaceous sandstone and coal, northern San Juan Basin, Colorado: potential targets for methane exploration, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic

Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 119–140. **SJ**

- Laubach, S. E., Tremain, C. M., Whitehead, N. H., and Baumgardner, R. W., 1990, Fracture-trace maps of Upper Cretaceous Pictured Cliffs Sandstone pavements, San Juan Basin, Colorado: implications for coalbed methane exploration (abs.): Geological Society of America Abstracts with Programs, v. 22, no. 7, p. A202. SJ
- Laubach, S. E., Tyler, Roger, Tremain, C. M., Grout, M. A., and Ambrose, W. A., 1991, Fracture patterns in coal in the western United States: observations and implications for development of coalbed methane resources (abs.): Geological Society of America Abstracts with Programs, v. 23, no. 5, p. A38–A39. GR, PB, PR, RB, SJ
- Lausten, C. D., 1989, Seismic detection of upper Dakota sandstones on the Moxa Arch, Green River Basin, Wyoming, using amplitude versus offset data, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 199–208. **GR**
- Law, B. E., 1976, Large-scale compaction structures in the coal-bearing Fort Union and Wasatch Formations, northeast Powder River Basin, Wyoming, *in* Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and Energy Resources of the Powder River: Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 221–229. **PR**
- Law, B. E., 1979, Section B-B'—subsurface and surface correlations of some Upper Cretaceous and Tertiary rocks, northern Green River Basin, Wyoming, U.S. Geological Survey Open-File Report 79-1689, 2 sheets. **GR**
- Law, B. E., 1984, Relationships of source-rock, thermal maturity, and overpressuring to gas generation and occurrence in low-permeability Upper Cretaceous and lower Tertiary rocks, Greater Green River Basin, Wyoming, Colorado, and Utah, *in* Woodward, Jane, Meissner, F. F., and Clayton, J. L., eds., Hydrocarbon source rocks of the greater Rocky Mountain region: Rocky Mountain Association of Geologists, p. 469–490. **GR**
- Law, B. E., 1990, Thermal evolution of the Upper Cretaceous Fruitland Formation, San Juan Basin, Colorado and New Mexico, *in* Carter, L. M. H., ed., U.S. Geological Survey Research on Energy Resources, 1990, Programs and Abstracts, p. 49–50. **SJ**
- Law, B. E., 1990, Thermal evolution of the Upper Cretaceous Fruitland Formation, San Juan Basin, Colorado and New Mexico, *in* Sixth V. E. McKelvey Forum on Mineral and Energy Resources: U.S. Geological Survey Circular 1060, p. 49–50. **SJ**
- Law, B. E., 1991, Vitrinite reflectance data from Cretaceous and Tertiary rocks, San Juan Basin, New Mexico and

- Colorado: U.S. Geological Survey Open-File Report 90-659, 18 p. **SJ**
- Law, B. E., and Dickinson, W. W., 1985, Conceptual model for origin of abnormally pressured gas accumulations in low-permeability reservoirs: American Association of Petroleum Geologists Bulletin, v. 69, no. 8, p. 1295– 1304. **GR, PB, PR, RB, SJ**
- Law, B. E., and Johnson, R. C., 1989, Structural and stratigraphic framework of the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. B1–B11. **GR**
- Law, B. E., and Nichols, D. J., 1982, Subsurface stratigraphic correlations of some Upper Cretaceous and Lower Tertiary rocks, northern Green River Basin, Wyoming, *in* Subsurface practices in geology and geophysics (abs.), University of Wyoming Department of Geology and Geophysics, p. 17. **GR**
- Law, B. E., and Smith, C. R., 1983, Subsurface temperature map showing depth to 180° Fahrenheit in the Greater Green River Basin of Wyoming, Colorado, and Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1504, scale 1:500,000. GR
- Law, B. E., and Spencer, C. W., 1981, Abnormally highpressured, low-permeability, Upper Cretaceous and Tertiary gas reservoirs, northern Green River Basin, Wyoming (abs.): American Association of Petroleum Geologists Bulletin, v. 65, no. 5, p. 948. **GR**
- Law, B. E., and Spencer, C. W., 1989, Introduction, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. A1–A7. **GR**, **PB**
- Law, B. E., and Spencer, C. W., eds., 1989, Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, variously paginated. **GR**, **PB**
- Law, B. E., Anders, D. E., and Michael, G. E., 1990, Use of Rock-Eval pyrolysis and vitrinite reflectance data in characterizing type and maturity of organic matter in coal, Upper Cretaceous Fruitland Formation, San Juan Basin, New Mexico and Colorado (abs.): American Association of Petroleum Geologists Bulletin, v. 74, no. 8, p. 1333. SJ
- Law, B. E., Barnum, B. E., and Galyardt, G. L., 1975, Tectonic implications of the Fort Union Formation, northwestern Powder River Basin, Wyoming and Montana (abs.): Geological Society of America Abstracts with Programs, v. 7, p. 1163. **PR**
- Law, B. E., Hatch, J. R., Keighin, C. W., and Kukal, G. C., 1983, Geologic implications of coal dewatering,

(Law, B. E. and others, 1983, continued) American Association of Petroleum Geologists Bulletin, v. 67, no. 12, p. 2255–2260. **GR**

- Law, B. E., Nuccio, V. F., and Barker, C. E., 1989, Kinky vitrinite reflectance well profiles—evidence of paleopore pressure in low-permeability, gas-bearing sequences in Rocky Mountain foreland basins: American Association of Petroleum Geologists Bulletin, v. 73, no. 8, p. 999–1010. **GR**, **PB**, **PR**, **RB**, **SJ**
- Law, B. E., Pollastro, R. M., and Keighin, C. W., 1986, Geologic characterization of low-permeability gas reservoirs in selected wells, Greater Green River Basin, Wyoming, Colorado, and Utah, in Spencer, C. W., and Mast, R. F., eds., Geology of tight gas reservoirs: American Association of Petroleum Geologists Studies in Geology 24, p. 253–269. GR
- Law, B. E., Rice, D. D., and Flores, R. M., 1991, Coalbed gas accumulations in the Paleocene Fort Union Formation, Powder River Basin, Wyoming, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 179–190. **PR**
- Law, B. E., Spencer, C. W., and Bostick, N. H., 1979, Preliminary results of organic maturation, temperature, and pressure studies in the Pacific Creek area, Sublette County, Wyoming: 5th Department of Energy Symposium on Enhanced Oil and Gas Recovery and Improved Drilling Methods, p. k2/1–k2/13. **PB**
- Law, B. E., Spencer, C. W., and Bostick, N. H., 1980, Evaluation of organic matter, subsurface temperature and pressure with regard to gas generation in low-permeability Upper Cretaceous and lower Tertiary sandstones in Pacific Creek area, Sublette and Sweetwater Counties, Wyoming: Mountain Geologist, v. 17, no. 2, p. 23–35. **PB**
- Law, B. E., Spencer, C. W., and Roehler, H. W., 1979, Section A-A'—surface and subsurface correlations of some Upper Cretaceous and Tertiary rocks, Green River Basin, Wyoming: U.S. Geological Survey Open-File Report 79-357. **GR**
- Law, B. E., Spencer, C. W., Charpentier, R. R., Crovelli, R. A., Mast, R. F., Dolton, G. L., and Wandrey, C. J., 1989, Estimates of gas resources in overpressured low-permeability Cretaceous and Tertiary sandstone reservoirs, Greater Green River Basin, Wyoming, Colorado, and Utah, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 39–61. **GR**
- Lawton, T. F., 1986, Fluvial systems of the Upper Cretaceous Mesaverde Group and Paleocene North Horn Formation, central Utah: a record of the transition from thin-skinned to thick-skinned deformation in the foreland region, *in* Peterson, J. A., ed., Paleotectonics and sedimentation in the Rocky Mountain region, United States: American Association of Petroleum Geologists Memoir 41, p. 423–443. **GR**, **PB**, **PR**, **RB**, **SJ**

- Leckie, D. A., Singh, Chaitanya, Goodarzi, Fariborz, and Wall, J. H., 1990, Organic-rich, radioactive marine shale: a case study of a shallow-water condensed section, Cretaceous Shaftesbury Formation, Alberta, Canada: Journal of Sedimentary Petrography, v. 60, no. 1, p. 101-117.
- Lee, A. A., Skillern, C. R., and Watkins, D., 1981, Gas recovery from coal deposits: Final report prepared for Gas Research Institute (GRI-80/0033), 113 p. GR, PB, PR, RB, SJ
- Lee, F. T., Smith, W. K., and Savage, W. Z., 1976, Stability of highwalls in surface coal mines, western Powder River Basin, Wyoming and Montana: U.S. Geological Survey Open-File Report 76-846, 52 p. **PR**
- Lee, M. W., 1989, Azimuthal vertical seismic profiles at the Multiwell Experiment site, northwest Colorado, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. O1–O16. **PB**
- Lee, R. W., 1980, Geochemistry of water in the Fort Union Formation of the northern Powder River Basin, southeastern Montana: U.S. Geological Survey Water Resources Investigations Open-File Report 80-336, p. 1–17. **PR**
- Lee, W. T., 1909, The Grand Mesa coal field, Colorado: U.S. Geological Survey Bulletin 341, part 2, p. 316-334. **PB**
- Lee, W. T., 1912, Coal fields of Grand Mesa and West Elk Mountains, Colorado: U.S. Geological Survey Bulletin 510, 237 p. **PB**
- Lee, W. T., 1917, Geology of the Raton Mesa and other regions in Colorado and New Mexico, *in* Lee, W. T., and Knowlton, F. H., Geology and paleontology of the Raton Mesa and other regions in Colorado and New Mexico: U.S. Geological Survey Professional Paper 101, p. 9–37. **RB**
- Lee, W. T., 1922, Raton-Brilliant-Koehler Folio, New Mexico-Colorado: U.S. Geological Survey Folio 214. **RB**
- Lee, W. T., 1924, Coal resources of the Raton coal field, Colfax County, New Mexico: U.S. Geological Survey Bulletin 752. **RB**
- Lee, W. T., and Knowlton, F. H., 1917, Geology and paleontology of the Raton Mesa and other regions in Colorado and New Mexico: U.S. Geology Survey Professional Paper 101, 450 p. **RB**
- Leel, Woodruff, and Wickstrom, Charles, 1990, Coalbed methane resource of the Rock Springs Formation on the Rock Springs Uplift, Sweetwater County, Wyoming (abs.): American Association of Petroleum Geologists Bulletin, v. 74, no. 8, p. 1334. **GR**
- Leighton, V. L., 1980, Depositional environments and petrography of the Trinidad Sandstone and related formations, Raton Area, New Mexico: Colorado State University, Masters thesis, 105 p. **RB**

Lent, J., 1979 (revised 1982), San Juan Basin report—Early Tertiary geology, coal, and the potential for methane recovery from coalbeds in Colorado and New Mexico: Denver, Colorado, Report prepared by TRW, Inc., for the U.S. Department of Energy, Morgantown Energy Technology Center. SJ

- Levey, R. A., 1985, Depositional model for understanding geometry of Cretaceous coals: major coal seams, Rock Springs Formation, Green River Basin, Wyoming: American Association of Petroleum Geologists Bulletin, v. 69, no. 9, p. 1359–1380. **GR**
- Levings, G. W., Craigg, S. D., Dam, W. L., Kernodle, J. M., and Thorn, C. R., 1990, Hydrogeology of the Menefee Formation in the San Juan structural basin, New Mexico, Colorado, Arizona, and Utah: U.S. Geological Survey Hydrologic Investigations Atlas HA-0720-F, 2 sheets, scale 1:1,000,000. SJ
- Levings, W. S., 1951, Late Cenozoic erosional history of the Raton Mesa region: Colorado School of Mines Quarterly Journal, v. 46, 111 p. **RB**
- Lewis, B. D., and Hotchkiss, W. R., 1981, Thickness, percent sand, and configuration of shallow hydrologic units in the Powder River Basin, Montana and Wyoming: U.S. Geological Survey Miscellaneous Investigation Series, Map I-1317. **PR**
- Lewis, B. D., and Roberts, R. S., 1978, Geology and wateryielding characteristics of rocks of the northern Powder River Basin, southeastern Montana: U.S. Geological Survey Miscellaneous Investigations Map I-847-D, scale 1: 250,000. **PR**
- Lewis, C. J., Wilde, D. E., and Gerhard, L. C., 1969, Basement structure map of the Raton Basin area, Colorado: Mountain Geologist, v. 6, no. 3, p. 85–86. **RB**
- Lewis, J. L., 1961, The stratigraphy and depositional history of the Almond formation in the Great Divide Basin, Sweetwater County, Wyoming, *in* Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 87–95. **GR**, **PR**
- Lewis, J. L., 1965, Measured surface sections of the Almond Formation on the east flank of the Rock Springs Uplift, Sweetwater County, Wyoming, *in* DeVoto, R. H., and Bitter, R. K., eds., Sedimentation of Late Cretaceous and Tertiary outcrops, Rock Springs Uplift: Wyoming Geological Association Guidebook, nineteenth field conference, p. 101–111. **GR**
- Leythaeuser, D., Schaefer, R. G., Cornford, C., and Weiner, B., 1979, Generation and migration of light hydrocarbons (C2-C7) in sedimentary basins: Organic Geochemistry, v. 1, p. 191–204. GR, PB, PR, RB, SJ
- Lickus, M. R., and Law, B. E., 1988, Structure contour map of the Greater Green River Basin, Wyoming, Colorado, and Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2031, scale 1:5,000,000. **GR**

- Lickus, M. R., Pawlewicz, M. J., Law, B. E., and Dickinson, W. W., 1989, Thermal maturity patterns in the northern Green River Basin, Wyoming, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. G1–G5. **GR**
- Lin, W., and Heuze, F. E., 1987, Comparison of in situ dynamic moduli and laboratory moduli of Mesaverde rocks: International Journal of Rock Mechanics and Mining Sciences, v. 24, no. 4, p. 257–263. **GR**, **PB**, **RB**, **SJ**
- Lindenlaub, J. C., 1976, The physical basis of remote sensing: fundamentals of remote sensing: Purdue University Minicourse Series, 13 p. GR, PB, PR, RB, SJ
- Lindsay, E. H., Jacobs, L. L., and Butler, R. F., 1978, Biostratigraphy and magnetostratigraphy of Paleocene terrestrial deposits, San Juan Basin, New Mexico: Geology, v. 6, no. 7, p. 425–429. SJ
- Lindsey, D. A., Andriessen, P. A. M., and Wardlaw, B. R., 1986, Heating, cooling, and uplift during Tertiary time, northern Sangre de Cristo Range, Colorado: Geological Society of America Bulletin, v. 97, p. 1133– 1143. **RB**
- Lindsey, D. A., Johnson, B. R., and Andriessen, P. A. M., 1984, Laramide and Neogene structure of northern Sangre de Cristo range, south-central Colorado (abs.): American Association of Petroleum Geologists Bulletin, v. 68, p. 941. **RB**
- Lipman, P. W., Doe, B. R., Hedge, C. E., and Steven, T. A., 1978, Petrologic evolution of the San Juan volcanic field, southwestern Colorado Pb and Sr isotope evidence: Geological Society of America Bulletin, v. 89, p. 59–82. **SJ**
- Lisenbee, A. L., 1988, Tectonic history of the Black Hills Uplift, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, 39th field conference, p. 45–52. **PR**
- Livesey, G. B., 1985, Laramide structures of the southeastern Sand Wash Basin, *in* Gries, R. R., and Dyer, R. C., eds., Seismic exploration of the Rocky Mountain region: Rocky Mountain Association of Geologists and Denver Geophysical Society, p. 87–94. **GR**
- Lobmeyer, D. H., 1985, Freshwater heads and groundwater temperatures in aquifers of the northern Great Plains in parts of Montana, North Dakota, South Dakota, and Wyoming: U.S. Geological Survey Professional Paper 1402-D, p. D1–11. **PR**
- Logan, T. L., 1986, Baseline stimulation results for a deep coal seam at the Red Mountain Unit, Piceance Basin, Colorado: Resource Enterprises Inc., topical report prepared for Gas Research Institute. **PB**
- Logan, T. L., 1989, Coalbed methane-6, western basins dictate varied operations: Oil and Gas Journal, v. 87, no. 49, p. 35–39. **GR, PB, PR, RB, SJ**

Logan, T. L., and Marshall, R. B., 1985, Drilling and configuration methods for deep coalbed methane wells used at the Red Mountain site, Piceance Basin, Colorado: Resource Enterprises, Inc., report prepared for Gas Research Institute (GRI-85/0137), 207 p. **PB**

- Logan, T. L., and Seccombe, J. C., 1986, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 3, nos. 3 and 4, p. 27–32. **PB**
- Logan, T. L., Clark, W. F., and McBane, R. A., 1989, Comparing different coalbed methane completion techniques, hydraulic fracture and openhole cavity, at the Northeast Blanco Unit, San Juan Basin, New Mexico, *in* Proceedings of the 1989 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, April 17-20, 1989, p. 265–272. **SJ**
- Logan, T. L., Seccombe, J. C., and Jones, A. H., 1986, Hydraulic fracture results and diagnostics in deeply buried coal seams, Piceance Basin, Colorado: Proceedings, 27th U.S. Symposium on Rock Mechanics, p. 677-681. **PB**
- Logan, T. L., Seccombe, J. C., and Jones, A. H., 1986, Hydraulic fracture simulation and openhole testing of a deeply buried coal seam: Society of Petroleum Engineers, SPE Paper 15251, p. 501–512. **PB**
- Long, J. C. S., and Billaux, D. A., 1987, From field data to fracture network modeling: an example incorporating spatial structure: Water Resources Research, v. 23, p. 1201–1216. **GR, PB, PR, RB, SJ**
- Long, J. C. S., and Witherspoon, P. A., 1985, The relationship of the degree of interconnection to permeability in fracture networks: Journal of Geophysical Research, v. 90, no. B4, p. 3087–3099. **GR**, **PB**, **PR**, **RB**, **SJ**
- Lorenz, J. C., 1982, Sedimentology of the Mesaverde Formation at Rifle Gap, Colorado, and implications for gas-bearing intervals in the subsurface: Sandia National Laboratories report SAND82-0604, 44 p. **PB**
- Lorenz, J. C., 1983, Lateral variability in the Corcoran and Cozzette blanket sandstones and associated Mesaverde rocks, Piceance Creek Basin, northwestern Colorado: Society of Petroleum Engineers, SPE/DOE Paper 11608, p. 81-86. **PB**
- Lorenz, J. C., 1983, Reservoir sedimentology in Mesaverde rocks at the multi-well experiment site: Sandia National Laboratories report SAND83-1078, 38 p. **PB**
- Lorenz, J. C., 1984, Reservoir sedimentology of Mesaverde rocks at the MWX site, *in* Spencer, C. W., and Keighin, C. W., 1984, Geological studies in support of the U.S. Department of Energy Multiwell Experiment, Garfield County, Colorado: U.S. Geological Survey Open-File Report 84-757, p. 21–32. **PB**
- Lorenz, J. C., 1985, Predictions of size and orientations of lenticular reservoirs in the Mesaverde Group, northwestern Colorado: Society of Petroleum Engineers, SPE/DOE Paper 13851, p. 23–31. **PB**

- Lorenz, J. C., 1985, Tectonic and stress histories of the Piceance Creek Basin and the MWX site, from 75 m.y.a. to the present: Sandia National Laboratories report SAND84-2603, UC-92, 48 p. **PB**
- Lorenz, J. C., 1987, Reservoir sedimentology of Mesaverde rocks at the Multiwell Experiment site and east central Piceance Creek Basin: Sandia National Laboratories report SAND87-0040, 40 p. **PB**
- Lorenz, J. C., 1988, Geology, Multiwell Experiment final report, part II. The Paludal interval of the Mesaverde Formation: Sandia National Laboratories Report SAND 88-1008, 21 p. **PB**
- Lorenz, J. C., 1989, Reservoir sedimentology of rocks of the Mesaverde Group, Multiwell Experiment site and east-central Piceance Basin, northwest Colorado, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. K1–K24. **PB**
- Lorenz, J. C., 1990, Geology, Multiwell Experiment final report, part IV. The fluvial interval of the Mesaverde Formation: Sandia National Laboratories Report SAND 89-2612/A, p. 3.1-3.54. **PB**
- Lorenz, J. C., 1991, Subsurface fracture spacing: comparison of influences from slant/horizontal core and vertical core in Mesaverde reservoirs: Rocky Mountain Region, Society of Petroleum Engineers, Proceedings, Low Permeability Reservoirs Symposium and Exhibition, p. 705–716. **PB**
- Lorenz, J. C., and Finley, S. J., 1987, Differences in fracture characteristics and related production of natural gas in different zones of the Mesaverde Formation, northwestern Colorado: Society of Petroleum Engineers, SPE Paper 16809, p. 589–596. **PB**
- Lorenz, J. C., and Finley, S. J., 1987, Significance of drilling and coring-induced fractures of Mesaverde core, northwestern Colorado: Sandia National Laboratories report SAND 87-1111, 29 p. **PB**
- Lorenz, J. C., and Finley, S. J., 1991, Regional fractures II: fracturing of Mesaverde reservoirs in the Piceance Basin, Colorado: American Association of Petroleum Geologists Bulletin, v. 75, no. 11, p. 1738–1757. **PB**
- Lorenz, J. C., and Hill, R. E., 1991, Subsurface fracture spacing: comparison of inferences from slant/horizontal core and vertical core in Mesaverde reservoirs: Society of Petroleum Engineers, SPE Paper 21877 [presented at Rocky Mountain Regional/Low Permeability Reservoir Symposium, Denver, Colorado, April 15-17], p. 705–716.
- Lorenz, J. C., and Rutledge, A. K., 1985, Facies relationships and reservoir potential of Ohio Creek interval across Piceance Creek Basin, northwestern Colorado: Sandia National Laboratories report SAND84-2610, 52 p. **PB**

Lorenz, J. C., and Rutledge, A. K., 1987, Late Cretaceous Mesaverde Group outcrops at Rifle Gap, Piceance Creek Basin, northwestern Colorado: Rocky Mountain Section Geological Society of America Centennial Field Guide, p. 307–310. **PB**

- Lorenz, J. C., Branagan, P., Warpinski, N. R., and Sattler, A. R., 1986, Fracture characteristics and reservoir behavior of stress-sensitive fracture systems in flat-lying lenticular formations: Society of Petroleum Engineers, SPE Paper 15244, p. 423–436. **PB**
- Lorenz, J. C., Finley, S. J., and Warpinski, N. R., 1990, Significance of coring-induced fractures in Mesaverde core, northwestern Colorado: American Association of Petroleum Geologists Bulletin, v. 74, no. 7, p. 1017–1029. **PB**
- Lorenz, J. C., Heinze, D. M., Clark, J. A., and Searls, C. A., 1985, Determination of widths of meander-belt sandstone reservoirs from vertical downhole data, Mesaverde Group, Piceance Creek Basin, Colorado: American Association of Petroleum Geologists Bulletin, v. 69, no. 5, p. 710–721. **PB**
- Lorenz, J. C., Teufel, L. W., and Warpinski, N. R., 1991, Regional fractures I: a mechanism for the formation of regional fractures in flat-lying reservoirs: American Association of Petroleum Geologists Bulletin, v. 75, no. 11, p. 1714–1737. **GR**, **PB**, **PR**, **RB**, **SJ**
- Love, J. D., 1960, Cenozoic sedimentation and crustal movements in Wyoming: American Journal of Science, v. 258A, p. 204-214. **GR**, **PB**, **PR**
- Love, J. D., 1961, Definition of Green River, Great Divide, and Washakie Basins, southwestern Wyoming (part 2): American Association of Petroleum Geologists Bulletin, v. 45, no. 10, p. 1749–1754. **GR**
- Love, J. D., 1970, Cenozoic geology of the Granite Mountains area, central Wyoming: U.S. Geological Survey Professional Paper 495-C, 154 p. **GR**
- Love, J. D., 1982, A possible gap in the western thrust belt in Idaho and Wyoming, *in* Powers, R. B., ed., Geological studies of the Cordilleran thrust belt: Rocky Mountain Association of Geologists, v. 1, p. 247–259. **GR**, **PB**
- Love, J. D., 1988, Geology of the Powder River Basin, northeastern Wyoming and southeastern Montana, *in* Sloss, L. L., ed., Sedimentary cover—North American Craton, U.S.: Geological Society of America, Decade of North American Geology, v. D-2, p. 204–208. **PR**
- Love, J. D., 1988, Geology of the Wind River Basin, central Wyoming, *in* Sloss, L. L., ed., Sedimentary cover—North American Craton, U.S.: Geological Society of America, Decade of North American Geology, v. D-2, p. 196–200. **WR**
- Love, J. D., and Christiansen, A. C., 1980, Preliminary correlation of stratigraphic units used on 1° x 2° geologic quadrangle maps of Wyoming, *in* Hollis, S., ed., Stratigraphy of Wyoming: Wyoming Geological Association Guidebook, thirty-first field conference, p. 279-282, and separate stratigraphic chart. **GR**, **PR**

- Love, J. D., and Christiansen, A. C., 1985, Geologic map of Wyoming: U.S. Geological Survey map, scale 1:500,000. **GR**, **PR**
- Love, J. D., McGrew, P. O., and Thomas, H. D., 1963, Relationship of latest Cretaceous and Tertiary deposition and deformation to oil and gas in Wyoming, *in* Childs, O. E., and Beebe, B. W., eds., Backbone of the Americas—tectonic history from pole to pole: American Association of Petroleum Geologists Memoir 2, p. 196–208. **PR**
- Lowry, M. E., and Cummings, T. R., 1966, Ground-water resources of Sheridan County, Wyoming: U.S. Geological Survey Water-Supply Paper 1807, p. 1–71. **PR**
- Lucas, S. G., 1990, Type and reference sections of the Romeroville Sandstone (Dakota Group), Cretaceous of northeastern New Mexico, *in* Bauer, P. W., and others, eds., Tectonic development of the southern Sangre de Cristo Mountains, New Mexico: New Mexico Geological Society Guidebook, forty-first field conference, p. 323–326. **RB**
- Lundegard, P. D., and Land, L. S., 1986, Carbon dioxide and organic acids: their origin and role in diagenesis, the Texas Gulf Coast Tertiary, *in* Gautier, D. L., ed., Roles of organic matter in sedimentary diagenesis: Society of Economic Paleontologists and Mineralogists, Special Publication No. 38, p. 129–146. **GR**, **PB**, **PR**, **RB**, **SJ**
- Lyle, Don, 1989, Coal drillers seek Sand Wash: Western Oil World, v. 46, no. 8, p. 10-11. **GR**

M

- Mackochick, D. J., Lanham, R. E., Bucurel, H. G., and Law, B. E., 1981, Summary chart of geological data from Amoco Tierney Unit 1 well, SW 1/4 sec. SE 1/4 sec. 15, T20N, R94W, Sweetwater County, Wyoming: U.S. Geological Survey Oil and Gas Investigations Chart OC-116. **GR**
- Madden, D. J., 1985, Description and origin of the lower part of the Mesaverde Group in Rifle Gap, Garfield County, Colorado: Mountain Geologist, v. 22, no. 3, p. 128–138. **PB**
- Madden, D. J., 1989, Geologic map and measured coal sections of the Point of Rocks quadrangle, Sweetwater County, Wyoming: U.S. Geological Survey Coal Investigations Map C-120, scale 1:24,000. **GR**
- Madden, D. J., 1989, Stratigraphy, depositional environments, and paleogeography of coal-bearing strata in the Upper Cretaceous Mesaverde Group, central Grand Hogback, Garfield County, Colorado: U.S. Geological Survey Professional Paper 1485, 45 p. **PB**
- Maher, J. C., 1945, Structural development of Las Animas Arch, Lincoln, Cheyenne, and Kiowa Counties, Colorado: American Association of Petroleum Geologists Bulletin, v. 29, no. 11, p. 1663–1667. **RB**
- Maione, S. J., 1971, Stratigraphy of the Frontier Sandstone Member of the Mancos Shale (Upper Cretaceous) on the south flank of the eastern Uinta Mountains, Utah

(Maione, S. J., 1971, continued) and Colorado: Wyoming Geological Association Earth Science Bulletin, September 1971, p. 27—58. **GR**

- Maldonado, N., Pearce, J. H., and Lippman, G. A., Case history: infill drilling increases reserves in Blanco Mesaverde and Basin Dakota Reservoirs, San Juan Basin, New Mexico: SPE/DOE Paper 11642. **SJ**
- Mallory, W. W., 1977, Fractured shale hydrocarbon reservoirs in southern Rocky Mountain basins, *in* Veal, H. K., ed., Exploration frontiers of the central and southern Rockies: Rocky Mountain Association of Geologists Symposium, p. 89—94. **PB**
- Mallory, W. W., 1977, Oil and gas from fractured shale reservoirs in Colorado and northwestern New Mexico: Rocky Mountain Association Geologists Special Publication 1, 38 p. **GR, PB, RB, SJ**
- Manfrino, Carrie, 1984, Stratigraphy and palynology of the upper Lewis Shale, Pictured Cliffs Sandstone, and lower Fruitland Formation (Upper Cretaceous) near Durango, Colorado: The Mountain Geologist, v. 21, no. 4, p. 115–132. **SJ**
- Manley, Kim, Scott, G. R., and Wobus, R. A. (compilers), 1987, Geologic map of the Aztec 1° x 2° quadrangle, northwestern New Mexico and southern Colorado: U.S. Geological Survey Miscellaneous Investigations Series Map I-1730. **SJ**
- Manydeeds, S. A., ed., 1991, Coal-bed methane potential of the Wind River Indian Reservation: Bureau of Indian Affairs, Division of Energy and Mineral Resources, 54 p. **WR**
- Manzolillo, C. D., 1976, Stratigraphy and depositional environments of the Upper Cretaceous Trinidad Sandstone, Trinidad-Aguilar area, Las Animas County, Colorado: Colorado School of Mines, Master's thesis, 147 p. **RB**
- Mapel, W. J., 1958, Coal in the Powder River Basin, *in* Strickland, John, ed., Powder River Basin: Wyoming Geological Association Guidebook, thirteenth field conference, p. 218–224. **PR**
- Mapel, W. J., 1959, Geology and coal resources of the Buffalo-Lake De Smet area, Johnson and Sheridan Counties, Wyoming: U.S. Geological Survey Bulletin 1078, 148 p. **PR**
- Mapel, W. J., and Swanson, V., 1977, Summary of the geology, mineral resources, environmental geochemistry, and engineering geologic characteristics of the northern Powder River coal region, Montana: U.S. Geological Survey Open-File Report 77-292, 124 p. **PR**
- Mark, Anson, and Requist, Norris, 1969, First days road log—Trinidad to Walsenburg and return to Trinidad, Mesozoic and Tertiary of the east flank of the Raton Basin: Mountain Geologist, v. 6, no. 3, p. 149–164. **RB**
- Mark, Anson, and Requist, Norris, 1969, Third days road log—Walsenburg to Rye to Wetmore—Mesozoic of the Wet Mountains: Mountain Geologist, v. 6, p. 185–190. **RB**

- Markochick, D. J., and Law, B. E., 1981, Estimates of gas content in coal and carbonaceous rocks from deep drilling in Pacific Creek area, northeastern Green River Basin, Sweetwater County, Wyoming: American Association of Petroleum Geologists Bulletin, v. 65, no. 3, p. 564–565. **GR**
- Markochick, D. J., Lanham, R. E., Bucurel, H. G., and Law, B. E., 1982, Summary chart of geological data from Amoco Tierney Unit 1 well, SW 1/4 SE 1/4 Sec. 15, T. 20N., R. 94 W., Sweetwater County, Wyoming: U.S. Geological Survey Oil and Gas Investigations Chart OC-116. **GR**
- Markochick, D. J., Law, B. E., and Spencer, C. W., 1982, Section E-E, preliminary subsurface correlations of some Cretaceous and Tertiary rocks from Moxa arch to Rock Springs Uplift, Green River Basin, Wyoming: U.S. Geological Survey Open-File Report 82-455. **GR**
- Marrs, R. W., and Raines, G. L., 1984, Tectonic framework of Powder River Basin, Wyoming and Montana, interpreted from Landsat imagery: American Association of Petroleum Geologists Bulletin, v. 68, no. 11, p. 1718–1731. **PR**
- Marsh, Steve, 1985, TRW Inc. seeking gas reserves in area near Glenwood Springs: Colorado Business Journal, v. 37, no. 8, p. 6. **PB**
- Marvin, R. F., Menhert, H. H., and Mountjoy, W. M., 1966, Age of basalt cap on Grand Mesa: U.S. Geological Survey Professional Paper 550-A, p. 81. **RB**
- Masszi, Denes, 1991, Cavity stress-relief method for recovering methane from coal seams, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 149–154.
- Masters, C. D., 1961, Fort Union Formation-eastern Sand Wash Basin, Colorado, *in* Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 125–128. **GR**, **PR**
- Masters, C. D., 1967, Use of sedimentary structures in determination of depositional environments, Mesaverde Formation, Williams Fork Mountains, Colorado: American Association of Petroleum Geologists Bulletin, v. 51, no. 10, p. 2033–2043. **PB**
- Masters, C. D., 1968, Geology of natural gas occurrence in Tertiary and Late Cretaceous rocks of Sand Wash Basin, Colorado and Wyoming, *in* Beebe, W. A., and Curtis, B. F., eds., Natural gases of North America: American Association of Petroleum Geologists Memoir 9, v.1, p. 866–877. **GR**
- Masters, C. D., and Mast, R. F., 1987, Geologic setting of U.S. fossil fuels: Episodes, v. 10, no. 4, p. 308–315. GR, PB, PR, RB, SJ
- Masters, J. A., 1952, The Frontier Formation of Wyoming, *in* Spalding, R. W., and Wold, J. S., eds., Southern Big

Horn Basin, Wyoming: Wyoming Geological Association Guidebook, 7th field conference, p. 58–62. **GR**

- Matson, R. E., 1971, Strippable coal in the Moorhead coal field Montana: Montana Bureau of Mines and Geology Bulletin 83, appendix 1. **PR**
- Matson, R. E., 1975, Strippable coal deposits, eastern Montana: Montana Geological Society, 22nd Annual Publication, Energy Resources of Montana, p. 113–124. **PR**
- Matson, R. E., and Pinchock, J. M., 1976, Geology of the Tongue River Member, Fort Union Formation of eastern Montana, *in* Murray, D. K., ed., Geology of Rocky Mountain coal: Colorado Geological Survey Resource Series 1, p. 91–114. **PR**
- Matthews, J. L., Emanuel, A. S., and Edwards, K. A., 1989, Fractal methods improve Mitsue miscible predictions, Journal of Petroleum Technology, v. 41, no. 11, p. 1136–1145. **GR, PB, PR, RB, SJ**
- Mattick, J. L., Duval, T. A., and Phillips, F. M., 1987, Quantification of groundwater recharge rates in New Mexico using bomb-36Cl, bomb-3H, and chloride as soilwater tracers: Las Cruces, New Mexico State University, New Mexico Water Resources Research Institute Report No. 220, 184 p. SJ
- Matuszczak, R. A., 1969, Trinidad Sandstone interpreted, evaluated, *in* Raton Basin, Colorado-New Mexico: Mountain Geologist, v. 6, no. 3, p. 119–124. **RB**
- Maughan, E. K., 1988, Regional Pennsylvanian and Permian tectonic movements and their effect on correlation of upper Paleozoic strata in the Powder River Basin and Black Hills, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 322. **PR**
- Mavor, M. J., and Close, J. C., 1989, Western Cretaceous coal seam project, evaluation of the cooperative research area Northeast Blanco Unit operated by Blackwood & Nichols Co., Ltd.: Topical report prepared for the Gas Research Institute (GRI-90/0041), 40 p. SJ
- Mavor, M. J., and Close, J. C., 1989, Western Cretaceous coal seam project, evaluation of the cooperative research well Colorado 32-7 #9 operated by Mobil Oil Corporation: Topical report prepared for the Gas Research Institute (GRI-90/0043), 18 p. **SJ**
- Mavor, M. J., and Close, J. C., 1989, Western Cretaceous coal seam project, evaluation of the cooperative research well Hamilton #3 operated by Mesa Operating Limited Partnership: Topical report prepared for the Gas Research Institute (GRI-90/0040), 21 p. SJ
- Mavor, M. J., and Close, J. C., 1989, Western Cretaceous coal seam project, evaluation of the cooperative research well Southern Ute-Mobil 36-1 operated by McKenzie Methane Cooperation: Topical report prepared for the Gas Research Institute (GRI-90/0042), 46 p. SJ

- Mavor, M. J., and Close, J. C., 1989, Western Cretaceous coal seam project, final project summary, January, 1988, to August 31, 1989: Final report prepared for the Gas Research Institute (GRI-90/0044), 28 p. **SJ**
- Mavor, M. J., Close, J. C., and McBane, R. A., 1990, Formation evaluation of exploration coalbed methane wells: CIM/SPE Paper 90-101. [Presented at the Petroleum Society of CIM and Society of Petroleum Engineers International Technical Meeting, Calgary, Alberta, Canada, June 10–13, 1990.] GR, PB, PR, RB, SJ
- Mavor, M. J., Close, J. C., and Pratt, T. J., 1991, Western Cretaceous coal seam project, annual report, 1990: Resource Enterprises, Inc., prepared for the Gas Research Institute under contract no. 5088-214-1657, 106 p. SJ
- Mavor, M. J., Dhir, Rahul, McLennan, J. D., and Close, J. C., 1991, Evaluation of the hydraulic fracture stimulation of the Colorado 32-7 No. 9 well, San Juan Basin, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 241-248. **SJ**
- McAda, D. P., and Shelton, S. G., 1987, Hydrologic data for the San Juan and Animas River valleys in the Farmington, Aztec, Bloomfield, and Cedar Hill area, San Juan County, New Mexico: U.S. Geological Survey Open-File Report 87-385, 18 p. **SJ**
- McBane, R. A., and Jeu, S. J., 1988, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 5, nos. 3 and 4, p. 31–32. **PB**
- McBane, R. A., and Jeu, S. J., 1988, Western Cretaceous coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 6, no. 1, p. 25–29. **SJ**
- McBane, R. A., and Jeu, S. J., 1988, Western Cretaceous coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 6, no. 2, p. 25-27. SJ
- McBane, R. A., and Mavor, M. J., 1989, Western Cretaceous coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 6, nos. 3 and 4, p. 21–27. SJ
- McCabe, P. J., 1984, Depositional environments of coal and coal-bearing strata, *in* Rahmani, R. A., and Flores, R. M., eds., Sedimentology of coal and coal-bearing sequences: International Association of Sedimentologists, Special Publication 7, p. 13. **GR**, **PB**, **PR**, **RB**, **SJ**
- McCarron, B. R., and Nelson, P. A., 1989, The Colorado and Rocky Mountain region natural gas industry—industry review and economic impacts: Business Research Corp. and Julander, Worster, and Associates, 46 p. **PB**
- McCarron, B. R., Worster, G. W., and Kastrinsky, Alan, 1989, Natural gas industry research series—the Rocky Mountain region report: Business Research Corp. and Julander, Worster, and Associates, 55 p. **PB**

McCaslin, J. C., 1984, Deep Raton Basin hole promises to be significant completion: Oil and Gas Journal, week of November 26, 1984, p. 119–120. **RB**

- McCaslin, J. C., 1988, Development key to San Juan basin future: Oil and Gas Journal, v. 86, no. 24 (June 13), p. 55. **SJ**
- McClurg, J. E., 1988, Peat forming wetlands and the thick Powder River Basin coals, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 229–236. PR
- McCord, J. P., 1988, Hydrogeology of a Fruitland Formation aquifer, San Juan Basin—New Mexico and Colorado, with emphasis on using temperature distribution data to estimate lateral groundwater velocity: New Mexico Institute of Mining and Technology, Masters thesis, 121 p. SJ
- McCord, J. P., 1980, Geological overview, coal, and coalbed methane resources of the Greater Green River coal region, Wyoming and Colorado: TRW Energy Systems Planning Division, report prepared for U.S. Department of Energy under contract no. DE-AC21-78MCO8089, 177 p. **GR**
- McCord, J. P., 1984, Geologic overview, coal, and coalbed methane resources of the Greater Green River coal region—Wyoming and Colorado, *in* Rightmire, C. T., Eddy, G. E., and Kirr, J. N., eds., Coalbed methane resources of the United States: American Association of Petroleum Geologists Studies in Geology 17, p. 271–293. GR
- McCord, John, 1980, Potential for coal-bed methane production from the Greater Green River coal region, *in* Carter, L. M., ed., Proceedings of the fourth symposium on the geology of Rocky Mountain coal: Colorado Geological Survey Resources Series 10, p. 65–68. **GR**
- McCubbin, D. G., and Brady, M. J., 1969, Depositional environment of the Almond reservoirs, Patrick Draw field, Wyoming: Mountain Geologist, v. 6, no. 1, p. 3–26. **GR**
- McCulloch, C. M., Deul, Maurice, and Jeran, P. W., 1974, Cleat in bituminous coalbeds: U.S. Bureau of Mines Report of Investigations No. 7910, 23 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- McCulloch, C. M., Diamond, W. P., Bench, B. M., and Deul, Maurice, 1975, Selected geological factors affecting mining of the Pittsburgh Coalbed: U.S. Bureau of Mines Report of Investigations No. 8093, 72 p. GR, PB, PR, RB, SJ
- McCulloch, C. M., Levine, J. R., Kissell, F. M., and Deul, M., 1975, Measuring the methane content of bituminous coal beds: U.S. Bureau of Mines Report of Investigations 8043, 22 p. **RB**
- McDonald, R. E., 1972, Paleocene and Eocene rocks of the central and southern Rocky Mountain basins, *in*Mallory,

- W. W., ed., Geologic atlas of the Rocky Mountain region: Rocky Mountain Association of Geologists, p. 243–256. **GR**
- McDonald, R. E., 1973, Big Piney-La Barge producing complex, Sublette and Lincoln Counties, Wyoming, *in* Schell, E. M., ed., Core seminar on the geology and mineral resources of the Greater Green River Basin: Wyoming Geological Association Guidebook, twenty-fifth field conference, p. 57–77. **GR**
- McDonald, R. E., 1973, Big Piney-La Barge producing complex, Sublette and Lincoln Counties, Wyoming: American Association of Petroleum Geologists Memoir 24, p. 91–120. **GR**
- McDonald, R. E., 1975, Structure, correlation and depositional environments of the Tertiary, Sand Wash and Washakie Basins, Colorado and Wyoming, *in* Bolyard, D. W., ed., Deep drilling frontiers of the central Rocky Mountains: Rocky Mountain Association of Geologists, p. 175–184. **GR**
- McFall, K. S., Wicks, D. E., Kelso, B. S., and Brandenburg, C. F., 1988, An analysis of the coal-seam gas resource of the Piceance Basin, Colorado: Journal of Petroleum Technology, v. 40, no. 6, p. 740–748. **PB**
- McFall, K. S., Wicks, D. E., Kelso, B. S., Sedwick, K. B., and Brandenburg, C., 1987, An analysis of the coal and coalbed methane resources of the Piceance Basin, Colorado: Society of Petroleum Engineers, SPE/DOE Paper 16418, p. 283–295. **PB**
- McFall, K. S., Wicks, D. E., Kuuskraa, V. A., and Sedwick, K. B., 1986, A geologic assessment of natural gas from coal seams in the Piceance Basin, Colorado: ICF Resources-Lewin and Associates and Colorado Geological Survey, topical report prepared for the Gas Research Institute under contract no. 5084-214-1066, 75 p. **PB**
- McFall, K. S., Wicks, D. E., Kuuskraa, V. A., and Sedwick, K. B., 1986, A geologic assessment of natural gas from coal seams in the Piceance Basin, Colorado: Report prepared for the Gas Research Institute (GRI-87/0060), 76 p. **PB**
- McGinnis, C. J., ed., 1956, Geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists Guidebook, 148 p. **RB**
- McGonigle, J. W., 1979, Preliminary geologic map of the Elkol quadrangle, Lincoln County, southwestern Wyoming: United States Geological Survey Open-File Report 79-1150, scale 1:24,000. **GR**
- McGonigle, J. W., 1980, Geologic and geochemical results of 1987 coal exploratory drilling in the Upper Cretaceous Frontier Formation, at six sites in Lincoln and Uinta Counties, Wyoming: United States Geological Survey Open-File Report 80-1224, 46 p. **GR**
- McGookey, D. P., Haun, J. D., Hale, L. A., Goodell, H. G., McCubbin, D. G., Weimer, R. J., and Wulf, G. R., 1972, Cretaceous system, *in* Mallory, W. W., ed., Geologic atlas of the Rocky Mountain region: Rocky Mountain

Association of Geologists, p. 190–229. **GR**, **PB**, **RB**, **SJ**

- McGowen, J. H., 1968, Utilization of depositional models in exploration from nonmetallic minerals, *in* Brown, L. F., Jr., ed., Proceedings, fourth forum on geology of industrial minerals: The University of Texas at Austin, Bureau of Economic Geology, p. 157–174. **GR**, **PB**, **PR**, **RB**, **SJ**
- McGrew, P. O., 1971, The Tertiary history of Wyoming, *in* Renfro, A. R., ed., Wyoming Geological Association Guidebook, twenty-third field conference, p. 71–80. **GR**, **PR**
- McKay, E. J., 1973, Preliminary geologic map of the Rawhide School quadrangle, Campbell County, Wyoming: U.S. Geological Society Open-File Report, scale 1:24,000. **PR**
- McKee, C. R., Bumb, A. C., and Horner, D. M., 1988, Use of barometric response to obtain in-situ compressibility of a coalbed methane reservoir: Society of Petroleum Engineers, SPE Paper 17725, p. 209–214. **GR**, **PB**, **PR**, **RB**, **SJ**
- McKee, C. R., Bumb, A. C., and Koenig, R. A., 1987, Stress-dependent permeability and porosity in coal, *in* Proceedings of the 1987 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, p. 183–193. **GR**, **PB**, **PR**, **RB**, **SJ**
- McKee, C. R., Bumb, A. C., and Koenig, R. A., 1988, Stress dependent permeability and porosity of coal and other geologic formations: Society of Petroleum Engineers, SPE Formation Evaluation, v. 3, no. 1, p. 81–91. **GR, PB, PR, RB, SJ**
- McKee, C. R., Bumb, A. C., Way, S. C., Koenig, R. A., Reverand, J. M., and Brandenburg, C. F., 1986, Using permeability-vs-depth correlation to assess the potential for producing gas from coal seams: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 1, p. 15–26. **GR, PB, PR, RB, SJ**
- McLaughlin, T. G., 1966, Groundwater in Huerfano County, Colorado: U.S. Geological Survey Water-Supply Paper 1805, 91 p. **RB**
- McLellan, M. W., 1981, Geologic map and coal resources of the Leslie Creek quadrangle, Powder River County, Montana, U.S. Geological Survey Miscellaneous Field Studies Map MF-1296, scale 1:24,000. **PR**
- McLellan, M. W., and Biewick, L. H., *in* press, Stratigraphic framework of the Paleocene coal beds in the Broadus 30' x 60' quadrangle, Powder River Basin: U.S. Geological Survey Coal Map C-119A, scale 1:100,000. **PR**
- McLellan, M. W., Biewick, L. H., Molnia, C. L., and Peirce, F. W., *in* press, Coal stratigraphy of northern and central Powder River Basin, Montana and Wyoming: U.S. Geological Survey Miscellaneous Investigations Map. **PR**

- McPeek, L. A., 1981, Eastern Green River Basin: a developing giant gas supply from deep, overpressured Upper Cretaceous sandstones: American Association of Petroleum Geologists Bulletin, v. 65, no. 6, p. 1078–1098. **GR**
- Medlin, W. L., and Fitch, J. L., 1988, Abnormal treating pressures in massive hydraulic fracturing treatments: Journal of Petroleum Technology, v. 40, no. 5, p. 633–642. **GR**
- Meissner, F. F., 1978, Patterns of source-rock maturity in nonmarine source-rocks of some typical Western Interior basins, *in* Nonmarine Tertiary and Upper Cretaceous source rocks and the occurrence of oil and gas in west central U.S.: Rocky Mountain Association of Geologists Continuing Education Lecture Series, p. 1– 37. **GR**, **PB**, **PR**, **RB**, **SJ**
- Meissner, F. F., 1984, Cretaceous and Lower Tertiary coals as sources for gas accumulations in the Rocky Mountain area, *in* Woodward, J., Meissner, F. F., and Clayton, J. L., eds., Hydrocarbon source rocks of the greater Rocky Mountain region: Rocky Mountain Association of Geologists, p. 401–431. **GR**, **PB**, **PR**, **RB**, **SJ**
- Meissner, F. F., 1984, Cretaceous and lower Tertiary coals as sources for gas accumulations in the Rocky Mountain area, *in* Woodward, Jane, Meissner, F. F., and Clayton, J. L., eds., Hydrocarbon source rocks of the greater Rocky Mountain region: Rocky Mountain Association of Geologists, p. 401–431. **GR**, **PB**, **PR**, **RB**, **SJ**
- Meissner, F. F., 1987, Mechanisms and patterns of gas generation and expulsion—migration and accumulation associated with coal measures, Green River and San Juan Basins, Rocky Mountain region, USA, *in* Doligez, Brigitte, ed., Migration of hydrocarbons in sedimentary basins: Paris, Editions Technip, p. 79–112. **GR**, **SJ**
- Meissner, F. F., Woodward, Jane, and Clayton, J. L., 1984, Stratigraphic relationships and distribution of source rocks in the greater Rocky Mountain region, *in* Woodward, Jane, Meissner, F. F., and Clayton, J. L., eds., Hydrocarbon source rocks of the greater Rocky Mountain region: Rocky Mountain Association of Geologists, p. 1–34. **GR, PB, PR, RB, SJ**
- Merewether, E. A., 1983, The Frontier Formation and Mid-Cretaceous orogeny in the foreland of southwestern Wyoming: Mountain Geologist, v. 20, no. 4, p. 121-138. **GR**
- Merewether, E. A., 1987, Plays for oil and gas in the Raton Basin, south-central Colorado and northeastern New Mexico: U.S. Geological Survey Open-File Report 87-450A, p. 1–23. **RB**
- Merewether, E. A., and Cobban, W. A., 1986, Biostratigraphic units and tectonism in the Mid-Cretaceous foreland of Wyoming, Colorado, and adjoining areas, *in* Peterson, J. A., ed., Paleotectonics and sedimentation in the Rocky Mountain region, United States: American Association of Petroleum Geologists Memoir 41, p. 443–468. **GR, PB, PR**
- Merewether, E. A., Blackmon, P. D., and Webb, J. C., 1984, The Mid-Cretaceous Frontier

Formation near the Moxa Arch, southwestern Wyoming: U.S. Geological Survey Professional Paper 1290, 29 p. **GR**

- Merewether, E. A., Krystinik, K. B., and Pawlewicz, M. J., 1987, Thermal maturity of hydrocarbon-bearing formations in southwestern Wyoming and northwestern Colorado: U.S. Geological Survey Miscellaneous Investigations Map I-1831, scale 1:1,000,000. GR, PB
- Merin, I. S., Everett, J. R, and Rose, P. R., 1988, Tectonic evolution and structural geology of the Raton Basin, Colorado and New Mexico, and Huerfano Park, Colorado, *in* Sloss, L. L., ed., Sedimentary cover—North American Craton, U.S.: Geological Society of America, Decade of North American Geology, v. D-2, p. 170–179. **RB**
- Merriam, D. F., 1954, Tertiary geology of the Piceance Basin, northwestern Colorado: Compass, v. 31, no. 3, p. 155-171. **PB**
- Merry, R. D., and Larsen, V. E., 1982, Geologic investigation of the methane potential of western U.S. coalbeds: Final report prepared for the Gas Research Institute under contract no. CE-807083, 155 p. GR, PB, PR, RB, SJ
- Merry, R. D., and Larsen, V. E., 1985, Thermal maturity of Bowie coals in southern portion of Piceance Basin, Colorado (abs.): American Association of Petroleum Geologists Bulletin, v. 69, no. 5, p. 857. **PB**
- Merschat, W. R., 1985, Lower Cretaceous paleogeography, Big Muddy-south Glenrock area, southwest Powder River Basin, Wyoming, *in* Nelson, G. E., ed., The Cretaceous geology of Wyoming: Wyoming Geological Association Guidebook, 36th field conference, p. 81. PR
- Merschat, W. R., 1988, Applications of surface geochemical techniques for mapping methane associated with near-surface coal deposits (abs.), *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin-Black Hills: Wyoming Geological Association Guidebook, thirty-ninth conference, Casper, Wyoming, Sept. 9–11, 1988, p. 322. **PR**
- Meyer, R. F., 1966, Geology of Pennsylvanian and Wolfcampian rocks in southeast New Mexico: New Mexico Bureau of Mines and Mineral Resources Memoir 17, 123 p.
- Michael, R. C., and Merin, I. S., 1986, Tectonic framework of Powder River Basin, Wyoming and Montana, interpreted from Landsat imagery: discussion: American Association of Petroleum Geologists Bulletin, v. 70, no. 4, p. 453–455. **PR**
- Miles, O. P., Jr., 1963, Kummerfeld field, *in* Cooper, G. C., and others, eds., Northern Powder River Basin, Wyoming and Montana: Wyoming Geological Association and Billings Geological Society Guidebook, first joint field conference, p. 125–128. **PR**

- Miller, D. N., Jr., 1978, Wyoming coal fields: Wyoming Geological Survey Public Information Circular 9, 88 p. **GR**, **PR**
- Miller, D. N., Jr., and VerPloeg, A. J., 1980, Tight gas sand inventory of Wyoming: Geological Survey of Wyoming Open-File Report WGS 81-1, 20 p. **GR**
- Miller, F. X., 1977, Biostratigraphic correlation of the Mesaverde Group in Southwestern Wyoming and northwestern Colorado, *in* Veal, H. K., ed., Exploration frontiers of the central and southern Rockies, Rocky Mountain Association of Geologists Symposium, p. 117–137. **GR**, **PB**
- Millison, C., 1962, Accumulation of oil and gas in northwestern Colorado controlled principally by stratigraphic variations, *in* Amuedo, C. L., and Mott, M. R., eds., Exploration for oil and gas in northwestern Colorado: Rocky Mountain Association of Geologists, p. 41–48. **PB**
- Millison, C., 1965, Powder Wash field, Moffat County, Colorado: Mountain Geologist, v. 2, no. 3, p. 173–179. **GR**
- Mitchell, J. G., Greene, J., and Gould, D. B., compilers, 1956, Catalog of stratigraphic names used in Raton Basin and vicinity, *in* McGinnis, C. J., ed., Geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists Guidebook, p. 131–135. **RB**
- Mitra, S., 1987, Regional variations in deformation mechanisms and structural styles in the central Appalachian orogenic belt: Geological Society of America Bulletin, v. 98, no. 5, p. 569–590.
- Molenaar, C. M., 1977, San Juan Basin time-stratigraphic nomenclature chart, *in* Fassett, J. E., ed., San Juan Basin III: New Mexico Geological Society, 28th field conference guidebook, p. xii. **SJ**
- Molenaar, C. M., 1977, Stratigraphy and depositional history of Upper Cretaceous rocks of the San Juan Basin area, New Mexico and Colorado, with a note on economic resources, *in* Fassett, J. E., ed., San Juan Basin III: New Mexico Geological Society, 28th field conference guidebook, p. 159–166. **SJ**
- Molenaar, C. M., 1983, Time-stratigraphic nomenclature chart for the San Juan basin, *in* Fassett, J. E., ed., Oil and gas fields of the Four Corners area: Four Corners Geological Society, p. 830. **SJ**
- Molenaar, C. M., 1988, Stratigraphic cross section showing upper Cretaceous rocks across the San Juan Basin, New Mexico and Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 21. SJ
- Molenaar, C. M., and Baird, J. K., 1989, North-south stratigraphic cross-sections of Upper Cretaceous rocks, northern San Juan Basin, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-2068, scale 1:633,600, 3 sheets. **SJ**

Molenaar, C. M., and Rice, D. D., 1988, Cretaceous rocks of the Western Interior basin, *in* Sloss, L. L., ed., Sedimentary cover—North American Craton, U.S.: Geological Society of America, Decade of North American Geology, v. D-2, p. 77–82. **GR**, **PB**, **PR**, **RB**, **SJ**

- Molenaar, C. M., Powers, R. B., Bostick, N. H., and Jacob, A. F., 1984, Road log, second day—Pueblo to northern Raton Basin, *in* Woodward, Jane, Meissner, F. F., and Clayton, J. L., eds., Hydrocarbon source rocks of the greater Rocky Mountain Region: Rocky Mountain Association of Geologists, p. 548–557. **RB**
- Momper, J. A., and Williams, J. A., 1984, Geochemical exploration in the Powder River Basin, *in* Demaison, Gerard, and Murris, R. J., eds., Petroleum geochemistry and basin evaluation: American Association of Geologists Memoir 35, p. 181–191. **PR**
- Moore, B. J., and Sigler, Stella, 1987, Analyses of natural gases, 1917-1985: U.S. Bureau of Mines Information Circular 9129, 1197 p. GR, PB, PR, RB, SJ
- Moore, T. A., 1986, Characteristics of coal bed splitting in the Anderson-Dietz coal seam (Paleocene), Powder River Basin, Montana: University of Kentucky, Master's thesis. **PR**
- Moore, T. A., Stanton, R. W., Flores, R. M., and Pocknal, D. T., 1987, Organic petrography, palynology, and sedimentology of the Smith and Anderson coal beds (Paleocene), Powder River Basin, Wyoming and Montana (abs.): Society for Organic Petrologists 4th Annual Meeting, Abstracts and Programs, p. 3–5. **PR**
- Moore, T. A., Stanton, R. W., Pocknall, D. T., and Flores, R. M., 1990, Maceral and palynomorph facies from two Tertiary peat-forming environments in the Powder River Basin, U.S.A.: International Journal of Coal Geology, v. 15, no. 4, p. 293–316. **PR**
- Moore, W. R., 1986, North Fork and Cellars Ranch fields, Johnson County, Wyoming: example of late Permian tectonism and resultant differential sedimentation—reply, *in* Noll, J. H., and Doyle, K. M., eds., Rocky Mountain oil and gas fields: Wyoming Geological Association Symposium, p. 217–231. **PR**
- Morton, R. A., and Land, L. S., 1987, Regional variations in formation water chemistry, Frio Formation (Oligocene), Texas Gulf Coast: American Association of Petroleum Geologists Bulletin, v. 71, no. 2, p. 191– 206.
- Moslow, T. F., and Tillman, R. W., 1986, Sedimentary facies and reservoir characteristics of Frontier Formation sandstones, southwestern Wyoming, *in* Spencer, C. W., and Mast, R. F., eds., Geology of tight gas reservoirs: American Association of Petroleum Geologists Studies in Geology 24, p. 271–295. **GR**
- Moslow, T. F., and Tillman, R. W., 1989, Characterization, distribution of Frontier Formation reservoir facies of Wyoming fields: Oil and Gas Journal, v. 87, no. 22, p. 95-103. **GR**
- Mrak, V. A., 1958, Uranium deposits in the Tertiary sediments of the Powder River Basin, Wyoming, *in* Strick-

- land, John, ed., Powder River Basin: Wyoming Geological Association Guidebook, thirteenth field conference, p. 233–240. **PR**
- Mroz, T. H., Ryan, J. G., and Byrer, C. W., eds., 1983, Methane recovery from coalbeds: a potential energy source: U.S. Department of Energy, Office of Fossil Energy report no. DOE/METC-83-76, 458 p. **RB**
- Mullen, M. J., 1988, Log evaluation in wells drilled for coal-bed methane, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 113–124. **SJ**
- Mullen, M. J., 1991, Cleat detection in coalbeds using the microlog, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 137–147. **GR**, **PB**, **PR**, **RB**, **SJ**
- Muller, O. H., 1986, Changing stresses during emplacement of the radial dike swarm at Spanish Peaks, Colorado: Geology, v. 14, p. 157-159. **RB**
- Muller, O. H., and Pollard, D. D., 1977, The stress state near Spanish Peaks, Colorado, determined from a dike pattern: Pure and Applied Geophysics, v. 115, p. 69–86. **RB**
- Muñoz-Espinoza, R. E., 1968, Fracture finding by structural curvature mapping: The University of Texas at Austin, Masters thesis, 44 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Murray, D. K., ed., 1974, Energy resources of the Piceance Creek Basin, Colorado: Rocky Mountain Association of Geologists, twenty-fifth field conference, 293 p. **PB**
- Murray, D. K., 1981, Methane from coal beds—a significant undeveloped source of natural gas: Colorado School of Mines Research Institute, 37 p. GR, PB, PR, RB, SJ
- Murray, D. K., 1981, Upper Cretaceous (Campanian) coal resources of western Colorado, *in* Epis, R. C., and Callender, J. F., eds., Western Slope Colorado: New Mexico Geological Society Guidebook, thirty-second field conference, p. 233–239. **PB**
- Murray, D. K., 1985, Raton Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 3, no. 2, p. 16–17. **RB**
- Murray, D. K., 1989, Coalbed methane resources of Colorado, *in* Lorenz, J. C., and Lucas, S. G., eds., Energy frontiers in the Rockies: Albuquerque Geological Society, p. 65–67. **PB**, **RB**, **SJ**
- Murray, D. K., and Haun, J. D., 1974, Introduction to the geology of the Piceance Creek Basin and vicinity, northwestern Colorado, *in* Murray, D. K., ed., Energy resources of the Piceance Creek Basin, Colorado: Rocky Mountain Association of Geologists, twenty-fifth field conference, p. 29–39. **PB**
- Murray, D. K., Fender, H. B., and Jones, D. C., 1977, Coal and methane gas in the southeastern part of the Piceance Creek Basin, Colorado, *in* Veal, H. K., ed.,

(Murray, D. K. and others, continued) Exploration frontiers of the central and southern Rockies, Rocky Mountain Association of Geologists Symposium, p. 379–405. **PB**

- Murray, D. K., Tremain, C. M., and Wise, R. L., 1979, Evaluation of the methane content and resources of Colorado coals: Proceedings, Second Annual Symposium on Methane Recovery from Coalbeds, p. 194–214. **PB**, **RB**, **SJ**
- Murray, F. N., 1967, Jointing in sedimentary rocks along the Grand Hogback monocline, Colorado: Journal of Geology, v. 75, no. 3, p. 340–350. **PB**
- Murray, G. H., 1968, Quantitative fracture study—Sanish pool, McKenzie County, North Dakota: American Association of Petroleum Geologists Bulletin, v. 52, p. 57–65. **GR, PB, PR, RB, SJ**
- Myal, F. R., Price, E. H., Hill, R. E., Kukal, G. C., Abadie, P. A., and Riecken, C. C., 1989, Geologic and production characteristics of the tight Mesaverde group—Piceance basin, Colorado: Report prepared for U.S. Department of Energy, Morgantown Energy Technology Center, under contract DE-AC21-88MC24120, 123 p. **PB**
- Myers, R. C., 1977, Stratigraphy of the Frontier Formation (Upper Cretaceous), Kemmerer area, Lincoln County, Wyoming, *in* Heisey, E. L., and others, eds., Rocky Mountain thrust belt, geology and resources: Wyoming Geological Association Guidebook, twentyninth field conference, p. 271–311. **GR**
- Mytton, J. W., and Schneider, G. B., 1987, Interpretive geology of the Chaco area, northwestern New Mexico: U.S. Geological Survey Miscellaneous Investigation Series Map I-1777, scale 1:24,000. **SJ**

N

- Naeser, N. D., 1989, Thermal history and provenance of rocks in the Wagon Wheel No. 1 well, Pinedale Anticline, northern Green River Basin—evidence from fission-track dating, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. E1–E13. **GR**
- National Oceanic and Atmospheric Administration, U.S. Department of Commerce (NOAA), 1974, Climates of the States: New York, Water Information Center, Inc., v. II, p. 481–975. **GR**, **PB**, **PR**, **RB**, **SJ**
- National Petroleum Council, 1980, Unconventional gas sources, tight gas reservoirs: v. 5, part II, p. 10-1–19-24. **GR**
- Nelms, C. A., 1976, Application of electrical well log techniques to identifying coal beds in the Powder River Basin, Wyoming: U.S. Geological Survey Open-File Report 76-581, 20 p. **PR**
- Nelson, R. A., 1985, Geologic analysis of naturally fractured reservoirs: Houston, Gulf Publishing, 320 p. GR, PB, PR, RB, SJ
 - Nelson, R. A., Lenox, L. C., and Ward, B. J.,

- 1987, Oriented core: its use, error, and uncertainty: American Association of Petroleum Geologists Bulletin, v. 71, p. 357–368. **GR**, **PB**, **PR**, **RB**, **SJ**
- Neuman, S. P., and Witherspoon, P. A., 1970, Finite element method of analyzing steady seepage with a free surface: Water Resources Research, v. 6, no. 3, p. 889–897. **GR**, **PB**, **PR**, **RB**, **SJ**
- Newman, K. R., 1987, Biostratigraphic correlation of Cretaceous-Tertiary boundary rocks, Colorado to San Juan Basin, New Mexico, *in* Fassett, J. E., and Rigby, J. K., Jr., eds., The Cretaceous-Tertiary boundary in the San Juan and Raton Basins, New Mexico and Colorado: Geological Society of America Special Paper 209, p. 151–164. **SJ**
- Newman, K. R., and McCord, J. P., 1980, Detailed site investigation, northern San Juan Basin: Unpublished report to TRW for U.S. Department of Energy [available for inspection at the Colorado Geological Survey, Denver, Colorado, variously paginated]. SJ
- Nichols, D. J., Wolfe, J. A., and Pocknall, D. T., 1989, Latest Cretaceous and early Tertiary history of vegetation in the Powder River basin, Montana and Wyoming, *in* Tertiary and Cretaceous coals in the Rocky Mountains: American Geophysical Union, Field Trip Guidebook T132, p. 28–33. **PR**
- Nikols, D. J., and Rottenfusser, B. A., 1991, Coalbed methane—a Canadian resource for the 1990s, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 249–254.
- Noll, J. H., and Doyle, K. M., eds., 1986, Rocky Mountain oil and gas fields: Wyoming Geological Association Symposium, p. 256. **GR**, **PB**, **PR**, **RB**, **SJ**
- North, F. K., 1985, Petroleum geology: Boston, Allen & Unwin, 607 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Northrop, D. A., 1990, Background and summary, Multiwell Experiment final report, part IV. The fluvial interval of the Mesaverde Formation: Sandia National Laboratories Report SAND 89-2612/A, p. 1.0–1.27. **PB**
- Northrop, D. A., 1990, Enhanced gas recovery bibliography, December 1975 through December 1989: Sandia National Laboratories Report SAND 90-0759 (April), 32 p. **PB**
- Novak, S. A., and Eckstein, Y., 1988, Hydrochemical characterization of brines and identification of brine contamination in aquifers: Ground Water, v. 26, no. 3, p. 317–324. **GR, PB, PR, RB, SJ**
- Nowak, H. C., 1991, Depositional environments and stratigraphy of Mesaverde Formation, southeastern Piceance Basin, Colorado—implications for coalbed methane exploration, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 1–20. **PB**

Nuccio, V. F., 1990, Burial, thermal, and petroleum generation history of the Upper Cretaceous Steele Member of the Cody Shale (Shannon Sandstone bed horizon), Powder River Basin, Wyoming: U.S. Geological Survey Bulletin 1917-A, p. 1–17. **PR**

- Nuccio, V. F., 1990, Determination of source-rock thermal maturity by direct measurements and predictive modeling—application to Upper Cretaceous Cody Shale, Powder River basin, Wyoming, *in* Nuccio, V. F., and Barker, C. E., eds., Application of thermal maturity studies to energy exploration: Society of Economic Paleontologists and Mineralogists, Rocky Mountain Section, p. 167–175. **PR**
- Nuccio, V. F., and Johnson, R. C., 1981, Map showing drill stem test and perforation recoveries of the Upper Cretaceous Mesaverde Group, Piceance Creek Basin, Colorado: U.S. Geological Society Miscellaneous Field Studies Map MF-1359, scale 1: 250,000. **PB**
- Nuccio, V. F., and Johnson, R. C., 1983, Preliminary thermal maturity map of the Cameo-Fairfield or equivalent coal zone in the Piceance Creek Basin, Colorado: U.S. Geological Society Miscellaneous Field Studies Map MF-1575, scale 1:253,440. **PB**
- Nuccio, V. F., and Johnson, R. C., 1988, Surface vitrinitereflectance map of the Uinta, Piceance, and Eagle basins area, Utah and Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-2008-B, scale 1:5,000,000. **PB**, **UB**
- Nuccio, V. F., and Johnson, R. C., 1989, Thermal history of selected coal beds in the Upper Cretaceous Mesaverde Group and Tertiary Wasatch Formation, Multiwell Experiment site, Colorado, *in* relation to hydrocarbon generation, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. L1–L8. **PB**
- Nuccio, V. F., and Schenk, C. J., 1986, Thermal maturity and hydrocarbon source-rock potential of the Eagle Basin, northwest Colorado, *in* Stone, D. S., ed., New interpretations of northwest Colorado geology: Rocky Mountain Association of Geologists, p. 259-264. **PB**
- Nur, Amos, 1982, The origin of tensile fracture lineaments: Journal of Structural Geology, v. 4, p. 31--0. **GR**, **PB**, **PR**, **RB**, **SJ**

\mathbf{O}

- O'Leary, D. W., Friedman, J. D., and Pohn, H. A., 1976, Lineament and linear, a terminological reappraisal, *in* Podwysocki, M. H., and Earle, J. L., eds., Proceedings, 2nd International Conference on Basement Tectonics: Denver, Basement Tectonics Committee, p. 571–577. **GR, PB, PR, RB, SJ**
- O'Sullivan, R. O., and Beikman, H. M. (compilers), 1963, Geology, structure and uranium deposits of the Shiprock quadrangle, New Mexico and Arizona: U.S.

- Geological Survey Miscellaneous Geologic Investigations Map I-345. SJ
- Obernyer, Stan, 1977, Basin margin depositional environments of the Wasatch Formation in the Buffalo-Lake de Smet area, Johnson County, Wyoming, *in* Hodgson, H. E., ed., Proceedings of the second symposium on the geology of Rocky Mountain Coal—1977: Colorado Geologic Survey Resource Series 4, p. 49–65. PR
- Obernyer, S. L., 1980, The Lake de Smet coal seam: the product of active basin-margin sedimentation and tectonics in the Lake de Smet area, Johnson County, Wyoming, during Eocene Wasatch time, *in* Glass, G. B., ed., Guidebook to the coal geology of the Powder River coal basin, Wyoming: Geological Survey of Wyoming Public Information Circular 14, p. 31–70. PR
- Ode, H., 1957, Mechanical analysis of the dike pattern of the Spanish Peaks, Colorado: Geological Society of America Bulletin, v. 68, p. 567–575. **RB**
- Oil and Gas Journal, 1989, Coal seam gas eyed in Raton, Warrior Basins: v. 87, no. 26, p. 22. **RB**
- Oil and Gas Journal, 1990, Study of San Juan Basin coalbed methane begins: Oil and Gas Journal, v. 88, no. 26, p. 19. **SJ**
- Oldaker, P. R., 1990, Hydrogeology of the Fruitland Formation, San Juan Basin, Colorado and New Mexico: Paper presented at The Coalbed Methane Forum, Lakewood, Colorado, February 22, 1990, unpaginated. SJ
- Oldland, S. K., Patterson, P. E., and Gustason, E. R., 1988, Amos Draw field: a diagenetic trap related to an intraformational unconformity in the Muddy Sandstone, Powder River Basin, Wyoming, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 147. **PR**
- Olive, W. W., 1957, The Spotted Horse coal field, Sheridan and Campbell Counties, Wyoming: U.S. Geological Survey Bulletin 1050, p. 83. **PR**
- Olson, Jon, and Pollard, D. D., 1989, Inferring paleostresses from natural fracture patterns: a new method: Geology, v. 17, no. 4, p. 345–347. **GR**, **PB**, **PR**, **RB**, **SJ**
- Oriel, S. S., 1962, Main body of Wasatch Formation near La Barge, Wyoming: American Association of Petroleum Geologists Bulletin, v. 62, p. 2161–2173. **GR**
- Orth, C. J., Gilmore, J. S., and Knight, J. D., 1987, Iridium anomaly at the Cretaceous-Tertiary boundary in the Raton Basin, *in* Lucas, S. G., and Hunt, A. P., eds., Northeastern New Mexico: New Mexico Geological Society Guidebook, thirty-eighth field conference, p. 265–269. **RB**

Orth, C. J., Gilmore, J. S., Knight, J. D., Pillmore, C. L., Tschudy, R. H., and Fassett, J. E., 1981, An iridium abundance anomaly at the palynological Cretaceous-Tertiary boundary in northern New Mexico: Science, v. 214, p. 1341–1343. **RB**

- Owen, D. E., 1969, The Dakota Sandstone of the eastern San Juan and Chama Basins and its possible correlation across the southern Rocky Mountains: Mountain Geologist, v. 6, no. 3, p. 87–92. **SJ**
- Owen, D. E., 1973, Depositional history of the Dakota Sandstone, San Juan Basin area, New Mexico, *in* Fassett, J. E., ed., Cretaceous and Tertiary rocks of the southern Colorado Plateau: Four Corners Geological Society Memoir, p. 37–51. **SJ**
- Owen, L. B., 1988, Strain recovery measurements, Resource Enterprises, Inc. well: Blanco unit No. 403: Salt Lake City, TerraTek, Inc., unpaginated. SJ
- Owen, L. B., 1989, ASR measurements, Resource Enterprises, Inc. project number 5265 well: Colorado 32-7 #9: Salt Lake City, TerraTek, Inc., unpaginated. SJ

P

- Paape, D. W., 1968, Geology of Wind River Basin of Wyoming and its relationship to natural gas accumulation, *in* Beebe, B. W., and Curtis, B. F., eds., Natural gases of North America: American Association of Petroleum Geologists Memoir 9, v. 1, p. 760–779. **WR**
- Pait, E. D., 1982, The stratigraphy and facies relationships of some coal-bearing alluvial plain strata, Powder River Basin, Montana and Wyoming: North Carolina State University, Masters thesis. **PR**
- Palmer, J. J., and Scott, A. J., 1984, Stacked shoreline and shelf sandstone of La Ventana Tongue (Campanian), northwestern New Mexico: American Association of Petroleum Geologists Bulletin, v. 68, no. 1, p. 74–91. SI
- Pappajohn, S. P., and Mitchell. T. E., 1991, Delineation of prospective coalbed methane trends in western and central Washington State, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 163–178.
- Pasley, M. A., 1986, Fluorescent spectral types of the liptinite macerals from selected Colorado coals and their implications on coalification patterns (abs.): Society of Organic Petrography, 3d annual meeting abstracts and programs, p. 40–42. **PB**, **RB**, **SJ**
- Pasley, M. A., 1987, Fluorescent spectral types of liptinite macerals from selected Colorado bituminous coals: Southern Illinois University-Carbondale, Masters thesis, 139 p. **PB**, **RB**, **SJ**
- Paul, G. W., 1990, Coalbed methane simulation: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 4, p. 14–16. **GR**, **PB**, **PR**, **RB**, **SJ**

- Pawlewicz, M. J., 1984, Microlithotype analysis of three coals from the Upper Cretaceous Menefee Formation near Durango, Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 80–89. **SJ**
- Pawlewicz, M. J., 1984, Stratigraphy, environments of deposition, and petrography of selected coals from the Upper Cretaceous Menefee Formation near Durango, Colorado: Colorado School of Mines, unpublished Masters thesis, 112 p. **SJ**
- Pawlewicz, M. J., and Barker, C. E., 1989, Vitrinite reflectance of Tertiary coal across the surface of the northern Powder River Basin, Wyoming-Montana: Montana Geological Survey field conference, Montana Centennial, p. 341–351. **PR**
- Pawlewicz, M. J., Lickus, M. R., Law, B. E., Dickinson, W. W., and Barclay, C. S. V., 1986, Thermal maturity map showing subsurface elevation of 0.8 percent vitrinite reflectance in the Greater Green River Basin of Wyoming, Colorado, and Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1890, scale 1:500,000. **GR**
- Payne, J. B., and Scott, A. J., 1982, Late Cretaceous anastomosing fluvial systems, northwestern Colorado (abs.): American Association of Petroleum Geologists Bulletin, v. 66, no. 5, p. 616. **PB**
- Payne, M. A., Wolberg, D. L., and Hunt, A. A., 1982, Magnetostratigraphy of Raton and San Juan Basins, New Mexico: implications for synchroneity of Cretaceous-Tertiary boundary events: Geological Society of America Abstracts with Programs, v. 14, no. 7, p. 584.
- Payne, M. A., Wolberg, D. L., and Hunt, A. A., 1983, Magnetostratigraphy of a core from Raton Basin, New Mexico: implications for synchroneity of Cretaceous-Tertiary boundary events: New Mexico Geology, v. 5, no. 3, p. 41–44. **RB**
- Payne, M. A., Wolberg, D. L., and Hunt, A. A., 1983, Magnetostratigraphy of Raton Basin, New Mexico: implications for synchroneity of Cretaceous-Tertiary boundary events: Geological Society of America Abstracts with Programs, v. 15, no. 5, p. 308-309. **RB**
- Peffer, J. W., 1985, An improved method for calculating bottom-hole pressures in gas wells: The University of Texas at Austin, Master's thesis, 138 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Peffer, J. W., Miller, M. A., and Hill, A. D., 1986, An improved method for calculating bottom-hole pressures in flowing gas wells with liquid present: Richardson, Texas, Society of Petroleum Engineers, SPE Paper 15655, 6 p. GR, PB, PR, RB, SJ
- PennWell Maps, 1985, Oil and gas field map of the United States (2d ed.): scale 1:3,600,000. **GR**, **PB**, **PR**, **RB**, **SJ**

PennWell Maps, 1988, Natural gas pipelines of the United States and Canada (rev. 2d ed.): scale 1:3,600,000. **GR**, **PB**, **PR**, **RB**, **SJ**

- Petersen, K. M., 1991, Coalbed gas development in the western United States—an update, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 297–312. **GR**, **PB**, **PR**, **RB**, **SJ**
- Peterson, R. E., 1984, Geological and production characteristics of the nonmarine part of the Mesaverde group, Rulison field area, Piceance basin, Colorado: Society of Petroleum Engineers/Department of Energy/Gas Research Institute Paper 12835, 10 p. **PB**
- Peterson, V. E., 1955, Fracture production from the Mancos Shale, Rangely field, Rio Blanco County, Colorado, *in* Ritzmo, H. R., and Oriel, S. S., eds., Guidebook to the geology of northwest Colorado: Intermountain Association of Petroleum Geologists, Rocky Mountain Association of Geologists, p. 101–105. **PB**
- Petroleum Information Corporation, 1990, Rocky Mountain region—coalbed methane report, v. 1, nos. 2–12, variously paginated. GR, PB, PR, RB, SJ
- Petroleum Information Corporation, 1991, Pipelines: Rocky Mountain region report, vol. 64, no. 1, variously paginated. **GR, PB, PR, RB, SJ**
- Petroleum Information Corporation, 1991, Rocky Mountain region—coalbed methane report, v. 2, nos. 1–5, variously paginated. GR, PB, PR, RB, SJ
- Petzet, G. A., 1990, Devon pressing Fruitland coal seam program: Oil and Gas Journal, v. 88, no. 45, p. 28–30. SJ
- Phillips, F. M., and Tansey, M. K., 1984, An integrated isotopic/physical approach to a numerical model of groundwater flow in the San Juan Basin: Las Cruces, New Mexico State University, New Mexico Water Resources Research Institute Report No. 197, 146 p. SJ
- Phillips, F. M., Peeters, L. A., Tansey, M. K., and Davis, S. N., 1986, Paleoclimatic inferences from an isotopic investigation of groundwater in the central San Juan Basin, New Mexico: Quaternary Research, v. 26, p. 179– 193. SJ
- Phillips, F. M., Tansey, M. K., Peeters, L. A., Cheng, S., and Long, A., 1989, An isotopic investigation of ground-water in the central San Juan Basin, New Mexico: carbon 14 dating as a basis for numerical flow modeling: Water Resources Research, v. 25, no. 10, p. 2259–2273. SJ
- Pierce, F. W., and Johnson, E. A., 1988, Preliminary facies analysis of the sequence of rocks below the upper Wyodak coal bed, Paleocene Fort Union Formation, southeastern Powder River Basin, Wyoming (abs.): U.S. Geological Survey Circular 1025, p. 47. **PR**
- Pierce, F. W., and Molnia, C. L., 1985, Computer-assisted reconstruction of the stratigraphic framework of an

- Anderson coal deposit, Powder River Basin, Wyoming (abs.): American Association of Petroleum Geologists Bulletin, v. 69, no. 5, p. 859–860. **PR**
- Pierce, F. W., Johnson, E. A., Molnia, C. L., and Sigleo, W. R., *in* press, Coal stratigraphy of the southeastern Powder River Basin, Wyoming: U.S. Geological Survey Miscellaneous Investigations Map. **PR**
- Pierce, F. W., Kent, B. H., and Grundy, W. D., 1982, Geostatistical analysis of a 113-billion ton coal deposit, central part of the Powder River Basin, northeastern Wyoming, *in* Proceedings, 5th Rocky Mountain Coal Symposium, Utah Geological and Mineral Survey Bulletin 118, p. 262–272. **PR**
- Pillmore, C. L., 1969, Geologic map of the Casa Grande quadrangle, Colfax County, New Mexico, and Las Animas County, Colorado: U.S. Geological Survey, Geologic Quadrangle Map GQ-823, scale 1:62,500. RB
- Pillmore, C. L., 1969, Geology and coal deposits of the Raton coal field, Colfax County, New Mexico: Mountain Geologist, v. 6, no. 3, p. 125–142. **RB**
- Pillmore, C. L., 1976, Commercial coal beds of the Raton coal field, Colfax County, New Mexico, *in* Ewing, R. C., and Kues, B. S., eds., Vermejo Park, northeastern New Mexico: New Mexico Geological Society Guidebook, twenty-seventh field conference, p. 227–239. **RB**
- Pillmore, C. L., 1976, The York Canyon coal bed, *in* Ewing, R. C., and Kues, B. S., eds., Vermejo Park, northeastern New Mexico: New Mexico Geological Society Guidebook, twenty-seventh field conference, p. 249–251. **RB**
- Pillmore, C. L., 1976, Third day road log from Raton to Adams and Bartlett Lakes, Vermejo Park, New Mexico, through Trinidad coal field and Tercio Anticline, Colorado; return via Van Bremmer Canyon and Colfax, New Mexico, *in* Ewing, R. C., and Kues, B. S., eds., Vermejo Park, northeastern New Mexico: New Mexico Geological Society Guidebook, twenty-seventh field conference, p. 49–53. **RB**
- Pillmore, C. L., 1980, 1980 Romocoal field trip—generalized first day road log from Denver south through Castle Rock, Colorado Springs, Pueblo, and Trinidad, Colorado, to Raton, New Mexico, *in* Carter, L. M., ed., Proceedings on the Geology of Rocky Mountain Coal—1980: Colorado Geological Survey, p. 110–112. **RB**
- Pillmore, C. L., 1980, 1980 Romocoal field trip—second day road log from Raton to Vermejo Park through the Raton coal field via the York Canyon Mine, *in* Carter, L. M., ed., Proceedings on the Geology of Rocky Mountain Coal—1980: Colorado Geological Survey, p. 113–117. **RB**
- Pillmore, C. L., 1980, 1980 Romocoal field trip—third day road log from Raton to Cokedale over Raton Pass through the eastern part of the Trinidad coal field,

(Pillmore, C. L., 1980, continued) Colorado, *in* Carter, L. M., ed., Proceedings on the Geology of Rocky Mountain Coal—1980: Colorado Geological Survey, p. 118–132. **RB**

- Pillmore, C. L., and Flores, R. M., 1984, Field guide and discussions of coal deposits, depositional environments, and the Cretaceous-Tertiary boundary, southern Raton Basin, *in* Lintz, Joseph, Jr., ed., Western geological excursions: Geological Society of America annual meeting, v. 3, field trip 3, p. 1–9. **RB**
- Pillmore, C. L., and Flores, R. M., 1987, Stratigraphy and depositional environments of the Cretaceous-Tertiary boundary clay and associated rocks, Raton Basin, New Mexico and Colorado, *in* Fassett, J. E., and Rigby, J. K., Jr., eds., The Cretaceous-Tertiary boundary in the San Juan and Raton Basins, New Mexico and Colorado: Geological Society of America Special Paper 209, p. 111–130. **RB**
- Pillmore, C. L., and Flores, R. M., 1990, Cretaceous-Tertiary boundary in the Raton Basin, New Mexico and Colorado, *in* Bauer, P. W., and others, eds., Tectonic development of the southern Sangre de Cristo Mountains, New Mexico: New Mexico Geological Society Guidebook, forty-first field conference, p. 327–331. **RB**
- Pillmore, C. L., and Flores, R. M.,1990, Cretaceous and Paleocene rocks of the Raton Basin, New Mexico and Colorado—stratigraphic-environmental framework, *in* Bauer, P. W., and others, eds., Tectonic development of the southern Sangre de Cristo Mountains, New Mexico: New Mexico Geological Society Guidebook, forty-first field conference, p. 333–336. **RB**
- Pillmore, C. L., and Hatch, J. R., 1976, Geochemical data on selected coal beds, Raton coal field, Colfax County, New Mexico: U.S. Geological Survey Open-File Report 76-542, 26 p. **RB**
- Pillmore, C. L., and Maberry, J. O., 1976, The depositional environment and trace fossils of the Trinidad Sandstone, southern Raton Basin, New Mexico, *in* Ewing, R. C., and Kues, B. S., eds., Vermejo Park, northeastern New Mexico: New Mexico Geological Society Guidebook, twenty-seventh field conference, p. 191–195. **RB**
- Pillmore, C. L., Tschudy, R. H., Orth, C. L., Gilmore, J. S., and Knight, J. D., 1984, Geological framework of nonmarine Cretaceous-Tertiary boundary sites, Raton Basin, New Mexico and Colorado: Science, v. 223, no. 4641, p. 1180–1182. **RB**
- Pirson, S. J., 1977, Geologic well log analysis: Houston, Gulf Publishing Co., 370 p. GR, PB, PR, RB, SJ
- Pitman, J. K., and Dickinson, W. W., 1989, Petrology and isotope geochemistry of mineralized fractures in Cretaceous rocks—evidence for cementation in a closed hydrologic system, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Ex-

- periment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. J1–J15. **GR**, **PB**
- Pitman, J. K., and Johnson, R. C., 1978, Isopach, structure contour, isovalue, and isoresources maps of the Mahogany oil-shale zone, Piceance Creek Basin, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-958. **PB**
- Pitman, J. K., and Spencer, C. W., 1984, Petrology of selected sandstones in the MWX wells (northwestern Colorado) and its relation to borehole geophysics, log analysis, and reservoir quality, *in* Spencer, C. W., and Keighin, C. W., eds., Geological studies in support of the U.S. Department of Energy Multiwell Experiment, Garfield County, Colorado: U.S. Geological Survey Open-File Report 84-757, p. 33–66. **PB**
- Pitman, J. K., and Sprunt, E. S., 1984, Origin and occurrence of fracture-filling cements in the Upper Cretaceous Mesaverde Formation at MWX, Piceance Creek Basin, Colorado, *in* Spencer, C. W., and Keighin, C. W., eds., Geological studies in support of the U.S. Department of Energy Multiwell Experiment, Garfield County, Colorado: U.S. Geological Survey Open-File Report 84-757, p. 87–101. **PB**
- Pitman, J. K., and Sprunt, E. S., 1986, Origin and distribution of fractures in lower Tertiary and Upper Cretaceous rocks, Piceance Basin, Colorado, and their relation to the occurrence of hydrocarbons, *in* Spencer, C. W., and Mast, R. F., eds., Geology of tight gas reservoirs: American Association of Petroleum Geologists Studies in Geology 24, p. 221–233. **PB**
- Pitman, J. K., Anders, D. E., Rouch, T. D., and Nichols, D. J., 1986, Hydrocarbon potential of nonmarine Upper Cretaceous and lower Tertiary rocks, eastern Uinta Basin, Utah, *in* Spencer, C. W., and Mast, R. F., eds., Geology of tight gas reservoirs: American Association of Petroleum Geologists Studies in Geology 24, p. 235–252. **PB**, **UB**
- Plaizier, R. R., and Hucka, V. J., 1991, In situ determination of desorbable methane content by use of three decay functions, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 77–86. **GR**, **PB**, **PR**, **RB**, **SJ**
- Pocknall, D. T., 1987, Palynomorph biozones for the Fort Union and Wasatch Formations (upper Paleocenelower Eocene), Powder River Basin, Wyoming and Montana, U.S.A.: Palynology, v. 11, p. 23–35. **PR**
- Pocknall, D. T., and Flores, R. M., 1987, Coal palynology and sedimentology in the Tongue River Member, Fort Union Formation, Powder River Basin, Wyoming: PALAIOS, v. 2, no. 2, p. 133–145. **PR**
- Podwysocki, M. H., and Dutcher, R. R., 1971, Coal dikes that intrude lamprophyre sills, Purgatoire River Valley, Colorado: Economic Geology, v. 66, p. 456–466. RB

Pollard, D. D., and Aydin, A., 1988, Progress in understanding jointing over the past century: Geological Society of America Bulletin, v. 100, no. 8, p. 1181–1204. **GR, PB, PR, RB, SJ**

- Pollastro, R. M., 1989, Mineral composition, petrography, and diagenetic modifications of lower Tertiary and Upper Cretaceous sandstones and shales, northern Green River Basin, Wyoming, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. D1–D40. **GR**
- Pollastro, R. M., and Barker, C. E., 1984, Geothermometry from clay minerals, vitrinite reflectance, and fluid inclusions—applications to the thermal and burial history of rocks cored from the Wagon Wheel No. 1 well, Green River Basin, Wyoming, *in* Law, B. E., ed., Geological characteristics of low-permeability Upper Cretaceous and lower Tertiary rocks in the Pinedale Anticline area, Sublette County, Wyoming: U.S. Geological Survey Open-File Report 84-753, p. 78–94. **GR**
- Pollastro, R. M., and Pillmore, C. L., 1987, Mineralogy and petrology of the Cretaceous-Tertiary boundary clay bed and adjacent clay-rich rocks, Raton Basin, New Mexico: Journal of Sedimentary Petrology, v. 57, p. 456–466. **RB**
- Pollastro, R. M., Pillmore, C. L., Tschudy, R. H., Orth, C. L., and Gilmore, J. S., 1983, Clay petrology of the conformable Cretaceous-Tertiary boundary interval, Raton Basin, New Mexico and Colorado: 32nd Clay Minerals Conference, programs and abstracts, p. 83. RB
- Power, D. V., Schuster, C. L., Hay, R., and Twombly, J., 1976, Detection of hydraulic fracture orientation and dimensions in cased wells: Journal of Petroleum Technology, v. 28, no. 9, p. 1116–1124. **GR**
- Pratsch, J. C., 1985, Powder River Basin, Wyoming: structural development, hydrocarbon migration, and accumulation (abs.): American Association of Petroleum Geologists Bulletin, v. 69, no. 2, p. 298. PR
- Pratsch, J. C., 1986, The distribution of major oil and gas reserves in regional basin structures—an example from the Powder River Basin, Wyoming, USA: Journal of Petroleum Geology, v. 9, no. 4, p. 393–412. **PR**
- Prensky, S. E., 1988, Well-log determination of ash content in Fruitland Formation coals, Southern Ute Indian Reservation, southwestern Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 91–112. SJ
- Prensky, S. E., 1989, Catalog of drilling-mud-weight histories for selected wells, northern Green River Basin, Wyoming: U.S. Geological Survey Open-File Report 89-008, 213 p. **GR**

- Prensky, S. E., 1989, Gamma-ray well-log anomaly in the northern Green River Basin of Wyoming, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. H1–H21. **GR**
- Pritchard, R. L., 1972, The San Juan basin, *in* Mallory, W. W., ed., Geologic atlas of the Rocky Mountain region: Rocky Mountain Association of Geologists, p. 284–286. **SJ**
- Prucha, J. J., Graham, J. A., and Nickelsen, R. P., 1965, Basement-controlled deformation in Wyoming province of Rocky Mountain foreland: American Association of Petroleum Geologists, v. 49, p. 966–992. PR
- Purcell, T. E., 1961, The Mesaverde Formation of the northern and central Powder River Basin, Wyoming, *in* Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 219–228. **PR**
- Puri, R., and Yee, D., 1990, Enhanced coalbed methane recovery, *in* 1990 SPE Annual Technical Conference and Exhibition, September 23-26, 1990, New Orleans, Louisiana: Society of Petroleum Engineers, SPE Paper No. 20732, p. 193–202. **GR, PB, PR, RB, SJ**

Q

Quigley, M. D., 1965, Geologic history of Piceance Creek-Eagle Basins: American Association of Petroleum Geologists Bulletin, v. 49, no. 11, p. 1974–1996. **PB**

R

- Rahmani, R. A., and Flores, R. M., 1984, Sedimentology of coal and coal-bearing sequences of North America: a historical review, *in* Rahmani, R. A., and Flores, R. M., eds., Sedimentology of coal and coal-bearing sequences: International Association of Sedimentologists, Special Publication 7, p. 7. **GR**, **PB**, **PR**, **RB**, **SJ**
- Raines, G. L., Offield, T. W., and Santos, E. S., 1978, Remote-sensing and subsurface definition of facies and structure related to uranium deposits, Powder River Basin, Wyoming: Economic Geology, v. 73, p. 1706–1723. **PR**
- Raistrick, A., and Marshall, C. E., 1939, The nature and origin of coal and coal seams: London, The English Universities Press, p. 42–45. **GR, PB, PR, RB, SJ**
- Rakop, K. C., 1985, Special core analysis to characterize the Cameo coal seam, and the KWS sandstone for the Deep Seam Well, Piceance Basin, Colorado: Terra Tek, final report prepared for Resource Enterprises, Inc., report TR 85-73. **PB**
- Rakop, K., and Bell, G., 1986, Methane absorption/desorption isotherms for the Cameo coal seam deep well, Piceance Basin, Colorado: Terra Tek, final report prepared for Resource Enterprises, Inc. **PB**

Randall, A. G., 1961, Catalog of formation names for post-Niobrara pre-Eocene rocks of Wyoming and adjacent areas: Sedimentation of late Cretaceous and Tertiary outcrops, Rock Springs Uplift, *in* Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 9–15. **GR**

- Randall, A. G., 1989, Shallow Tertiary gas production, Powder River Basin, Wyoming, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 83–96. **PR**
- Randall, A. G., 1991, Shallow Tertiary gas production, Powder River Basin, Wyoming, *in* Proceedings of the 1991 Coalbed Methane Symposium: Tuscaloosa, University of Alabama, School of Mines and Energy Development, Gas Research Institute, U.S. Mine Safety and Health Administration, and Geological Survey of Alabama, May 13-17, 1991, p. 509–525. **PR**
- Rasmussen, D. L., Jump, C. J., and Wallace, K. A., 1985, Deltaic systems in the early Cretaceous Fall River Formation, southern Powder River Basin, Wyoming, in Nelson, G. E., ed., The Cretaceous geology of Wyoming: Wyoming Geological Association Guidebook, 36th field conference, p. 91–111. **PR**
- Rathbun, F. C., 1968, Abnormal pressures and conductivity anomaly, northern Green River Basin, Wyoming: Society of Petroleum Engineers 43rd annual fall meeting, SPE Paper 2205, p. 1–8. **GR**
- Rathbun, F. C., and Dickey, Parke, 1969, Abnormal pressures and conductivity anomaly, northern Green River Basin, Wyoming: The Log Analyst, v. x, no 4, p. 3–8. **GR**
- Read, C. B., Duffney, R. T., Wood, G. H., Jr., and Zapp, A. D., 1950, Coal resources of New Mexico: U.S. Geological Survey Circular 89, 24 p.
- Reeside, J. B., Jr., 1955, Revised interpretation of the Cretaceous section on Vermillion Creek, Moffat County, Colorado: Wyoming Geological Association Guidebook, tenth field conference, p. 85–88. **GR**
- Reinecke, K. M., Rice, D. D., and Johnson, R. C., 1991, Characteristics and development of fluvial sandstone and coalbed reservoirs of Upper Cretaceous Mesaverde Group, Grand Valley Field, Colorado, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 209–225. **PB**
- Reiter, M., Edwards, C. L., Hartman, H., and Weidman, C., 1975, Terrestrial heat flow along the Rio Grande Rift, New Mexico and southern Colorado: Geological Society of America Bulletin, v. 86, p. 811–818. **RB**
- Reiter, M., Eggleston, R. E., Broadwell, B. R., and Minier, J., 1986, Estimates of terrestrial heat flow from deep petroleum tests along the Rio Grante Rift in central and

- southern New Mexico: Journal of Geophysical Research, v. 91, no. B6, p. 6225–6245. **RB**
- Reiter, Marshall, and Clarkson, G., 1983, Geothermal studies in the San Juan Basin and the Four Corners area of the Colorado Plateau, II. Steady state models of the thermal source of the San Juan volcanic field: Tectonophysics, v. 91, p. 253–269. **SJ**
- Reiter, Marshall, and Clarkson, G., 1983, Relationships between heat flow, paleotemperatures, coalification, and petroleum maturation in the San Juan Basin, northwest New Mexico and southwest Colorado: Geothermics, v. 12, p. 323–339. SJ
- Reiter, Marshall, and Mansure, A. J., 1983, Geothermal studies in the San Juan Basin and the Four Corners area of the Colorado Plateau, I. Terrestrial heat-flow measurements: Tectonophysics, v. 91, p. 233–251. SJ
- Resource Enterprises, Inc., 1986, Baseline stimulation results for a deep coal seam at the Red Mountain Unit, Piceance Basin, Colorado: topical report prepared for the Gas Research Institute (GRI-86/0169), 75 p. **PB**
- Reynolds, M. W., 1966, Stratigraphic relations of Upper Cretaceous rocks, Lamont-Bairoil area, south-central Wyoming: U.S. Geological Survey Professional Paper 550-B, p. B69–B76. **GR**
- Reynolds, M. W., 1968, Geologic map of the Muddy Gap quadrangle, Carbon County, Wyoming: U.S. Geological Survey Geologic Quadrangle Map GQ-771, scale 1:24,000. **GR**
- Reynolds, M. W., 1968, Muddy Gap quadrangle, Wyoming: U.S. Geological Survey Geologic Quadrangle Map GQ-77, scale 1:24,000. **GR**
- Reynolds, M. W., 1976, Influence of recurrent Laramide structural growth on sedimentation and petroleum accumulation, Lost Soldier area, Wyoming: American Association of Petroleum Geologists Bulletin, v. 60, p. 12–32. **GR**
- Rice, D. D., 1983, Relation of natural gas composition to thermal maturity and source-rock type in San Juan Basin, northwestern New Mexico and southeastern Colorado: American Association of Petroleum Geologists Bulletin, v. 67, no. 8, p. 1199–1218. **SJ**
- Rice, D. D., and Claypool, G. E., 1981, Generation, accumulation, and resource potential of biogenic gas: American Association of Petroleum Geologists Bulletin, v. 65, no. 1, p. 5–25. **GR**, **PB**, **PR**, **RB**, **SJ**
- Rice, D. D., and Flores, R. M., 1989, Nature of natural gas in anomalously thick coal beds, Powder River Basin, Wyoming: American Association of Petroleum Geologists Bulletin, v. 73, no. 9, p. 1172. **PR**
- Rice, D. D., and Flores, R. M., 1990, Coalbed methane potential of Tertiary coal beds and adjacent sandstone deposits, Powder River basin, Wyoming and Montana (abs.): American Association of Petroleum Geologists Bulletin, v. 74, no. 8, p. 1343. **PR**
- Rice, D. D., and Flores, R. M., 1991, Controls on bacterial gas accumulations in thick Tertiary coal beds and

adjacent channel sandstones, Powder River Basin, Wyoming and Montana (abs.): American Association of Petroleum Geologists Bulletin, v. 75, no. 3, p. 661. **PR**

- Rice, D. D., and Johnson, R. C., 1989, Occurrence and geochemistry of natural gases, Piceance Basin, northwestern Colorado (abs.): American Association of Petroleum Geologists Bulletin, v. 73, p. 405. **PB**
- Rice, D. D., Clayton, J. L., and Pawlewicz, M. J., 1989, Characterization of coal-derived hydrocarbons and source-rock potential of coal beds, San Juan Basin, New Mexico and Colorado, U.S.A.: International Journal of Coal Geology, v. 13, p. 597–626. **SJ**
- Rice, D. D., Threlkeld, C. N., Vuletich, A. K., and Pawlewicz, M. J., 1988, Identification and significance of coal-bed gas, San Juan Basin, northwestern New Mexico and southwestern Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 51–59. SJ
- Rice, D. D., Threlkeld, C. N., Vuletich, A. K., and Pawlewicz, M. J., 1990, Nonassociated gas potential of San Juan Basin considerable: Oil and Gas Journal, v. 88 (August 13, 1990), p. 60–61. **SJ**
- Rich, F. J., 1980, Brief survey of chemical and petrographic characteristics of Powder River Basin coals, *in* Glass, G. B., ed., Guidebook to the coal geology of the Powder River coal basin, Wyoming: Wyoming Geological Society Public Information Circular 14, p. 133–158. **PR**
- Rich, F. J., Dorsett, R. K., and Chapman, C. R., 1988, Petrography, sedimentology, and geochemistry of the Wyodak coal, Wyodak, Wyoming, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 237–247. **PR**
- Richard, J. J., 1986, Interpretation of a seismic section across the Danforth Hills anticline (Maudlin Gulch) and Axial Arch in northwest Colorado, *in* Stone, D. S., ed., New interpretations of northwest Colorado geology: Rocky Mountain Association of Geologists, p. 191–193. **PB**
- Richardson, R. J. H., 1991, Coal resources and coalbed methane potential of a major Alberta coal zone, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 255–264.
- Ridgley, J. L., and Huffman, A. C., Jr., 1990, Basin analysis study of the San Juan Basin, Colorado and New Mexico, *in* the Sixth V. E. McKelvey Forum on Mineral and Energy Resources: U.S. Geological Survey Circular 1060, p. 68–69. **SJ**
- Rieke, H. H., and Kirr, J. N., 1984, Geologic overview, coal, and coalbed methane resources of the Wind River

- basin—Wyoming, *in* Rightmire, C. T., Eddy, G. E., and Kirr, J. N., eds., Coalbed methane resources of the United States: American Association of Petroleum Geologists Studies in Geology Series No. 17, p. 295–334. **GR**, **PR**, **WR**
- Rieke, H. H., Rightmire, C. T., and Fertl, W. H., 1981, Evaluation of gas-bearing coal seams: Journal of Petroleum Technology, v. 33, no. 1, p. 195-201. **GR**, **PB**, **PR**, **RB**, **SJ**
- Rightmire, C. T., 1984, Coalbed methane resources, *in* Rightmire, C. T., Eddy, G. E., and Kirr, J. N., eds., Coalbed methane resources of the United States: American Association of Petroleum Geologists Studies in Geology Series No. 17, p. 1–14. **SJ**
- Rightmire, C. T., and Choate, R., 1986, Coal-bed methane and tight gas sands interrelationships, *in* Spencer, C. W., and Mast, R. F., eds., Geology of tight gas reservoirs: American Association of Petroleum Geologists Studies in Geology 24, p. 87–110. **GR**, **PB**, **PR**, **RB**, **SJ**
- Rightmire, C. T., Eddy, G. E., and Kirr, J. N., eds., 1984, Coalbed methane resources of the United States: American Association of Petroleum Geologists Studies in Geology 17, p. 163–184. **GR**, **PB**, **PR**, **RB**, **SJ**
- Ritzma, H. R., 1955, Early Cenozoic history of the Sand Wash Basin, northwest Colorado, *in* Ritzma, H. R., and Oriel, S. S., eds., Guidebook to the geology of northwest Colorado: Intermountain Association of Petroleum Geologists and Rocky Mountain Association of Geologists, sixth field conference, p. 36–40. **GR**
- Ritzma, H. R., 1959, Geologic atlas of Utah, Dagget County: Utah Geological and Mineralogical Survey, 116 p. **UB**
- Ritzma, H. R., 1962, Piceance Creek gas field, *in* Amuedo, C. L., and Mott, M. R., eds., Exploration for oil and gas in northwestern Colorado: Rocky Mountain Association of Geologists, p. 96–103. **PB**
- Ritzma, H. R., 1965, Geological significance, No. 1 Raeder-Govt Dry Mountain Anticline, Moffat County, Colo., *in* DeVoto, R. H., and Bitter, R. K., eds., Sedimentation of Late Cretaceous and Tertiary outcrops, Rock Springs Uplift: Wyoming Geological Association Guidebook, nineteenth field conference, p. 131–135. **GR**
- Ritzma, H. R., 1968, Geology and occurrence of gas, Wamsutter Arch, Sweetwater County, Wyoming, *in* Beebe, W. S., and Curtis, B. F., eds., Natural gases of North America: American Association of Petroleum Geologists, v. 1, p. 817–827. **GR**
- Ritzma, H. R., 1969, Tectonic resume, Uinta Mountains: Intermountain Association of Geologists, 16th field conference, p. 57–63. **GR**, **UB**
- Ritzma, H. R., 1971, Faulting on the north flank of the Uinta Mountains, Utah and Colorado, *in* Renfro, A. R., ed., Wyoming Geological Association Guidebook, twenty-third field conference, p. 145–150. **GR**, **UB**

Roberts, J. W., Barnes, J. J., and Wacker, H. J., 1976, Subsurface Paleozoic stratigraphy of the northeastern New Mexico basin and arch complex, *in* Ewing, R. C., and Kues, B. S., eds., Vermejo Park, northeastern New Mexico: New Mexico Geological Society Guidebook, twenty-seventh field conference, p. 141–152. **RB**

- Roberts, L. N. R., 1989, Results of 1988 coal exploratory drilling in the Fruitland Formation, western part of the Southern Ute Indian Reservation, La Plata County, Colorado: U.S. Geological Survey Open-File Report 89-487, 221 p. SJ
- Roberts, L. N. R., and Uptegrove, Jane, 1991, Coal geology and preliminary coal zone correlations in the Fruitland Formation, western part of the Southern Ute Indian Reservation, La Plata County, Colorado: U.S. Geological Survey Coal Investigations Map C-138, scale 1:24,000. **SJ**
- Robinson, C. S., Mapel, W. J., and Bergendahl, M. H., 1964, Stratigraphy and structure of the northern and western flanks of the Black Hills Uplift, Wyoming, Montana, and South Dakota: U.S. Geological Survey Professional Paper 404, 134 p. **PR**
- Robinson, G. D., Wanek, A. A., Hays, W. H., and McCallum, M. E., 1964, Philmont country—the rocks and landscape of a famous New Mexico ranch: U.S. Geological Survey Professional Paper 505, 152 p. **RB**
- Robinson, P., 1960, Fossil mammals of the Huerfano Formation (Eocene) of Colorado (abs.): Geological Society of America Bulletin, v. 71, no. 12, part 2, p. 1957–1958. **RB**
- Robinson, P., 1963, Fossil vertebrates and age of the Cuchara Formation in Colorado: Colorado University Studies in Geology 1, p. 1–5. **RB**
- Rocky Mountain Association of Geologists, 1956, A brief description of the physiography of the Raton Basin, Colorado, *in* McGinnis, C. J., ed., Geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists Guidebook, p. 10–13. **RB**
- Rocky Mountain Association of Geologists, Research Committee, 1977, Subsurface cross-sections of Colorado: Rocky Mountain Association of Geologists Special Publication 2, 39 p. **RB**
- Roehler, H. W., 1961, The Late Cretaceous-Tertiary boundary in the Rock Springs Uplift, Sweetwater County, Wyoming, *in* Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 96–100. **GR**, **PR**, **WR**
- Roehler, H. W., 1965, Early Tertiary depositional environments in the Rock Springs Uplift area, *in* DeVoto, R. H., and Bitter, R. K., eds., Sedimentation of Late Cretaceous and Tertiary outcrops, Rock Springs Uplift: Wyoming Geological Association Guidebook, nineteenth field conference, p. 141–150. **GR**

- Roehler, H. W., 1965, Summary of pre-Laramide Late Cretaceous sedimentation in the Rock Springs Uplift area, *in* DeVoto, R. H., and Bitter, R. K., eds., Sedimentation of Late Cretaceous and Tertiary outcrops, Rock Springs Uplift: Wyoming Geological Association Guidebook, nineteenth field conference, p. 11–12. **GR**
- Roehler, H. W., 1974, Depositional environments of rocks in the Piceance Creek Basin, Colorado, *in* Murray, D. K., ed., Energy resources of the Piceance Creek Basin, Colorado: Rocky Mountain Association of Geologists, twenty-fifth field conference, p. 57-64. **PB**
- Roehler, H. W., 1978, Correlations of coal beds in the Fort Union, Almond and Rock Springs Formations, *in* measured sections on the west flank of the Rock Springs Uplift, Sweetwater County, Wyoming: U.S. Geological Survey Open-File Report 78-395. **GR**
- Roehler, H. W., 1978, Geologic map of the Chicken Creek SE quadrangle, Sweetwater County, Wyoming: U.S. Geological Survey Geologic Quadrangle Map GQ-1454, scale 1:24,000. **GR**
- Roehler, H. W., 1979, Geology and energy resources of the Sand Butte Rim NW quadrangle, Sweetwater County, Wyoming: U.S. Geological Survey Professional Paper 1065-A, 54 p. **GR**
- Roehler, H. W., 1980, Measured sections in the point of rocks SE quadrangle, Sweetwater County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-1222. **GR**
- Roehler, H. W., 1980, Measured sections of the Almond Formation (part), Ericson sandstone, Rock Springs Formation, and Blair Formation (part) in the Camel rock quadrangle, Sweetwater County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-1223. **GR**
- Roehler, H. W., 1981, Correlation of Eocene rocks in measured sections in the southeast and west parts of the Rock Springs coal field, Wyoming: U.S. Geological Survey Oil and Gas Investigations Chart OC-111. GR
- Roehler, H. W., 1981, Description of Eocene rocks in White Mountain at Rock Springs, Wyoming: U.S. Geological Survey Oil and Gas Investigations Chart OC-117. **GR**
- Roehler, H. W., 1983, Stratigraphy of Upper Cretaceous and Lower Tertiary outcrops in the Rock Springs Uplift, Wyoming: U.S. Geological Survey Miscellaneous Investigations Series Map I-1500. **GR**
- Roehler, H. W., 1985, Electric log correlations of the Upper Cretaceous Rock Springs and Blair Formations on the east and west flanks of the Rock Springs Uplift, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-1785. **GR**
- Roehler, H. W., 1986, Electric log correlations of Upper Cretaceous rocks in the Mesaverde Group, Baxter shale, and equivalent units across the Greater Divide Basin in southwest Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-1828. **GR**

Roehler, H. W., 1987, Surface-subsurface correlations of the Mesaverde Group and associated Upper Cretaceous Formations, Rock Springs, Wyoming, to Mount Harris, Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1937. **GR**

- Roehler, H. W., 1988, The Pintail coal bed and Barrier Bar G—a model for coal of barrier bar-lagoon origin, Upper Cretaceous Almond Formation, Rock Springs coal field, Wyoming: U.S. Geological Survey Professional Paper 1398, 60 p. **GR**
- Roehler, H. W., 1989, Surface-subsurface correlations of the Mesaverde Group and associated Upper Cretaceous formations, Rock Springs to Atlantic Rim, southwest Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-3078. **GR**
- Roehler, H. W., 1990, Stratigraphy of the Mesaverde Group in the central and eastern Greater Green River Basin, Wyoming, Colorado, and Utah: U.S. Geological Survey Professional Paper 1508, 52 p. **GR**
- Roehler, H. W., and Hansen, D. E., 1989, 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: U.S. Geological Survey Miscellaneous Field Studies Map MF-2077. **GR**
- Roehler, H. W., and Phillips, S. T., 1980, Cross section of the Rock Springs and Blair Formations in measured sections in the Flaming Gorge-Minnies Gap-Clay Basin area, Utah and Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-1216. **GR**
- Rogers, A. M., and Malkeil, A., 1979, A study of earthquakes in the Permian Basin of Texas-New Mexico: Seismological Society of America Bulletin, v. 69, no. 6, p. 843–865.
- Rogers, G. S., and Lee, W., 1923, Geology of the Tullock Creek coal field, Rosebud and Bighorn Counties, Montana: U.S. Geological Survey Bulletin 749, 181 p. PR
- Rohrback, B. G., Peters, K. E., Sweeney, R. E., and Kaplan, I. R., 1983, Ammonia formation in laboratory simulated thermal maturation: implications related to the origin of nitrogen in natural gas, *in* Bjoroy, M., ed., Advances in organic geochemistry, 1981: New York, John Wiley, p. 819–823. **GR**, **PB**, **PR**, **RB**, **SJ**
- Rose, P. R., Everett, J. R., and Merin, I. S., 1984, Possible basin-centered gas accumulation, Raton Basin, southern Colorado: Oil and Gas Journal, v. 82, no. 40, p. 190–197. **RB**
- Rose, P. R., Everett, J. R., and Merin, I. S., 1986, Potential basin-centered gas accumulation in Cretaceous Trinidad Sandstone, Raton Basin, Colorado, *in* Spencer, C. W., and Mast, R. F., eds., Geology of tight gas reservoirs: American Association of Petroleum Geologists Studies in Geology 24, p. 111–128. **RB**

- Ross, C. A., and Ross, J. R. P., 1986, Paleozoic paleotectonics and sedimentation in Arizona and New Mexico, *in* Peterson, J. A., ed., Paleotectonics and sedimentation in the Rocky Mountain region: American Association of Petroleum Geologists Memoir 41, p. 653–668. **SJ**
- Ross, L. M., 1980, Geochemical correlation of San Juan Basin oils—a study: Oil and Gas Journal, v. 78, p. 102– 110. **SJ**
- Ross, R. J., Jr., 1986, Lower Paleozoic of northwest Colorado: a summary, *in* Stone, D. S., ed., New interpretations of northwest Colorado geology: Rocky Mountain Association of Geologists, p. 99–102. **PB**
- Roundtree, Russ, 1985, Colorado gas discoveries create optimism: Western Oil Reported, v. 42, no. 4, p. 13–14. **PB**, **RB**, **SJ**
- Rowley, P. D., Hansen, W. R., Tweto, Ogden, and Carrara, P. E., 1985, Geologic map of the Vernal 1° x 2° quadrangle, Colorado, Utah, and Wyoming: U.S. Geological Survey Miscellaneous Investigations Series Map I-1526, scale 1:250,000. **GR**
- Roybal, F. E., and others, 1983, Hydrology of area 60, northern Great Plains, and Rocky Mountain coal provinces, New Mexico, Colorado, Utah, and Arizona: U.S. Geological Survey Water Resources Investigations Open-File Report 83-203, 80 p. GR, PB, RB, SJ
- Roybal, G. H., Campbell, F. W., Beaumont, E. C., Cohen, A. D., Kuellmer, F. J., and Kottlowski, F. E., 1985, Quality assessment of strippable coals in New Mexico, phase I, Fruitland and Cleary coals in the San Juan Basin of northwestern New Mexico: New Mexico Energy Research and Development Institute Report No. 2-73-4304, 89 p. SJ
- Royse, F., Jr., 1985, Geometry and timing of the Darby-Prospect-Hogsback thrust fault system, Wyoming: Geological Society of America Abstracts with Programs, v. 17, no. 4, p. 683. **GR**
- Royse, F., Jr., Warner, M. A., and Reese, D. L., 1975, Thrust belt structural geometry and related stratigraphic problems, Wyoming-Idaho-northern Utah, *in* Bolyard, D. W., ed., Deep drilling frontiers of the central Rocky Mountains: Rocky Mountain Association of Geologists, p. 41–54. **GR**, **PB**, **SJ**
- Rubey, W. W., Oriel, S. S., and Tracey, J. I., Jr., 1975, Geology of the Sage and Kemmerer 15-minute quadrangles, Lincoln County, Wyoming: U.S. Geological Survey Professional Paper 855, 18 p. **GR**
- Ryder, R. T., 1985, Oil and gas potential of the Chama-Southern San Juan Mountains Wilderness Study Area, Colorado: U.S. Geological Survey Bulletin 1524, p. 84– 118. **SJ**
- Ryder, R. T., 1988, Greater Green River Basin, *in* Sloss, L. L., ed., Sedimentary cover—North American Craton, U.S.: Geological Society of America, Decade of North American Geology, v. D-2, p. 154–165. **GR**

Ryder, R. T., Lee, M. W., Agena, W. F., and Anderson, R. C., 1989, Seismic profile through Patrick Draw-Table Rock area, east flank Rock Springs Uplift, Wyoming, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 209–229. **GR**

- Ryer, T. A., 1976, Cretaceous invertebrate faunal assemblages of the Frontier and Aspen Formations, Coalville and Rockport areas, north-central Utah: Mountain Geologist, v. 13, p. 101-114. **GR**
- Ryer, T. A., 1977, Patterns of Cretaceous shallow-marine sedimentation, Coalville and Rockport areas, Utah: Geological Society of America Bulletin, v. 88, no. 2, p. 177–188. **GR**
- Ryer, T. A., 1980, Deltaic coals of the Ferron Sandstone Member of the Mancos Shale: predictive model for Cretaceous coals of the Western Interior, *in* Carter, L. M., ed., Proceedings of the fourth symposium on the geology of Rocky Mountain coal: Colorado Geological Survey Resource Series 10, p. 4-5. **GR, PB, UB**
- Ryer, T. A., 1981, Deltaic coals of Ferron Sandstone Member of Mancos Shale: predictive model for Cretaceous coal-bearing strata of Western Interior: American Association of Petroleum Geologists Bulletin, v. 65, no. 11, p. 2323–2340. **GR**, **PB**, **UB**
- Ryer, T. A., 1984, Transgressive-regressive cycles and the occurrence of coal in some Upper Cretaceous strata of Utah, U.S.A., *in* Rahmani, R. A., and Flores, R. M., eds., Sedimentology of coal and coal-bearing sequences: International Association of Sedimentologists, Special Publication 7, p. 217. **UB**
- Ryer, T. A., and Langer, A. W., 1980, Thickness change involved in the peat-to-coal transformation for a bituminous coal of Cretaceous age in central Utah: Journal of Sedimentary Petrology, v. 50, no. 3, p. 987–992. UB

S

- Sales, J. K., 1983, Collapse of Rocky Mountain basement uplifts, *in* Lowell, J. D., ed., Rocky Mountain foreland basins and uplifts: Rocky Mountain Association of Geologists, p. 79–97. **GR**, **PB**, **PR**, **RB**, **SJ**
- Sanborn, A. F., 1977, Possible future petroleum of Uinta and Piceance Basins and vicinity, northeast Utah and northwest Colorado, in Veal, H. K., ed., Exploration frontiers of the central and southern Rockies: Rocky Mountain Association of Geologists Symposium, p. 151– 166. PB, UB
- Sanborn, A. F., 1981, Potential petroleum resources of northeastern Utah and northwestern Colorado, *in* Epis, R. C., and Callender, J. F., eds., Western Slope Colorado: New Mexico Geological Society Guidebook, thirty-second field conference, p. 255–265. **PB**
- Sandberg, D. T., 1986, Correlation of coal beds in the Fruitland Formation as interpreted from geophysical logs, east-central San Juan County, New Mexico: U.S.

- Geological Survey Miscellaneous Field Studies Map MF-1848. **SJ**
- Sandberg, D. T., 1986, Isopach map of interval between top of the Pictured Cliffs Sandstone and the Huerfanito Bentonite Bed of the Lewis Shale, La Plata County, Colorado, and Rio Arriba and San Juan Counties, New Mexico: U.S. Geological Survey Miscellaneous Field Studies Map MF-1831, scale 1:100,000. **SJ**
- Sandberg, D. T., 1988, Coal resources and coal-bed geometry, Fruitland Formation, Southern Ute Indian Reservation, Archuleta and La Plata Counties, Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 39–50. **SJ**
- Sandia National Laboratories and CER Corporation, 1987, The marine interval of the Mesaverde Formation: Multiwell Experiment final report I, Sandia National Laboratories report SAND87-0327, 262 p. **PB**
- Sanford, A. R., Olsen, K. M., and Jaksha, L. H., 1981, Earthquakes in New Mexico, 1847-1977: New Mexico Bureau of Mines and Mineral Resources Circular 171, 20 p. **SJ**
- Santos, E. S., 1981, Facies distribution in uranium host rocks of the southern Powder River Basin, Wyoming: U.S. Geological Survey Open-File Report 81-741, 15 p. PR
- Sato, Y., 1982, Methane recovery from coalbeds: Surface and physical properties of western United States coal: University of New Mexico, Masters thesis. **GR**, **PB**, **PR**, **RB**, **SJ**
- Satriana, M., 1980, Unconventional natural gas, resources, potential and technology: Noyes Data Corporation, 163 p. GR, PB, PR, RB, SJ
- Savage, D., 1984, Coalbed methane plentiful in Colorado: Western Oil Reporter, v. 41, no. 8, p. 31–34. **PB**, **RB**
- Scanlon, A. H., 1983, Oil and gas fields map of Colorado, Colorado Geological Survey Map Series 22, scale 1:500,000. **PB**, **RB**
- Schavran, G., 1985, Structural features in the Huerfano Park area, east flank, Sangre de Cristo Range, Colorado: Mountain Geologist, v. 22, p. 33–39. **RB**
- Schell, E. M., ed., 1973, Core seminar on the geology and mineral resources of the Greater Green River Basin: Wyoming Geological Association Guidebook, twentyfifth field conference, 246 p. **GR**
- Schmidt, C. J., and Perry, W. J., Jr., eds., 1988, Interaction of the Rocky Mountain foreland and Cordilleran thrust belt: Geological Society of America Memoir 171, 582 p. **GR**
- Schmitt, J. G., 1987, Origin of Late Cretaceous to early Tertiary quartzite conglomerates in northwestern Wyoming, *in* Miller, W. R., ed., The thrust belt revisited: Wyoming Geological Association Guidebook, thirtyeighth field conference, p. 217–224. **GR**

Schraufnagel, R. A., 1987, Multiple coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 3, p. 33–42. **PB**, **RB**

- Schultz, A. L., and Coppinger, W. W., 1989, Identification of point bar reservoirs within units of the Fall River Formation through comprehensive electric log interpretation; Powder River Basin, Wyoming, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 143–153. **PR**
- Schultz, A. R., 1909, The northern part of the Rock Springs coal field, Sweetwater County, Wyoming: U.S. Geological Survey Bulletin 341, p. 256–282. **GR**
- Schultz, A. R., 1910, The southern part of the Rock Springs coal field, Sweetwater County, Wyoming: U.S. Geological Survey Bulletin 381, p. 214-281. **GR**
- Schultz, A. R., 1920, Oil possibilities in and around Baxter Basin in the Rock Springs Uplift, Sweetwater County, Wyoming: U.S. Geological Survey Bulletin 702, 107 p. GR
- Schultz, M. S., and Lafollette, R. F., 1989, Effect of drilling and completion methods on Frontier gas production, northern Moxa Arch, southwestern Wyoming, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 247–254. **GR**
- Schuster, M. W., 1986, The origin and sedimentary evolution of the northern Green River Basin, western Wyoming: Laramie, University of Wyoming, Ph.D. dissertation, 323 p. **GR**
- Schuster, M. W., and Steidtmann, J. R., 1983, Origin and development of northern Green River Basin; a stratigraphic and flexural study: American Association of Petroleum Geologists Bulletin, v. 67, p. 1356. **GR**
- Schwerer, F. C., 1986, Development of coal-gas production simulators and mathematical models for well-test strategies: Quarterly Review of Methane from Coal Seams Technology, v. 3, nos. 3 and 4, p. 38–39. **GR**, **PB**, **PR**, **RB**, **SJ**
- Schwerer, F. C., 1986, Development of coal-gas production simulators and mathematical models for well-test strategies: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 1, p. 41–42. **GR**, **PB**, **PR**, **RB**, **SJ**
- Schwochow, S. D., 1978, Mineral fuels, *in* Colorado Geological Survey, Mineral resources survey of Mesa County—a model study: Colorado Geological Survey Resources Series 2, p. 27–52. **PB**
- Schwochow, S. D., 1985, American Association of Petroleum Geologists Rocky Mountain Section: Quarterly Review of Methane from Coal Seams Technology, v. 3, no. 2, p. 55–57. **GR**, **PB**, **PR**, **RB**, **SJ**
- Schwochow, S. D., 1985, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 3, no. 1, p. 46–48. **GR**, **PB**, **PR**, **RB**, **SJ**

- Schwochow, S. D., 1985, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 3, no. 2, p. 53–55. **GR, PB, PR, RB, SJ**
- Schwochow, S. D., 1986, Chinese delegation visits U.S. on coalbed methane fact-finding tour: Quarterly Review of Methane from Coal Seams Technology, v. 3, nos. 3 and 4, p. 53–54. **GR**, **PB**, **PR**, **RB**, **SJ**
- Schwochow, S. D., 1986, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 3, nos. 3 and 4, p. 47–49. **GR, PB, PR, RB, SJ**
- Schwochow, S. D., 1986, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 1, p. 47–49. **GR**, **PB**, **PR**, **RB**, **SJ**
- Schwochow, S. D., 1986, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 2, p. 42–44. **GR, PB, PR, RB, SJ**
- Schwochow, S. D., 1987, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 3, p. 49–50. **GR**, **PB**, **PR**, **RB**, **SJ**
- Schwochow, S. D., 1987, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 4, p. 54–55. **GR**, **PB**, **PR**, **RB**, **SJ**
- Schwochow, S. D., 1987, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 2, p. 46–48. **GR, PB, PR, RB, SJ**
- Schwochow, S. D., 1988, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 6, no. 1, p. 56–59. **GR**, **PB**, **PR**, **RB**, **SJ**
- Schwochow, S. D., 1989, Colorado Natural Gas Strategy and Marketing Conference: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 43. **GR**, **PB**, **PR**, **RB**, **SJ**
- Schwochow, S. D., 1989, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 39–41. **GR, PB, PR, RB, SJ**
- Schwochow, S. D., 1990, Sources of coalbed methane well information: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 3, p. 2–3. **GR**, **PB**, **PR**, **RB**, **SJ**
- Schwochow, S. D., 1990, The coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 7, no. 4, p. 31–32. **GR**, **PB**, **PR**, **RB**, **SJ**
- Schwochow, S. D., and Larsen, V. E., 1989, Greater Green River Basin, Wyoming and Colorado: Quarterly Review of Methane from Coal Seams Technology, v. 7, nos. 1 and 2, p. 3–5. **GR**
- Schwochow, S. D., comp., 1990, Cumulative bibliography and index of the Quarterly Review of Methane from Coal Seams Technology Volumes 1 (1983) through 7 (1989): Quarterly Review of Methane from Coal Seams Technology, v. 8, no. 1, 89 p. GR, PB, PR, RB, SJ

Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., 1991, Coalbed methane of western North America: Guidebook for Rocky Mountain Association of Geologists, fall conference and field trip guidebook, 336 p. GR, PB, PR, RB, SJ

- Schwoebel, J. J., and Horner, D. M., 1986, Deep coal seam project: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 1, p. 27–32. **PB**
- Schwoebel, J. J., and Logan, T. L., 1986, Baseline stimulation results for a coal seam at the Red Mountain Unit, Piceance Basin Colorado: topical report prepared for Gas Research Institute (GRI-86/0169), 75 p. **PB**
- Schwoebel, J. J., Logan, T. L., Decker, A. D., and Cooper, J. D., 1986, Development and evaluation of technology for methane production from a deep coal seam in the Piceance Basin: Resource Enterprises, Inc., report prepared for Gas Research Institute, 79 p. **PB**
- Scott, A. R., and Kaiser, W. R., 1991, Relation between basin hydrology and Fruitland gas composition, San Juan Basin, Colorado and New Mexico: Quarterly Review of Methane from Coal Seams Technology, v. 9, no. 1. **SJ**
- Scott, A. R., Kaiser, W. R., and Ayers, W. B., Jr., 1991, Composition and origin of Fruitland Coalbed and Pictured Sandstone gases, San Juan Basin, Colorado and New Mexico (abs.): Geological Society of America, Joint Rocky Mountain/South-Central Section Meeting, v. 23, no. 4, 91 p. SJ
- Scott, A. R., Kaiser, W. R., and Ayers, W. B., Jr., 1991, Composition, distribution, and origin of Fruitland Formation and Pictured Cliffs Sandstone gases, San Juan Basin, Colorado and New Mexico, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 93–108. **SJ**
- Scott, A. R., Kaiser, W. R., and Ayers, W. B., Jr., 1991, Thermal maturity of Fruitland coal and composition and distribution of Fruitland Formation and Pictured Cliffs Sandstone gases, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 243–270. **SJ**
- Scruton, P. C., 1961, Rocky Mountain Cretaceous stratigraphy and regressive sandstones: Wyoming Geological Association Guidebook, 16th annual field conference, p. 242–249. **GR, PB, PR, RB, SJ**
- Sears, J. D., Hunt, C. B., and Hendricks, T. A., 1941, Transgressive and regressive Cretaceous deposits in southern San Juan Basin, New Mexico: U.S. Geological Survey Professional Paper 193-F, p. 101–121. SJ
- Seccombe, J. C., and Decker, A. D., 1986, Geologic and reservoir characteristics of the Red Mountain coalbed

- methane test site in the Piceance Basin: Topical report prepared for Gas Research Institute (GRI-86/0109), 89 p. **PB**
- Seccombe, J. C., and Decker, A. D., 1986, Geologic and reservoir characteristics of the Red Mountain coalbed methane test site in the Piceance basin: Topical report (April 1983-January 1986) prepared for the Gas Research Institute (GRI-86/0109), 102 p. **PB**
- Seccombe, J. C., and Logan, T. L., 1986, Baseline simulation results for a deep coal seam at the Red Mountain Unit, Piceance basin, Colorado: Topical report (October 1983-February 1986) prepared for the Gas Research Institute (GRI-86/0169), 75 p. **PB**
- Seccombe, J. C., and Sakashita, B. J., 1985, Preliminary economic assessment for the commercial potential for deep coalbed methane production from the Red Mountain Unit, Piceance, Colorado: Topical report prepared for Gas Research Institute (GRI-85/0138), 34 p. **PB**
- Seccombe, J. C., Logan, T. L., Decker, A. D., and Cooper, J. D., 1986, Development and evaluation of technology for methane production from a deep coal seam in the Piceance basin: Annual report (June 1985-May 1986) prepared for the Gas Research Institute (GRI-86/0242), 79 p. **PB**
- Seccombe, J. C., Sakashita, B. J., and Schwoebel, J. J., 1985, R & D plan for deep coal seam project: topical report prepared for Gas Research Institute (GRI-85/0139), 87 p. **PB**
- Seccombe, J. C., Schwoebel, J. J., Logan, T. L., Decker, A. D., and Cooper, J. D., 1986, Development and evaluation of technology for methane production from a deep coal seam in the Piceance Basin: topical report prepared for Gas Research Institute (GRI-86/0069), 128 p. **PB**
- Seccombe, J. C., Schwoebel, J. J., Logan, T. L., Decker, A. D., and Cooper, J. D., 1986, Development and evaluation of technology for methane production from a deep coal seam in the Piceance basin: Annual report (June 1984-May 1985) prepared for the Gas Research Institute (GRI-86/0069), 124 p. **PB**
- Seeland, D. A., 1976, Relationships between early Tertiary sedimentation patterns and uranium mineralization in the Powder River Basin, Wyoming, *in* Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and energy resources of the Powder River: Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 53–63. **PR**
- Seeland, D. A., Flores, R. M., Johnson, F. W., and Pierce, F. W., 1989, Some paleogeographic inferences from paleocurrents of the Tongue River Member, Fort Union Formation, Powder River, Bull Mountains, and southwestern Williston Basins, Montana and Wyoming, *in* Flores, R. M., Warwick, P. D., and Moore, T. A., eds., Tertiary and Cretaceous coals in the Rocky Mountain region: American Geophysical Union, 28th

International Geological Congress field trip guide-book T132, p. 15–18. **PR**

- Seeland, David, 1988, Laramide paleogeographic evolution of the eastern Powder River Basin, Wyoming and Montana, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 29–34. **PR**
- Sharp, W. N., and Gibbons, A. B., 1964, Geology and uranium deposits of the southern part of the Powder River Basin, Wyoming: U.S. Geological Survey Bulletin 1147-D, 59 p. **PR**
- Sharp, W. N., McKay, E. J., McKeown, F. A., and White, A. M., 1964, Geology and uranium deposits of the Pumpkin Buttes area of the Powder River Basin, Wyoming: U.S. Geological Survey Bulletin 1107-H, p. 544–633. **PR**
- Shaughnessy, H. J., and Butcher, R. H., 1974, Geology of Wagon Wheel nuclear stimulation project, Pinedale field, Wyoming: American Association of Petroleum Geologists Bulletin, v. 58, p. 2250–2259. **GR**
- Sheppy, R. J., 1986, Slattery field, Powder River Basin, Wyoming: a multidisciplinary interpretation of a complex Minnelusa (Permian) field, in Noll, J. H., and Doyle, K. M., eds., Rocky Mountain oil and gas fields: Wyoming Geological Association Symposium, p. 245– 256. PR
- Shipp, B. G., and Dunnewald, J. B., 1962, The Big Piney-LaBarge Frontier gas field, Sublette and Lincoln Counties, Wyoming, *in* Heisey, E. L., and others, eds., Symposium on Early Cretaceous rocks of Wyoming and adjacent areas: Wyoming Geological Association Guidebook, seventeenth field conference, p. 273–279. **GR**
- Shock, E. L., 1988, Organic acid metastability in sedimentary basins: Geology, v. 16, p. 886–890. **GR**, **PB**, **PR**, **RB**, **SJ**
- Shoemaker, E. M., Pillmore, C. L., and Peacock, E. W., 1987, Remnant magnetization of rocks of latest Cretaceous and earliest Tertiary age from drill core at York Canyon, New Mexico, *in* Fassett, J. E., and Rigby, J. K., eds., The Cretaceous-Tertiary boundary in the San Juan and Raton Basin: Geological Society of America Special Paper 209, p. 131–150. **RB**
- Shoemaker, E. M., Pillmore, C. L., Tschudy, R. H., and Orth, C. J., 1983, Characteristic magnetization of Cretaceous-Tertiary boundary claystone in Raton Basin is reversed: Geological Society of America Abstracts with Programs, v. 15, no. 5, p. 309. **RB**
- Shoemaker, E. M., Squires, R. L., and Abrams, M. J., 1974, The Bright Angel and Mesa Butte fault systems of northern Arizona, *in* Geology of northern Arizona with notes on archaeology and paleoclimate, part 1: Geological Society of America, Rocky Mountain Section, p. 355–391.

- Sholes, M. A., and Cole, G. A., 1981, Depositional history and correlation problems of the Anderson-Dietz zone, southeastern Montana: Montana Geologist, v. 18, no. 2, p. 35–65. **PR**
- Shomaker, J. W., and Feldman, S. C., 1978, 1978 re-evaluation of original strippable coal reserves, Picnic Flats area, Southern Ute project: unpublished report prepared for the Southern Ute Tribe, 21 p. SJ
- Shomaker, J. W., and Holt, R. D., 1973, Coal resources of Southern Ute and Ute Mountain Ute Indian Reservations, Colorado and New Mexico: New Mexico State Bureau of Mines and Mineral Resources Circular 134, 22 p. **SJ**
- Shurr, G. W., 1972, Paleocurrent indicators in Tongue River sandstones of the Bull Mountain syncline, Montana: Montana Geological Society, 21st field conference, p. 107–111. **PR**
- Shurr, G. W., Nelson, C. L., and Jenkins, J. T., Jr., 1988, Prediction of sandstone geometry in the Upper Cretaceous Shannon sandstone in the northern Powder River Basin, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 217–228. **PR**
- Shurr, G. W., Watkins, I. W., and Lisenbee, A. L., 1988, Possible strike-slip components on monoclines at the Powder River Basin-Black Hills Uplift margin, in Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 53. **PR**
- Siepman, B. R., 1985, Stratigraphy and petroleum potential of Trout Creek and Twentymile Sandstones (Upper Cretaceous), Sand Wash Basin, Colorado: Colorado School of Mines Quarterly, v. 80, no. 2, 59 p. **GR**
- Siepman, B. R., 1986, Facies relationships in Campanian wave-dominated coastal deposits in Sand Wash Basin, *in* Stone, D. S., ed., New interpretations of northwest Colorado geology: Rocky Mountain Association of Geologists, p. 157–164. **GR**
- Sikkink, P. G. L., 1987, Lithofacies relationships and depositional environment of the Tertiary Ojo Alamo Sandstone and related strata, San Juan Basin, New Mexico and Colorado, *in* Fassett, J. E., and Rigby, J. K., Jr., eds., The Cretaceous-Tertiary boundary in the San Juan and Raton Basins, New Mexico and Colorado: Geological Society of America Special Publication 209, p. 81–104. **SI**
- Silver, Caswell, 1951, Cretaceous stratigraphy of the San Juan Basin: New Mexico Geological Society, Guidebook of the south and west sides of the San Juan Basin, New Mexico and Arizona, second field conference, p. 104–118. SJ
- Silver, Caswell, 1957, Relation of coastal and submarine topography to Cretaceous stratigraphy (New Mexico),

(Silver, Caswell, 1957, continued) *in* Geology of southwestern San Juan Basin, Four Corners Geological Society Guidebook, second field conference, p. 128–137. **SJ**

- Sklenar, S. E., 1982, Genesis of an Eocene lake system within the Washakie Basin of southwestern Wyoming: San Jose State University, Masters thesis, 89 p. **GR**
- Sklenar, S. E., and Anderson, D. W., 1985, Origin and early evolution of an Eocene lake system within the Washakie Basin of southwestern Wyoming, *in* Flores, R. M., and Kaplan, S. S., eds., Cenozoic paleogeography of the west-central United States: Rocky Mountain Section, Society of Economic Paleontologists and Mineralogists, Rocky Mountain Paleogeography Symposium 3, p. 231–245. **GR**
- Slack, P. B., 1981, Paleotectonics and hydrocarbon accumulation, Powder River Basin, Wyoming: American Association of Petroleum Geologists Bulletin, v. 65, no. 4, p. 730–743. **PR**
- Slagle, S. E., Lewis, B. D., and Lee, R. W., 1985, Ground-water resources and potential hydrologic effects of surface coal mining in the northern Powder River Basin, southeastern Montana: U.S. Geological Survey Water-Supply Paper 2239, p. 1–34. **PR**
- Slaton, Mike, 1988, Arsenic taints Pecos Slope gas: Southwest Oil World, v. 36, no. 9, p. 6. **PB**
- Slaughter, M., and Earley, J. W., 1965, Mineralogy and geological significance of the Mowry bentonites, Wyoming: Geological Society of America Special Paper 83, 116 p. **GR**
- Sloss, L. L., 1984, Comparative anatomy of cratonic unconformities, *in* Schlee, J. S., ed., Interregional unconformities and hydrocarbon accumulation: American Association of Petroleum Geologists Memoir 36, p. 1–6. **GR**
- Smith, A. D., and Keith, A. V., 1989, Methane content, residual gas and maceral comparisons of two central Utah coal fields, *in* Flores, R. M., Warwick, P. D., and Moore, T. A., eds., Tertiary and Cretaceous coals in the Rocky Mountain region: American Geophysical Union, 28th International Geological Congress field trip guidebook T132, p. 48–56. **PR**
- Smith, D. A., 1988, The integration of hydrodynamics and stratigraphy, Muddy Sandstone, northern Powder River Basin, Wyoming and Montana, *in* Diedrich, R. P., Dyka, M. A. K., and Miller, W. R., eds., Eastern Powder River Basin—Black Hills: Wyoming Geological Association Guidebook, thirty-ninth field conference, p. 179. **PR**
- Smith, J. B., Ayler, M. F., Knox, C. C., and Pollard, B. C., Strippable coal reserves of Wyoming, location, tonnage, and characteristics of coal and overburden: U.S. Department of the Interior and Bureau of Mines Information Circular 8538, p. 1–48. **GR**, **PR**
- Smith, L. N., Lucas, S. G., and Elston, W. E., 1985, Paleogene stratigraphy, sedimentation and volcanism of

- New Mexico, *in* Flores, R. M., and Kaplan, S. S., eds., Cenozoic paleogeography of the west-central United States: Society of Economic and Paleontologic Mineralogists, Rocky Mountain Paleogeography Symposium 3, p. 293–315. **RB**
- Smith, R. P., 1973, Age and emplacement structures of Spanish Peaks dikes, south-central Colorado (abs.): Geological Society of America Abstracts with Programs, v. 5, p. 513–514. **RB**
- Smith, R. S., 1980, A regional study of joints in the northern Piceance Basin, northwestern Colorado: Colorado School of Mines, Master's thesis, 126 p. **PB**
- Smith, R. S., and Whitney, J. W., 1979, Map of joint sets and airphoto lineaments of the Piceance Creek Basin, northwestern Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-1128, scale 1:100,000. PB
- Smithson, S. B., Brewer, Jon, Kaufman, S., Oliver, Jack, and Hurich, Charles, 1978, Nature of the Wind River thrust, Wyoming, from COCORP deep-reflection data and from gravity data: Geology, v. 6, no. 11, p. 648–652. **GR**
- Soeder, D. J., and Randolph, P. L., 1987, Porosity, permeability, and pore structure of the tight Mesaverde sandstone, Piceance Basin, Colorado: Society of Petroleum Engineers, SPE Formation Evaluation, v. 2, no. 2, p. 129–136. **PB**
- Soot, P. M., 1988, Non-conventional fuel tax credit, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 253–255. **SJ**
- Soot, P. M., 1991, Western United States coal gas-content correlations, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 87–92. **GR**, **PB**, **PR**, **RB**, **SJ**
- Spears, D. A., and Caswell, S. A., 1986, Mineral matter in coals: cleat minerals and their origin in some coals from the English Midlands: International Journal of Coal Geology, v. 6, p. 107–125. **GR**, **PB**, **PR**, **RB**, **SJ**
- Speer, W. R., 1976, Oil and gas exploration in the Raton Basin, *in* Ewing, R. C., and Kues, B. S., eds., Guidebook of Vermejo Park, northeastern New Mexico, New Mexico Geological Society Guidebook, twenty-seventh field conference, p. 217–226. **RB**
- Speltz, C. N., 1974, Coal resources of the Piceance Creek Basin, Colorado, *in* Murray, D. K., ed., Energy resources of the Piceance Creek Basin, Colorado: Rocky Mountain Association of Geologists, twenty-fifth field conference, p. 235–238. **PB**
- Spencer, C. W., 1983, Geologic aspects of tight gas reservoirs in the Rocky Mountain region: Proceedings, SPE/DOE Joint Symposium on Low Permeability Gas Reservoirs, p. 399–408. **GR**, **PB**, **RB**, **SJ**

Spencer, C. W., 1983, Overpressured reservoirs in the Rocky Mountain region (abs.): American Association of Petroleum Geologists Bulletin, v. 67, no. 8, p. 1356– 1357. **GR, PB, PR, RB, SJ**

- Spencer, C. W., 1984, Overview of U.S. Department of Energy Multiwell Experiment, Piceance Creek Basin, Colorado, *in* Spencer, C. W., and Keighin, C. W., eds., Geological studies in support of the U.S. Department of Energy Multiwell Experiment, Garfield County, Colorado: U.S. Geological Survey Open-File Report 84-757, p. 1–13. **PB**
- Spencer, C. W., 1985, Geologic aspects of tight gas reservoirs in the Rocky Mountain region: Journal of Petroleum Technology, v. 37, p. 1308–1314. **GR**, **PB**, **RB**, **SJ**
- Spencer, C. W., 1987, Hydrocarbon generation as a mechanism for overpressuring in Rocky Mountain region: American Association of Petroleum Geologists Bulletin, v. 71, no. 4, p. 368–388. **GR**, **PB**, **PR**, **RB**, **SJ**
- Spencer, C. W., 1988, Review of characteristics of low-permeability gas reservoirs in western United States: American Association of Petroleum Geologists Bulletin, v. 73, no. 5, p. 613–629. **GR**, **PB**, **RB**, **SJ**
- Spencer, C. W., 1989, Comparison of overpressuring at the Pinedale Anticline area, Wyoming, and Multiwell Experiment site, Colorado, *in* Law, B. E., and Spencer, C. W., eds., Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the Multiwell Experiment site, Colorado: U.S. Geological Survey Bulletin Report No. B 1886, p. C1–C16. **GR**
- Spencer, C. W., and Keighin, C. W., eds., 1984, Geological studies in support of the U.S. Department of Energy Multiwell Experiment, Garfield County, Colorado: U.S. Geological Survey Open-File Report 84-757, 134 p. **PB**
- Spencer, C. W., and Law, B. E., 1981, Overpressured, low-permeability gas reservoirs in Green River, Washakie, and Great Divide Basins, southwestern Wyoming (abs.): American Association of Petroleum Geologists Bulletin, v. 65, p. 569. **PB**
- Spencer, C. W., and Law, B. E., 1988, Western tight gas reservoirs, *in* National assessment of undiscovered oil and gas resources, U.S. Geological Survey Open-File Report 88-373, p. 480–500. **GR**, **PB**, **PR**, **RB**, **SJ**
- Spieker, E. M., 1949, Sedimentary facies and associated diastrophism in the Upper Cretaceous of central and eastern Utah: Geological Society of America Memoir 39, p. 55–81. **UB**
- Spieker, E. M., and Reeside, J. B., Jr., 1925, Cretaceous and Tertiary formations of the Wasatch Plateau, Utah: Geological Society of America Bulletin, v. 36, p. 429–454.
- Stach, E., Mackowsky, M.-Th., Teichmüller, M., Taylor, G. H., Chandra, D., and Teichmüller, R., 1975, Stachs textbook of coal petrology, 2d ed: Berlin, Stuttgart, Gebrüder Borntraeger, 428 p. GR, PB, PR, RB, SJ

- Stanton, R. W., 1989, Comparative facies formation in selected coal beds of the Powder River Basin, *in* Flores, R. M., Warwick, P. D., and Moore, T. A., eds., Tertiary and Cretaceous coals in the Rocky Mountain region: American Geophysical Union, 28th International Geological Congress field trip guidebook T132, p. 19–39. PR
- Stearns, D. W., and Friedman, M., 1972, Reservoirs in fractured rock, *in* Stratigraphic oil and gas fields, American Association of Petroleum Geologists Memoir 16, p. 82–106. **GR**, **PB**, **PR**, **RB**, **SJ**
- Stearns, D. W., Sacrison, W. R., and Hanson, R. C., 1975, Structural history of southwest Wyoming as evidenced from outcrop and seismic, *in* Bolyard, D. W., ed., Deep drilling frontiers in central Rocky Mountains: Rocky Mountain Association of Geologists, p. 9–20. **GR**, **PB**
- Steidtmann, J. R., 1969, Stratigraphy of the early Eocene Pass Peak Formation, central-western Wyoming, *in* Barlow, J. A., Jr., ed., Tertiary rocks of Wyoming: Wyoming Geological Association Guidebook, twentyfirst field conference, p. 55–63. **GR**
- Steidtmann, J. R., McGee, L. C., and Middleton, L. T., 1983, Laramide sedimentation, folding, and faulting in the southern Wind River Range, Wyoming, *in* Lowell, J. D., ed., Rocky Mountain foreland basins and uplifts: Rocky Mountain Association of Geologists, p. 161– 167. **GR**
- Steven, T. A., 1975, Middle Tertiary volcanic field in the southern Rocky Mountains, *in* Curtis, B. F., ed., Cenozoic history of the southern Rocky Mountains: Geological Society of America Memoir 144, p. 75–94. **SJ**
- Steven, T. A., Lipman, P. W., Hail, W. J., Jr., Barker, Fred, and Luedke, R. G. (compilers), 1974, Geologic map of the Durango quadrangle, southwestern Colorado: U.S. Geological Survey Miscellaneous Investigations Series Map I-764. SJ
- Stevenson, G. M., 1983, Paleozoic rocks of the San Juan Basin: an exploration frontier, *in* Fassett, J. E., ed., Oil and gas fields of the Four Corners area: Four Corners Geological Society, v. III, p. 780–788. **SJ**
- Stocks, W. L., and Madsen, J. H., Jr., compilers, 1961, Northeast quarter of the geologic map of Utah: Utah State Board map, scale 1:250,000. **UB**
- Stockton, S. L., and Hawkins, C. M., 1985, Southern Green River Basin/Moxa Arch, *in* Gries, R. R., and Dyer, R. C., eds., Seismic exploration of the Rocky Mountain region: Rocky Mountain Association of Geologists and Denver Geophysical Society, p. 73–78. **GR**
- Stone, D. S., 1969, Wrench faulting and Rocky Mountain tectonics: Mountain Geologist, v. 6, no. 2, p. 67–69. **GR, PB, PR, RB, SJ**
- Stone, D. S., 1975, A dynamic analysis of subsurface structure in northwestern Colorado, *in* Bolyard, D. W., ed., Deep drilling frontiers in the central Rocky Mountains: Rocky Mountain Association of Geologists, p. 33–40. **PB**

Stone, D. S., 1977, Tectonic history of the Uncompander Uplift, *in* Veal, H. K., ed., Exploration frontiers of the central and southern Rockies: Rocky Mountain Association of Geologists, p. 23–30. **PB**

- Stone, D. S., 1986, Geology of the Wilson Creek field, Rio Blanco County, Colorado, *in* Stone, D. S., ed., New interpretations of northwest Colorado geology: Rocky Mountain Association of Geologists, p. 229-246. **PB**
- Stone, D. S., 1986, North Fork and Cellers Ranch field: Differential sedimentation or thrust-folding?, *in* Noll, J. H., and Doyle, K. M., eds., Rocky Mountain oil and gas fields: Wyoming Geological Association Symposium, p. 199–215. **GR**, **PB**
- Stone, D. S., 1986, Rangely field summary 2, seismic profile, structural cross-section, and geochemical comparison, *in* Stone, D. S., ed., New interpretations of northwest Colorado geology: Rocky Mountain Association of Geologists, p. 226–228. **PB**
- Stone, D. S., 1986, Seismic and borehole evidence for important pre-Laramide faulting along the Axial Arch in northwest Colorado, *in* Stone, D. S., ed., New interpretations of northwest Colorado geology: Rocky Mountain Association of Geologists, p. 19–36. **PB**
- Stone, D. S., 1991, Wilson Creek field—U.S.A., Piceance Basin, northern Colorado: American Association of Petroleum Geologists Bulletin, v. 75, no. 1, p. 1–45. PB
- Stone, R., and Snoeberger, D. F., 1977, Cleat orientation and areal hydraulic anisotropy of a Wyoming coal aquifer: Groundwater, v. 15, no. 6, p. 434–438. **PR**
- Stone, W. J., Lyford, F. P., Frenzel, P. F., Mizell, N. H., and Padgett, E. T., 1983, Hydrogeology and water resources of San Juan Basin, New Mexico: Socorro, New Mexico, New Mexico Bureau of Mines and Mineral Resources Hydrologic Report 6, 70 p. **SJ**
- Stonecipher, S. A., Winn, R. D., Jr., and Bishop, M. G., 1984, Diagenesis of the Frontier Formation, Moxa Arch: a function of sandstone geometry, texture and composition and fluid flux, *in* McDonald, D. A., and Surdam, R. C., eds., Clastic diagenesis: American Association of Petroleum Geologists Memoir 37, p. 289–316. **GR**
- Stoner, J. D., 1981, Horizontal anisotropy determined by pumping in two Powder River Basin coal aquifers, Montana: Groundwater, v. 19, no. 1, p. 34–40. **PR**
- Stormer, J. C., 1972, Ages and nature of volcanic activity on the southern High Plains, New Mexico and Colorado: Geological Society of America Bulletin, v. 83, p. 2443–2448. **RB**
- Stremel, Kristine, 1990, Western coalbeds: Oil and Gas Investor, v. 9, no. 6, p. 28-41. **GR**, **PB**, **PR**, **RB**, **SJ**
- Strever, Mark, 1979, A methane drainage plan using horizontal holes at the Hawks Nest east mine, Paonia, Colorado: Colorado Geological Survey Open-File Report 80-7, 19 p. **PB**

- Strickland, J. W., 1958, Habitat of oil in the Powder River Basin, *in* Strickland, John, ed., Powder River Basin: Wyoming Geological Association Guidebook, thirteenth field conference, p. 132–147. **PR**
- Stright, D. H., Jr., Gordon, J. I., 1983, Decline curve analysis in fractured low-permeability gas wells in the Piceance Creek Basin: Proceedings, SPE/DOE Joint Symposium on low Permeability Gas Reservoirs, p. 351–362. **PB**
- Strum, S. R., 1984, Depositional environments and lithofacies of the Raton Formation, eastern Raton Basin, New Mexico: North Carolina State University, Masters thesis, 81 p. **RB**
- Suits, V. J., and Cordell, Lindrith, 1981, Bouger gravity map of the San Juan Basin area, Colorado and New Mexico: U.S. Geological Survey Open-File Report No. 81-0657. **SJ**
- Surdam, R. C., and Stanley, K. O., 1980, The stratigraphic and sedimentologic framework of the Green River Formation, Wyoming, *in* Harrison, A., ed., Stratigraphy of Wyoming: Wyoming Geological Association Guidebook, thirty-first field conference, p. 205–221. **GR**
- Surdam, R. C., Crossey, L. J., Hagen, E. S., and Heasler, H. P., 1989, Organic-inorganic interactions and sandstone diagenesis: American Association of Petroleum Geologists, v. 73, no. 1, p. 1–23. GR, PB, PR, RB, SJ

Γ

- Taff, J. A., 1909, The Sheridan coal field, Wyoming: U.S. Geological Survey Bulletin 341-G, p. 123–150. **PR**
- Taylor, D. J., and Huffman, A. C., 1988, Overthrusting in the northwestern San Juan Basin, New Mexico—a new interpretation of the Hogback Monocline (abs.): U.S. Geological Survey Circular 1025, V. E. McKelvey Forum on Mineral and Energy Resources, p. 60. **SJ**
- Taylor, R. B., Stoneman, R. J., and Marsh, S. P., 1984, An assessment of the mineral resource potential of the San Isabel National Forest, south-central Colorado: U.S. Geological Survey Bulletin 1638, 42 p. PB, RB, SJ
- Teichmüller, Marlies, 1987, Recent advances in coalification studies and their application to geology, *in* Scott, A. C., ed., 1987, Coal and coal-bearing strata: recent advances: London, Blackwell Scientific Publications, Geological Society Publication No. 32, p. 127–169. **GR, PB, PR, RB, SJ**
- TerraTek, 1988, CAT scan analysis performed on the Hamilton #3 Well, San Juan Basin: Salt Lake City, Utah, TerraTek Geoscience Services, Project 89-118x. SJ
- TerraTek, 1990, Preliminary cleat and fracture data, Resource Enterprises, Inc. well: Southern Ute Tribal H#1: Salt Lake City, Utah, TerraTek Geoscience Services, 5 p. SJ

Terry, B. E., 1956, Tercio anticline, Las Animas County, Colorado, *in* McGinnis, C. J., ed., Geology of the Raton Basin, Colorado: Rocky Mountain Association of Geologists Guidebook, p. 66–67. **RB**

- Thaden, R. E., and Zech, R. S., 1984, Preliminary structure contour map on base of the Cretaceous Dakota Sandstone in the San Juan Basin and vicinity, New Mexico, Arizona, Colorado and Utah: U.S. Geological Survey Map MF-1673, scale 1:500,000. **SJ**
- Thomaidis, N. D., 1973, Church Buttes Arch, Wyoming and Utah, *in* Schell, E. M., ed., Core seminar on the geology and mineral resources of the Greater Green River Basin: Wyoming Geological Association Guidebook, twenty-fifth field conference, p. 35–39. **GR**
- Thompson, D. A., 1986, Eastern coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 3, nos. 3 and 4, p. 45-47. **GR, PB, PR, RB, SI**
- Thompson, D. A., 1987, Eastern coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 4, p. 52-54. **GR, PB, PR, RB, SJ**
- Thompson, G. A., and Zoback, M. L., 1979, Regional geophysics of the Colorado Plateau, *in* McGetchin, T. R., and others, eds., Plateau uplift: mode and mechanism: Tectonophysics, v. 61, no. 1/3, p. 149–181. **SJ**
- Ting, F. T. C., 1977, Origin and spacing of cleats in coal beds: Journal of Pressure Vessel Technology, v. 99, p. 624–626. **GR, PB, PR, RB, SJ**
- Tissot, B., and Welte, D., 1978, Petroleum formation and occurrence: Berlin, Springer-Verlag, 521 p. GR, PB, PR, RB, SJ
- Toenges, A. I., Turnbull, L. A., Davis, J. D., Reynolds, D. A., Parks, B. C., Cooper, H. M., and Abernethy, R. F., 1952, Coal deposit, Coal Creek district, Gunnison County, Colorado: U.S. Bureau of Mines Bulletin 501, 83 p. **PB**
- Tonnsen, J. J., 1989, Natural gas pipelines and regulations in Wyoming and adjacent areas, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 31– 38. **GR**, **PB**
- Tóth, J., 1978, Gravity-induced cross-formational flow of formation fluids, Red Earth region, Alberta, Canada: analysis, patterns, and evolution: Water Resources Research, v. 14, no. 5, p. 805–843. **GR, PB, PR, RB, SJ**
- Tóth, J., 1980, Cross-formational gravity-flow of ground-water; a mechanism of the transport and accumulation of petroleum; the generalized hydraulic theory of petroleum migration, *in* Roberts, W. H., III, and Cordell, R. J., eds., Problems of petroleum migration: Tulsa, American Association of Petroleum Geologists Studies in Geology No. 10, p. 121–167. **GR**, **PB**, **PR**, **RB**, **SJ**
- Towse, D. F., and Heuze, F. E., 1983, Estimating in situ stresses and rockmass properties from geological and geophysical data: applications in the hydraulic frac-

- turing of tight gas reservoirs: Lawrence Livermore National Laboratory, report UCRL-53443, 33 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Trauger, F. D., and Churan, K. R., 1987, Geohydrology of the Roy-Solano area, Harding County, New Mexico, *in* Lucas, S. G., and Hunt, A. P., eds., Northeastern New Mexico: New Mexico Geological Society Guidebook, thirty-eighth field conference, p. 295–315. **RB**, **SJ**
- Trauger, F. D., and Kelly, T. E., 1987, Water resources of the Capulin topographic basin, Colfax and Union counties, New Mexico, *in* Lucas, S. G., and Hunt, A. P., eds., Northeastern New Mexico: New Mexico Geological Society Guidebook, thirty-eighth field conference, p. 285–293.
- Treckman, P. A., Gilman, A. H., Colburn, W. A., and Miller, F. H., 1962, Exploration hydrodynamics—northwestern Colorado, *in* Amuedo, C. L., and Mott, M. R., eds., Exploration for oil and gas in northwestern Colorado: Rocky Mountain Association of Geologists, p. 75.
 PB
- Tremain, C. M., 1980, The coal bed methane potential of the Raton Basin, Colorado: Proceedings, SPE/DOE Unconventional Gas Recovery Symposium, SPE Paper 8927, p. 43–50. **RB**
- Tremain, C. M., 1980, The coalbed methane potential of the Raton Mesa coal region, Raton Basin, Colorado: Colorado Geological Survey Open-File Report 80-4, 48 p. **RB**
- Tremain, C. M., 1983, Coal bed methane potential of the Piceance Basin, Colorado: Colorado Geological Survey Open-File Report 82-1, 49 p. **PB**
- Tremain, C. M., 1984, Coal bed methane resources of Colorado: Colorado Geological Survey Map Series 19, scale 1:500,000. **GR, PB, RB, SJ**
- Tremain, C. M., 1984, Colorado desorption samples—descriptive statistics and gas prediction equations: Colorado Geological Survey Open-File Report 84-2, 85 p. **PB**, **RB**
- Tremain, C. M., 1990, Coalbed methane development in Colorado: Colorado Geological Survey Information Series no. 32, 35 p. **PB**, **RB**
- Tremain, C. M., and Busch, Ernie, 1991, Current coalbed methane drilling activity in San Juan Basin (abs.): Geological Society of America Abstracts with Programs, v. 23, no. 5, p. A38. **SJ**
- Tremain, C. M., and Toomey, J., 1983, Coalbed methane desorption data: Colorado Geological Survey Open-File Report 81-4, 514 p. **PB**, **RB**
- Tremain, C. M., and Whitehead, N. H., III, 1990, Natural fracture (cleat and joint) characteristics and patterns in Upper Cretaceous and Tertiary rocks of the San Juan Basin, New Mexico and Colorado, *in* Ayers, W. B., Jr., and others, Geologic evaluation of critical production parameters for coalbed methane resources, part I, San Juan Basin: The University of Texas, Bureau

(Tremain, C. M., and Whitehead, N. H., III, 1990, continued) of Economic Geology, annual report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-90/0014.1), p. 73–98. **SJ**

- Tremain, C. M., Boreck, D. L., and Kelso, B. S., 1981, Methane in Cretaceous and Paleocene coals of western Colorado, *in* Epis, R. C. and Callender, J. F., eds, Western Slope Colorado: New Mexico Geological Society Guidebook, thirty-second field conference, p. 241–248. **PB**, **RB**
- Tremain, C. M., Laubach, S. E., and Whitehead, N. H., III, 1991, Coal fracture (cleat) patterns in Upper Cretaceous Fruitland Formation, San Juan Basin, Colorado and New Mexico: implications for coalbed methane exploration and development, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 97–117. **SJ**
- Tremain, C. M., Laubach, S. E., and Whitehead, N. H., III, 1991, Coal fracture (cleat) patterns in Upper Cretaceous Fruitland Formation, San Juan Basin, Colorado and New Mexico—implications for coalbed methane exploration and development, *in* Schwochow, S. D., Murray, D. K., and Fahy, M. F., eds., Coalbed methane of western North America: Rocky Mountain Association of Geologists, fall conference and field trip guidebook, p. 49–59. **SJ**
- Trotter, J. F., 1963, The Minnelusa play of the northern Powder River, Wyoming, and adjacent areas, *in* Cooper, G. C., and others, eds., Northern Powder River Basin Wyoming and Montana: Wyoming Geological Association and Billings Geological Society Guidebook, first joint field conference, p. 117–122. **PR**
- Truchot, J. F., Jr., 1963, The Miller Creek field, Crook County, Wyoming, *in* Cooper, G. C., and others, eds., Northern Powder River Basin Wyoming and Montana: Wyoming Geological Association and Billings Geological Society Guidebook, first joint field conference, p. 129–132. **PR**
- TRW Energy Systems Planning Division, 1980, Methane recovery from coalbeds project: TRW Energy Systems Planning Division monthly progress report, prepared for U.S. Department of Energy and METC under contract no. DE-AC21-78MC08089, p. 1–16. **GR**, **PB**, **PR**, **RB**, **SJ**
- TRW, 1978, Preliminary well test report on Western Coal Co., P-07, San Juan County, New Mexico: Report on file at Colorado Geological Survey, Denver, Colorado. SI
- Turcotte, D. L., and Schubert, G., 1982, Geodynamics applications of continuum physics to geological problems: New York, John Wiley, 450 p. GR, PB, PR, RB, SI

- Tweto, Ogden, 1975, Laramide (Late Cretaceous-early Tertiary) orogeny in the southern Rocky Mountains, *in* Curtis, B. F., ed., Cenozoic history of the southern Rocky Mountains: Geological Society of America Memoir 144, p. 1–44. **PB**, **RB**, **SJ**
- Tweto, Ogden, 1976, Geologic map of the Craig 1° x 2° quadrangle, northwestern Colorado: U.S. Geological Survey Miscellaneous Investigations Series Map I-972, scale 1:250,000. **GR**
- Tweto, Ogden, 1979, Geologic map of Colorado: U.S. Geologic Survey, scale 1:500,000. **PB**, **RB**, **SJ**
- Tweto, Ogden, 1980, Summary of Laramide orogeny in Colorado, *in* Kent, H. C., and Porter, K. W., eds., Colorado geology: Rocky Mountain Association of Geologists Symposium, p. 129–134. **PB**, **RB**, **SJ**
- Tweto, Ogden, 1980, Summary of Laramide orogeny in Colorado, *in* Kent, H. C., and Porter, K. W., eds., Colorado geology: Rocky Mountain Association of Geologists, p. 131–132. **GR**, **PB**, **RB**, **SJ**
- Tweto, Ogden, 1980, Tectonic history of Colorado, *in* Kent, H. C., and Porter, K. W., eds., Colorado geology: Summary of Laramide orogeny in Colorado: Rocky Mountain Association of Geologists Symposium, p. 5–10. **PB**, **RB**, **SJ**
- Tweto, Ogden, and others, 1976, Preliminary geologic map of Montrose 1° x 2° quadrangle, southwestern Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-761, scale 1:250,000. **PB**
- Tweto, Ogden, Moench, R. H., Reed, J. C., Jr., 1978, Geologic map of the Leadville 1° x 2° quadrangle, northeastern Colorado: U.S. Geological Survey Miscellaneous Investigations Series Map I-999, scale 1:250,000. **PB**, **GR**
- Tweto, Ogden, Steven, T. A., Hail, W. J., Jr., and Moench, R. H., 1976, Preliminary geologic map of the Montrose 1° x 2° quadrangle, southwestern Colorado: U.S. Geological Society Miscellaneous Field Studies Map MF-761, scale 1:250,000. **PB**
- Tyler, D. L., and Modroo, A. C., 1986, High Road field, Campbell County, Wyoming, *in* Noll, J. H., and Doyle, K. M., eds., Rocky Mountain oil and gas fields: Wyoming Geological Association Symposium, p. 233–243. **PR**
- Tyler, Roger, Ambrose, W. A., Scott, A. R., and Kaiser, W. R., 1991, Coalbed methane of the Greater Green River, Piceance, Powder River, and Raton Basins: geologic and hydrologic overview: Presented at the Bureau of Economic Geology, The University of Texas at Austin, for the Gas Research Institute, Sept. 4, 1991, unpaginated. **GR**, **PB**, **PR**, **RB**
- Tyler, Roger, Ambrose, W. A., Scott, A. R., and Kaiser, W. R., 1991, Coalbed methane potential of the Greater Green River, Piceance, Powder River, and Raton Basins: The University of Texas at Austin, Bureau of Economic Geology, topical report (January 1991–July 1991) prepared for the Gas Research Institute under

contract no. 5087-214-1544 (GRI-91/0315), 248 p. **GR**, **PR**, **PB**, **RB**

- Tyler, Roger, Laubach, S. E., and Ambrose, W. A., 1991, Effects of compaction on cleat characteristics: preliminary observations, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 141–150. **GR, PB, PR, RB, SI**
- Tyler, Roger, Laubach, S. E., Ambrose, W. A., Grout, M. A., and Tremain, C. M., *in* press: Wyoming Geological Association. [Paper to be presented at the 1992 AAPG-SEPM-EMD Rocky Mountain Section joint conference, Casper, Wyoming, Sept. 13–16, 1992.]. GR, PB, PR, RB

U

- U.S. Department of Energy, Energy Technology Center, 1981, Preliminary resource assessment of coalbed methane in the United States: Technical report prepared under contract no. DOE/METC/SP-186, 30 p. GR, PB, PR, RB, SJ
- U.S. Department of the Interior, Bureau of Land Management, 1990, Coal bed methane environmental assessment, eastern Campbell and western Johnson Counties, Wyoming: document no. WY-061-0-EA064, 52 p. PR
- Uhrin, D. C., 1987, Pittsburgh coalbed methane forum: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 4, p. 55–57. **GR**, **PB**, **PR**, **RB**, **SJ**
- Utah Board of Oil, Gas, and Mining, 1981, Cause no. TGF-100, application by Belco Petroleum Corp., Coastal Oil and Gas Corp., Conoco, Inc., Cotton Petroleum Corp., Ensearch Exploration, Inc., and MAPCO Production for designation of the Wasatch and Mesaverde Formations in part of Uintah County, Utah, as a tight gas sand. UB

\mathbf{V}

- Van Horn, M. D., and Lee, T. S., 1989, Hay Reservoir field: a submarine fan gas reservoir within the Lewis Shale, Sweetwater County, Wyoming, *in* Eisert, J. L., ed., Gas resources of Wyoming: Wyoming Geological Association Guidebook, fortieth field conference, p. 155–180. **GR**
- van Gijzel, P., 1982, Characterization and identification of kerogen and bitumen and determination of thermal maturation by means of qualitative and quantitative microscopical techniques: how to assess maturation and paleotemperatures: Society of Economic Paleontologists and Mineralogists Short Course 7, p. 132–216. GR, PB, PR, RB, SJ
- Velde, B., Dubois, J., Touchard, G., and Badri, A., 1990, Fractal analysis of fractures in rocks: the Cantors Dust

- method: Tectonophysics, v. 179, p. 345–352. **GR**, **PB**, **PR**, **RB**, **SJ**
- Ver Steeg, K., 1942, Jointing in the coal beds of Ohio, *in* Economic geology: Economic Publishing Co., v. 37, p. 503–509. **GR**, **PB**, **PR**, **RB**, **SJ**
- Verbeek, E. R., and Grout, M. A., 1983, Fracture history of the northern Piceance Creek Basin, northwestern Colorado, *in* Gary, J. H., ed., Proceedings, 16th Oil Shale Symposium, p. 29–44. **PB**
- Verbeek, E. R., and Grout, M. A., 1984, 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: U.S. Geological Survey Open-File Report 84-156, 32 p. **PB**
- Verbeek, E. R., and Grout, M. A., 1984, Prediction of subsurface fracture patterns from surface studies of joints—an example from the Piceance Creek Basin, Colorado, *in* Spencer, C. W., and Keighin, C. W., eds., Geological studies in support of the U.S. Department of Energy Multiwell Experiment, Garfield County, Colorado: U.S. Geological Survey Open-File Report 84-757, p. 84–757. **PB**
- Verbeek, E. R., and Grout, M. A., 1986, Cenozoic stress rotation, northern Colorado Plateau (abs.): Geological Society of America Abstracts with Programs, v. 18, no. 5, p. 97. **PB**
- Vernetta, Mickey, 1986, San Juan Basin hanging in there: Western Oil World, v. 43, no. 11 (November), p. 21–22, 24. SJ
- VerPloeg, A. J., and Oliver, R. L., 1981, Wyoming's oil and gas industry—past, present, and future, *in* Reid, S. G., and Miller, D. D., eds., Energy resources of Wyoming: Wyoming Geological Association Guidebook, thirty-second field conference, p. 65–81. **GR**, **PR**
- VerPloeg, A. J., DeBruin, R. H., and Lageson, D. R., 1980, Oil and gas map of Wyoming: Geological Survey of Wyoming Map Series 6, scale 1:500,000. **GR, PR**
- VerPloeg, A. J., DeBruin, R. H., Oliver, R. L., and Clark, Michael, 1983, Almond and Frontier tight gas sand cross sections, Greater Green River Basin, Wyoming: Geological Survey of Wyoming Open-File Report 83-5, 22 p. **GR**
- Vine, J. D., 1974, Geological map and cross sections of the La Veta Pass, La Veta and Ritter Arroyo quadrangles, Huerfano and Costilla Counties, Colorado: U.S. Geological Survey Miscellaneous Investigations Map I-833, scale 1:62,500. **RB**
- Vistelius, A. B., 1966, Structural diagrams: New York, Pergamon, 178 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Von Drehle, W. F., 1985, Amos Draw field, Campbell County, Wyoming, *in* Nelson, G. E., ed., The Cretaceous geology of Wyoming: Wyoming Geological Association Guidebook, 36th field conference, p. 11. **PR**
- von Schonfeldt, H. A., Kehle, R. O., and Gray, K. E., 1973, Mapping of stress fields in the upper earth's crust of

(von Schonfeldt, H. A and others, 1973, continued) the U.S.: Final technical report prepared for U.S. Geological Survey under contract no. 14-08-0001-1222, 78 p. **GR, PB, PR, RB, SJ**

Vuke-Foster, S. M., Colton, R. B., Stickney, M. C., Wilde, E. M., Robocker, J. E., and Christensen, K. C., 1986, Geology of the Baker and Wibaux 30' x 60' quadrangles, eastern Montana and adjacent North Dakota: Montana Bureau of Mines and Geology Geologic Map 41, scale 1:100,000. **PR**

W

- Wach, P. H., 1977, The Moxa Arch, an overthrust model?, *in* Heisey, E. L., and others, eds., Rocky Mountain thrust belt: Wyoming Geological Association Guidebook, twenty-ninth field conference, p. 651-664. **GR**
- Waechter, N. B., Johnson, W. E., 1986, Pennsylvanian-Permian paleostructure and stratigraphy as interpreted from seismic data in the Piceance Basin, northwest Colorado, *in* Stone, D. S., ed., New interpretations of northwest Colorado geology: Rocky Mountain Association of Geologists, p. 51–64. **PB**
- Wandrey, C. J., 1989, Lineament map of part of the Southern Ute Reservation, San Juan Basin, southwestern Colorado: U.S. Geological Survey Open-File Report No. 89-112, scale 1:100,000. **SJ**
- Wanek, A. A., 1963, Geological and fuel resources of the southwestern part of the Raton coal field, Colfax County, New Mexico: U.S. Geological Survey Coal Investigations Map C-45, scale 1:48,000. **RB**
- Waring, Juliana, 1976, Regional distribution of environments of the Muddy Sandstone, southeastern Montana, *in* Laudon, R. B., Curry, W. H., III, and Runge, J. S., eds., Geology and energy resources of the Powder River: Wyoming Geological Association Guidebook, twenty-eighth field conference, p. 83–96. **PR**
- Warner, D. L., 1964, Stratigraphy of Mancos-Mesaverde (Upper Cretaceous) intertonguing relations, southeast Piceance Basin, Colorado: American Association of Petroleum Geologists Bulletin, v. 48, no. 7, p. 1091–1107. **PB**
- Warpinski, N. R., 1986, Elastic and viscoelastic calculations of stresses in sedimentary basins: Society of Petroleum Engineers, SPE Paper 15243, p. 409–417. **GR**, **PB**, **PR**, **RB**, **SJ**
- Warpinski, N. R., and Teufel, L. W., 1987, In situ stress in low-permeability, nonmarine rocks: Society of Petroleum Engineers, SPE Paper 16402, p. 125–138. **PB**
- Warpinski, N. R., Branagan, P. T., and Wilmer, R., 1983, In situ stress measurements at DOEs multi-well experiment site, Mesaverde Group, Rifle, Colorado: Society of Petroleum Engineers, SPE Paper 12142, p. 54– 61. **PB**
- Warpinski, N. R., Branagan, P. T., and Wilmer, R., 1985, Fracturing and testing case study of paludal, tight, lenticular gas sands: Society of Petroleum Engineers, SPE Paper 13876, p. 267–278. **PB**
 - Warpinski, N. R., Branagan, P. T., and Wilmer,

- R., 1985, In situ stress measurements at DOEs Multiwell Experiment site, Mesaverde Group, Rifle, Colorado: Journal of Petroleum Technology, v. 37, no. 3, p. 527–536. **PB**
- Warren, W. C., 1959, Reconnaissance geology of the Birney-Broadus coal field, Rosebud and Powder River Counties, Montana: U.S. Geological Survey Bulletin 1072-J, p. 561-585. **PR**
- Warwick, P. D., 1985, Depositional environments and petrology of Felix coal interval (Eocene), Powder River Basin: Wyoming, University of Kentucky, Ph.D. dissertation. **PR**
- Warwick, P. D., and Flores, R. M., 1987, Evolution of fluvial styles in the Eocene Wasatch Formation, Powder River Basin, Wyoming, *in* Ethridge, F. G., Flores, R. M., and Harvey, M. D., eds., Recent developments in fluvial sedimentology: Society of Economic Paleontologists and Mineralogists Special Publication 39, p. 303–310. **PR**
- Warwick, P. D., and Stanton, R. W., 1988, Depositional models for two Tertiary coal-bearing sequences in the Powder River basin, U.S.A.: Journal of the Geological Society of London, v. 145, p. 613-620. **PR**
- Warwick, P. D., and Stanton, R. W., *in* press, Petrographic characteristics of the Wyodak-Anderson coal bed (Paleocene), Powder River Basin, Wyoming, USA: Organic Geochemistry. **PR**
- Way, S. C., 1983, Hydrologic constraints in dewatering coal seams: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 3, p. 16. **GR, PB, PR, RB, SI**
- Way, S. C., 1984, Hydrologic constraints in dewatering coal seams: Quarterly Review of Methane from Coal Seams Technology, v. 2, no. 1, p. 15. GR, PB, PR, RB, SI
- Way, S. C., 1984, Hydrologic constraints in dewatering coal seams: Quarterly Review of Methane from Coal Seams Technology, v. 2, no. 2, p. 18. **GR, PB, PR, RB, SI**
- Way, S. C., 1986, Hydrologic characterization of coals for optimal dewatering and methane drainage: Quarterly Review of Methane from Coal Seams Technology, v. 3, nos. 3 and 4, p. 37. **GR**, **PB**, **PR**, **RB**, **SJ**
- Way, S. C., 1987, Hydrologic characterization of coal seams for optimal dewatering and methane drainage: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 3, p. 42–43. **RB**
- Way, S. C., 1987, Hydrologic characterization of coals for optimal dewatering and methane drainage: Quarterly Review of Methane from Coal Seams Technology, v. 4, no. 4, p. 46–47. **GR, PB, PR, RB, SJ**
- Way, S. C., 1987, Hydrologic characterization of coals for optimal dewatering and methane drainage: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 1, p. 30–31. **GR**, **PB**, **PR**, **RB**, **SJ**

Way, S. C., 1987, Hydrologic characterization of coals for optimal dewatering and methane drainage: Quarterly Review of Methane from Coal Seams Technology, v. 5, no. 2, p. 37–38. **GR**, **PB**, **PR**, **RB**, **SJ**

- Way, S. C., 1988, Hydrologic characterization of coals for optimal dewatering and methane drainage: Quarterly Review of Methane from Coal Seams Technology, v. 5, nos. 3 and 4, p. 44–45. **GR**, **PB**, **PR**, **RB**, **SJ**
- Way, S. C., Bumb, A. C., Koenig, R. A., McKee, C. R., and Reverand, J. M., 1984, Hydrologic characterization of coal seams for methane recovery. Activity 1 topical report—hydrologic data base for Piceance, San Juan, and Warrior Basins: Final report prepared for the Gas Research Institute (GRI-83/0064), 59 p. **PB**, **SJ**
- Way, S. C., Bumb, A. C., Koenig, R. A., McKee, C. R., and Reverand, J. M., 1985, Hydrologic characterization of coal seams for methane recovery, activities 5 and 7 progress report: review of single-phase hydrologic testing in coalbeds and development of unsaturated-flow well test procedures: Topical report prepared for the Gas Research Institute (GRI 85/0046), 79 p. GR, PB, PR, RB, SJ
- Way, S. C., Bumb, A. C., Koenig, R. A., McKee, C. R., Reverand, J. M., Santoro, D. J., and Ward, W. P., 1985, Hydrologic characterization of coal seams for methane recovery, Activity 2 topical report—hydrologic constraints and single-phase test procedures: Final reports (March-June 1983) prepared for the Gas Research Institute (GRI-83/0065.1 and GRI-83/0065.2), variously paginated. **GR, PB, PR, RB, SJ**
- Way, S. C., Koenig, R. A., Reverand, J. M., and Ward, W. P., 1984, Hydrologic characterization of coal seams for methane recovery, activity 2 topical report—hydrologic data base for Piceance, San Juan, and Warrior Basins: Final report prepared for the Gas Research Institute (GRI-83/0064), 59 p. SJ
- Way, S. C., McKee, C. R., Bell, G. J., and Brandenburg, C. F., 1983, Role of hydrology in the production of methane from coal seams: Quarterly Review of Methane from Coal Seams Technology, v. 1, no. 2, p. 13–19. GR, PB, PR, RB, SJ
- Wayhan, D. A., and McCaleb, J. A., 1969, Elk Basin Madison heterogeneity—its influence on performance: Journal of Petroleum Technology, v. 21, no. 3, p. 153-159.
- Weaver, J. N., and Flores, R. M., 1985, Stratigraphic framework of the upper Fort Union Formation, TA Hills, western Powder River Basin, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-1779. **PR**
- Weaver, J. N., and Flores, R. M., *in* press, Environments of deposition of Late Paleocene coals, western Powder River Basin, Wyoming, U.S.A.: Geological Society of Australia, Special Publication. **PR**
- Webring, M. W., 1988, Preliminary interpretation of shortwavelength magnetic and gravity anomalies on the

- Southern Ute Indian Reservation, southwestern Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 293–294. **SJ**
- Weichman, B. E., 1961, Regional correlation of the Mesaverde group and related rocks in Wyoming, *in* Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 29–33. **GR**, **PR**
- Weimer, R. J., 1960, Upper Cretaceous stratigraphy, Rocky Mountain area: American Association of Petroleum Geologists Bulletin, v. 44, no. 1, p. 1–20. **PB**
- Weimer, R. J., 1961, Spatial dimensions of Upper Cretaceous sandstones, Rocky Mountain area, *in* Peterson, J. A., and Osmond, J. C., eds., Geometry of sandstone bodies: American Association of Petroleum Geologists Special Publication 6101, p. 82–97. **GR**
- Weimer, R. J., 1961, Uppermost Cretaceous rocks in central and southern Wyoming, and northwest Colorado, in Wiloth, G. J., and others, eds., Late Cretaceous rocks—Green River, Washakie, Wind River and Powder River Basins: Wyoming Geological Association Guidebook, sixteenth field conference, p. 17–28. GR, PR, WR
- Weimer, R. J., 1962, Late Jurassic and Early Cretaceous correlations, south-central Wyoming and northwestern Colorado, *in* Enyert, R. L., and Curry, W. H., III, eds., Early Cretaceous rocks of Wyoming and adjacent areas: Wyoming Geological Association Guidebook, seventeenth field conference, p. 124–130. **PB**
- Weimer, R. J., 1965, Stratigraphy and petroleum occurrences, Almond and Lewis Formations (Upper Cretaceous), Wamsutter Arch, Wyoming, *in* DeVoto, R. H., and Bitter, R. K., eds., Sedimentation of Late Cretaceous and Tertiary outcrops, Rock Springs Uplift, Wyoming: Wyoming Geological Association Guidebook, nineteenth field conference, p. 65–80. **GR**
- Weimer, R. J., 1966, Time-stratigraphic analysis and petroleum accumulations, Patrick Draw field, Sweetwater County, Wyoming: American Association of Petroleum Geologists Bulletin, v. 50, no. 10, p. 2150–2175. **GR**
- Weimer, R. J., 1970, Rates of deltaic sedimentation and intrabasin deformation, Upper Cretaceous of Rocky Mountain region, *in* Morgan, J. P., ed., Deltaic sedimentation, modern and ancient: Society of Economic Paleontologists and Mineralogists Special Publication 15, p. 270–292. **GR**
- Weimer, R. J., 1976, Stratigraphy and tectonics of western coals, *in* Murray, D. K., ed., Geology of Rocky Mountain coal: Colorado Geological Survey Resource Series 1, p. 9–27. **GR**, **PB**, **PR**, **RB**, **SJ**
- Weimer, R. J., 1984, Relation of unconformities, tectonics, and sea level changes, Cretaceous of Western Interior,

(Weimer, R. J., 1984, continued) U.S.A., *in* Schlee, J. S., ed., Interregional unconformities and hydrocarbon accumulation: American Association of Petroleum Geologists Memoir 36, p. 7–35. **GR**, **PB**, **PR**, **RB**, **SJ**

- Weimer, R. J., 1986, Relationship of unconformities, tectonics, and sea level changes in the Cretaceous of the Western Interior, United States, *in* Peterson, J. A., ed., Paleotectonics and sedimentation in the Rocky Mountain region, United States: American Association of Petroleum Geologists Memoir 41, p. 397–422. GR, PB, PR, RB, SJ
- Weimer, R. J., and Flexer, A., 1985, Depositional patterns and unconformities, Upper Cretaceous, eastern Powder River Basin, Wyoming, *in* Nelson, G. E., ed., The Cretaceous geology of Wyoming: Wyoming Geological Association Guidebook, 36th field conference, p. 131–147. **PR**
- Weimer, R. J., Emme, J. J., Farmer, C. L., Anna, L. O., Davis, T. L., and Kidney, R. L., 1982, Tectonic influences on sedimentation, Early Cretaceous, east flank Powder River Basin, Wyoming and South Dakota: Colorado School of Mines Quarterly, v. 77, no. 4, 61 p. PR
- Welder, G. E., 1968, Ground-water reconnaissance of the Green River Basin, southwestern Wyoming: U.S. Geological Survey Hydrologic Investigations Atlas HA-290. **GR**
- Welhan, J. A., 1987, Stable isotope hydrology, *in* Kyser, T. K., ed., Stable isotope geochemistry of low temperature processes: Mineralogical Society of Canada Short Course Handbook v. 13, p. 129–161. **GR**, **PB**, **PR**, **RB**, **SJ**
- Wellborn, J. E., 1982, Stratigraphy of the Mesaverde Formation, Mt. Gunnison coal property, Gunnison County, Colorado: Colorado School of Mines, Masters thesis, 91 p. **PB**
- Wenger, W. J., and Reid, B. W., 1958, Characteristics of petroleum in the Powder River Basin, *in* Strickland, John, ed., Powder River Basin: Wyoming Geological Association Guidebook, thirteenth field conference, p. 148. **PR**
- Western Oil World, 1989, Coal beds attract Piceance players: v. 46, no. 9, p. 14. **PB**
- Western Oil World, 1989, Hunting the Powder wildcat: v. 46, no. 8, p. 25. **PR**
- Western Oil World, 1990, Rocky Mountains future projects roundup: April, p. 31. **GR**, **PB**, **PR**, **RB**, **SJ**
- Western Oil World, 1990, San Juan scores gathering system: Western Oil World, v. 47, no. 4, p. 16. SJ
- Western Oil World, 1991, Colorado Interstate Gas seeks FERCs approval for new 223-mile pipeline from Utah to Wyoming: April, p. 11. **GR**, **PB**
- Whitcomb, H. A., Cummings, T. R., and McCullough, R. A., 1966, Ground-water resources and geology of northern and central Johnson County, Wyoming: U.S.

- Geological Survey Water-Supply Paper 1806, p. 1–99. **PR**
- Whitcomb, H. A., and Lowry, M. E., 1968, Ground-water resources and geology of Wind River Basin area, central Wyoming: U.S. Geological Survey Hydrological Investigations Atlas HA-270, scale 1:250,000. **WR**
- Whitcomb, H. A., Morris, D. A., Gordon, E. D., and Robinove, C. J., 1958, Occurrence of ground water in the eastern Powder River Basin and western Black Hills, northeastern Wyoming, *in* Strickland, John, ed., Powder River Basin: Wyoming Geological Association Guidebook, thirteenth field conference, p. 245. **PR**
- White, J. M., 1986, Compaction of Wyodak coal, Powder River Basin, Wyoming, U.S.A.: International Journal of Coal Geology, v. 6, p. 139–147. **PR**
- Whiticar, M. J., Faber, E., and Schoell, Martin, 1986, Biogenic methane formation in marine and freshwater environments: CO2 reduction vs. acetate fermentation—isotope evidence: Geochimica et Cosmochimica Acta, v. 50, p. 693–709. GR, PB, PR, RB, SJ
- Widmayer, M. A., 1977, Depositional model of the sandstone beds in the Tongue River Member of the Fort Union Formation (Paleocene), Decker, Montana: Montana State University, Master's thesis, 123 p. **PR**
- Williams, G. D., and Stelck, C. R., 1975, Speculations on the Cretaceous paleogeography of North America, *in* Caldwell, W. G. E., ed., The Cretaceous system in the Western Interior of North America: Geological Association of Canada Special Paper 13, p. 1–20. **GR**, **PB**, **PR**, **RB**, **SJ**
- Williams, P. L., 1964, Geology, structure, and uranium deposits of the Moab quadrangle, Colorado and Utah: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-360, scale 1:250,000. **GR**
- Williams, Peggy, 1986, Mickelson Creek field extension: a Mesaverde unconformity trap, in Noll, J. H., and Doyle, K. M., eds., Rocky Mountain oil and gas fields: Wyoming Geological Association Symposium, p. 99–105.
- Williams, R. S., Jr., 1983, Geological applications, in Colwell, R. N., ed., Manual of remote sensing (2d ed.):
 American Society of Photogrammetry, v. 2, in Estes, J. E., ed., Interpretation and applications, p. 1667–1953.
 GR, PB, PR, RB, SJ
- Willis, R. D., and Taylor, H. W., 1984, Amendment of incomplete stratigraphic data as an aid to interpreting and modeling discontinuous seams in multi-seam deposits (abs.), *in* Houghton, R. L., and Clausen, E. N., eds., 1984 symposium on the geology of Rocky Mountain coal: North Dakota Geological Society Publication 84-1, p. 126. **GR, PB, PR, RB, SJ**
- Wilson, R. W., and Jentgen, R. W., 1980, Coal test drilling for the De-Na-Zin Bisti Area, San Juan County, New Mexico: U.S. Geological Survey Open-File Report 80-1289, 111 p. **SJ**

Wiltschko, D. V., and Dorr, J. A., 1983, Timing of deformation in overthrust belt and foreland of Idaho, Wyoming, and Utah: American Association of Petroleum Geologists Bulletin, v. 67, no. 8, p. 1304–1322. GR, PB, PR, RB, SJ

- Wiltschko, D. V., and Eastman, D. B., 1983, Role of basement warps and faults in localizing thrust fault ramps, *in* Hatcher, R. D., Jr., Williams, H., and Zietz, I., eds., Contributions to the tectonics and geophysics of mountain chains: Geological Society of America Memoir 158, p. 177–190. **GR**, **PB**, **PR**, **RB**, **SJ**
- Wiman, S. K., 1984, Development and evaluation of technology for methane production from a deep coal seam in the Piceance Basin: Annual report prepared for the Gas Research Institute. **PB**
- Wiman, S. K., 1985, Development and evaluation of technology for methane production from a deep coal seam in the Piceance Basin: Annual report prepared for the Gas Research Institute. **PB**
- Wiman, S. K., and Bell, G. L., 1985, Red Mountain Unit, Piceance Basin, Colorado: Field laboratory for research and development in coalbed methane production (abs.): American Association of Petroleum Geologists Bulletin, v. 69, no. 2, p. 317. **PB**
- Wiman, S. K., Logan, T. L., Seccombe, J. C., and Decker, A. D., 1984, Development and evaluation of technology for methane production from a deep coal seam in the Piceance basin: Annual report (April 1983-May 1984) prepared for the Gas Research Institute (GRI-85/0076), 323 p. **PB**
- Windley, B. F., 1984, The evolving continents: New York, John Wiley, 399 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Windolf, J. W., Jr., Hickling, N. L., and Warlow, R. C., 1982, Coal resource assessment of the Wind River Indian Reservation, Fremont and Hot Springs Counties, Wyoming: U.S. Geological Survey Administrative Report to the Bureau of Indian Affairs, 186 p. **WR**
- Windolf, J. W., Jr., Warlow, R. C., and Hickling, N. L., 1986, Paleoenvironmental and tectonic controls in coal-forming basins of the United States. Deposition of deltaic and intermontane Cretaceous and Tertiary coal-bearing strata in the Wind River Basin, Wyoming: Geological Society of America Special Paper 210, p. 123–140. **WR**
- Winn, R. D., Jr., and Smithwick, M. E., 1980, Lower Frontier Formation, southwestern Wyoming: depositional controls on sandstone compositions and on diagenesis, *in* Harrison, A., ed., Stratigraphy of Wyoming: Wyoming Geological Association Guidebook, thirty-first field conference, p. 137–153. **GR**
- Winn, R. D., Jr., Bishop, M. G., and Gardner, P. S., 1985, Lewis Shale, south-central Wyoming: shelf, delta front, and turbidite sedimentation, *in* Nelson, G. E., ed., The Cretaceous geology of Wyoming: Wyoming Geological Association Guidebook, 36th field conference, p. 113–130. **GR**

- Winn, R. D., Jr., Bishop, M. G., and Gardner, P. S., 1987, Shallow-water and sub-storm-base deposition of Lewis Shale in Cretaceous Western Interior seaway, south-central Wyoming: American Association of Petroleum Geologists Bulletin, v. 71, no. 7, p. 859-881. GR, PB, PR, RB, SJ
- Winn, R. D., Jr., Stonecipher, S. A., and Bishop, M. G., 1984, Sorting and wave abrasion: controls on composition and diagenesis in lower Frontier sandstones, southwestern Wyoming: American Association of Petroleum Geologists Bulletin, v. 68, no. 3, p. 268–284.
- Wold, J. S., and Woodward, T. C., 1968, Project Thunderbird: Wyoming Geological Association Guidebook, twentieth field conference, p. 147–163. **PR**
- Wolff, R. G., Bredehoeft, J. D., Keys, W. S., and Shuter, E., 1974, Tectonic stress determinations, northern Piceance Creek Basin, Colorado, *in* Murray, K. D., ed., Energy resources of the Piceance Creek Basin, Colorado: Rocky Mountain Association of Geologists, twenty-fifth field conference, p. 193–197. **PB**
- Wong, I. G., and Humphrey, J. R., 1989, Contemporary seismicity, faulting, and the state of stress in the Colorado Plateau: Geological Society of America Bulletin, v. 101, p. 1127–1146. **GR, PB, PR, RB, SJ**
- Wood, G. H., Jr., and Bour, W. V., III, 1988, Coal map of North America: U.S. Geological Survey Special Geologic Map, scale 1:500,000. **GR**, **PB**, **PR**, **RB**, **SJ**
- Wood, G. H., Jr., Johnson, R. B., and Dixon, G. H., 1948, Geology of the southern part of Archuleta County, Colorado: U.S. Geological Survey Oil and Gas Investigation Preliminary Map 81, scale 1:63,360. **SJ**
- Wood, G. H., Jr., Johnson, R. B., and Dixon, G. H., 1957, Geology and coal resources of the Starkville-Western area, Las Animas County, Colorado: U.S. Geological Survey Bulletin 1051, 68 p. **RB**
- Wood, G. H., Jr., Johnson, R. B., Eargle, D. H., Duffner, R. T., and Harald, M., 1951, Geology and coal resources of the Stonewall-Tercio area, Las Animas County, Colorado: U.S. Geological Survey Coal Investigation Map C-4. **RB**
- Woodruff, C. M., Jr., and Caran, S. C., 1984, Lineaments of Texas—possible surface expressions of deep-seated phenomena: The University of Texas at Austin, Bureau of Economic Geology, final report prepared for U.S. Department of Energy, Division of Geothermal Energy, under contract no. DE-AS07-79ID12057, Geothermal resource assessment for the State of Texas, 68 p. GR, PB, PR, RB, SJ
- Woodward, Jane, Meissner, F. F., and Clayton, J. L., eds., 1984, Hydrocarbon source rocks of the greater Rocky Mountain region: Rocky Mountain Association of Geologists, 557 p. **GR**, **PB**, **PR**, **RB**, **SJ**
- Woodward, L. A., 1983, Geology and hydrocarbon potential of the Raton Basin, New Mexico, *in* Fassett, J., ed., Oil and gas fields of the Four Corners area: Four Corners Geological Society, v. 3, p. 789–798. **RB**

Woodward, L. A., 1984, Potential for significant oil and gas fracture reservoirs in Cretaceous rocks of Raton Basin, New Mexico: American Association of Petroleum Geologists Bulletin, v. 68, no. 5, p. 628–636. **RB**

- Woodward, L. A., 1987, Oil and gas potential of the Raton Basin, New Mexico, *in* Lucas, S. G., and Hunt, A. P., eds., Northeastern New Mexico: New Mexico Geological Society Guidebook, thirty-eighth field conference, p. 331–338. **RB**
- Woodward, L. A., and Callender, J. F., 1977, Tectonic framework of the San Juan Basin, *in* Fassett, J. E., ed., San Juan Basin III: New Mexico Geological Society, 28th field conference guidebook, p. 209–212. **SJ**
- Woodward, L. A., and Snyder, D. O., 1976, Structural framework of the southern Raton Basin, New Mexico, *in* Ewing, R. C., and Kues, B. S., eds., Vermejo Park, northeastern New Mexico: New Mexico Geological Society Guidebook, twenty-seventh field conference, p. 125–127. **RB**
- Woodward, L. A., and Snyder, D. O., 1976, Tectonic map of the southern Raton Basin, New Mexico, *in* Ewing, R. C., and Kues, B. S., eds., Vermejo Park, northeastern New Mexico: New Mexico Geological Society Guidebook, twenty-seventh field conference. **RB**
- Woodward, L. A., Callender, J. F., Seager, W. R., Chapin, C. E., Gries, J. C., Shaffer, W. L., and Zilinski, R. E., 1978, Tectonic map of Rio Grande Rift region in New Mexico, Chihuahua, and Texas, *in* Hawley, J. W., compiler, Guidebook to Rio Grande Rift in New Mexico and Colorado: New Mexico Bureau of Mines and Mineral Resources Circular 163. **RB**
- Wright, Robyn, 1986, Cycle stratigraphy as a paleogeographic tool: Point Lookout Sandstone, southeastern San Juan Basin, New Mexico: Geological Society of America Bulletin, v. 96, p. 661–673. SJ
- Wulf, G. R., 1963, Late Paleozoic tectonics of northeastern Powder River Basin, Wyoming, *in* Cooper, G. C., and others, eds., Northern Powder River Basin Wyoming and Montana: Wyoming Geological Association and Billings Geological Society Guidebook, first joint field conference, p. 113–116. **PR**
- Wulf, G. R., 1963, Lower Cretaceous Muddy Sandstone, northeastern Powder River Basin, Wyoming, *in* Cooper, G. C., and others, eds., Northern Powder River Basin Wyoming and Montana: Wyoming Geological Association and Billings Geological Society Guidebook, first joint field conference, p. 104–111. **PR**
- Wyoming Geological Association, 1965, Geological history of Powder River Basin: American Association of Petroleum Geologists Bulletin, v. 49, no. 11, p. 1893–1907. **PR**

Y

Yamaguchi, Yasushi, 1985, Image-scale and look-direction effects on the detectability of lineaments in radar images: Remote Sensing of Environment, v. 17, no. 2, p. 117–127. **GR, PB, PR, RB, SJ**

Yarborough, L., and Hall, K. R., 1974, How to

- solve equation of state for Z-factors: Oil and Gas Journal, v. 72, no. 7, p. 86–88. **GR**, **PB**, **PR**, **RB**, **SJ**
- Yeh, Joseph, Schultz-Ela, D. D., and Laubach, S. E., 1991, Predicting fracture permeability from bed curvature, *in* Ayers, W. B., Jr., and others, Geologic and hydrologic controls on the occurrence and producibility of coalbed methane, Fruitland Formation, San Juan Basin: The University of Texas at Austin, Bureau of Economic Geology, topical report prepared for the Gas Research Institute under contract no. 5087-214-1544 (GRI-91/0072), p. 181–192. **SJ**
- Young, G. B. C., McElhiney, J. E., Dhir, R., Mavor, M. J., and Anbouba, I. K. A., 1991, Coalbed methane production potential of the Rock Springs Formation, Great Divide Basin, Sweetwater County, Wyoming: Proceedings, Society of Petroleum Engineers Gas Technology Symposium, SPE Paper 21487, p. 55–62. GR
- Young, R. G., 1955, Sedimentary facies and intertonguing in the Upper Cretaceous of the Book Cliffs, Utah-Colorado: Geological Society of America Bulletin, v. 66, no. 2, p. 177–202. **UB**
- Young, R. G., 1966, Stratigraphy of coal-bearing rocks of the Book Cliffs, Utah-Colorado: Utah Geological and Mineralogical Survey Bulletin 80, p. 7–20. **UB**
- Young, R. G., 1975, Lower Cretaceous rocks of northwestern Colorado and northeastern Utah, *in* Bolyard, D. W., ed., Deep drilling frontiers in the central Rocky Mountains: Rocky Mountain Association of Geologists, p. 141–147. **UB**
- Young, R. G., 1982, Stratigraphy and petroleum geology of the Mesaverde Group, southeastern Piceance Creek Basin, *in* Southeastern Piceance Basin, Colorado: Grand Junction Geological Society, 1982 field trip guidebook, p. 45–54. **PB**

\mathbf{Z}

- Zapp, A. D., 1949, Geology and coal resources of the Durango area, La Plata and Montezuma Counties, Colorado: U.S. Geological Survey Oil and Gas Investigation Preliminary Map 109, scale 1:31,680. **SJ**
- Zapp, A. D., and Cobban, W. R., 1960, Some Late Cretaceous strandlines in northwestern Colorado and northeastern Utah, in Geological Survey research 1960: U.S. Geological Society Professional Paper 400-B, p. B246–249. GR, PB, PR, RB, SJ
- Zeller, H. D., and Stephens, E. V., 1969, Geology of the Oregon Buttes area, Sweetwater, Sublette, and Fremont Counties, southwestern Wyoming: U.S. Geological Survey Bulletin 1256, 60 p. **GR**
- Zemanek, J., Glenn, E., Norton, L. J., and Caldwell, R. L., 1970, Formation evaluation by inspection with borehole televiewer: Geophysics, v. 35, no. 2, p. 254–269.
- Zietz, Isidore, and Kirby, J. R., Jr., 1972, Aeromagnetic map of Colorado: U.S. Geological Survey Geophysical

Investigations Map GP-836, scale 1:500,000. **PB**, **RB**, **SI**

- Zietz, Isidore (compiler) and others, 1982, Composite magnetic anomaly map of the United States, part A: Conterminous United States: U.S. Geological Survey Geophysical Investigation Map GP-0954-A, scale 1:250,000. GR, PB, PR, RB, SJ
- Zimpfer, G. L., Harmon, E. J., and Boyce B. C., 1988, Disposal of production waters from oil and gas wells in the northern San Juan Basin, Colorado, *in* Fassett, J. E., ed., Geology and coal-bed methane resources of the northern San Juan Basin, Colorado and New Mexico: Rocky Mountain Association of Geologists, p. 183–198. **SJ**
- Zoback, M. D., Tsukahara, Hiroaki, and Hickman, Stephen, 1980, Stress measurements at depth in the

- vicinity of the San Andreas Fault: implications for the magnitude of shear stress at depth: Journal of Geophysical Research, v. 85, no. B11, p. 6157–6173. **GR**, **PB**, **PR**, **RB**, **SJ**
- Zoback, M. L., 1988, State of stress in the Rocky Mountain region (abs.): Geological Society of America Abstracts with Programs, v. 20, p. A12. **GR**, **PB**, **PR**, **RB**, **SJ**
- Zoback, M. L., and Zoback, M. D., 1980, State of stress in the conterminous United States: Journal of Geophysical Research, v. 85, no. B11, p. 6113–6156. **GR**, **PB**, **PR**, **RB**, **SJ**
- Zoback, M. L., and Zoback, M. D., 1989, Tectonic stress field of the continental United States, *in* Pakiser, L. C., and Mooney, W. D., Geophysical framework of the continental United States: Geological Society of America Memoir 172, p. 523–539. **GR**, **PB**, **PR**, **RB**, **SJ**