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New publications

NMBMMR

***Scenic Trip 8**—Mosaic of New Mexico's scenery, rocks, and history, by P. W. Christiansen and F. E. Kottlowski, reprinted 1982 from 1972 edition, 170 p., 64 illustrations and maps, 6 color photos $4.00

***Scenic Trip 13**—Española–Chama–Taos—A climb through time, by W. R. Muehlberger and Sally Muehlberger, 1982, 97 p., 69 illustrations and maps, 16 color photos. This guidebook was written for either one long trip or two shorter trips beginning in historic Santa Fe, the capital of New Mexico. At Española, the traveler can choose to take a longer loop through Abiquiu and Chama or a shorter loop through Ojo Caliente and Tres Piedras. North of Santa Fe to Abiquiu, the route parallels magnificent cliffs of yellow, white, and red sandstone and gypsum. The Ghost Ranch Visitor Center and Echo Amphitheater are recommended stops. El Vado Lake State Park and Heron Lake State Park are only a short drive west of the tour route at Tierra Amarilla. Chama is the northernmost town on the tour and a point of departure for the Cumbres and Toltec Scenic Railroad. At Tierra Amarilla, the road log turns east and crosses the Tusas Mountains. The route reenters Carson National Forest and continues southeast to Taos, at the base of the Sangre de Cristo Mountains. The final leg of this loop follows the Rio Grande south and returns to Española. $4.50

***Circular 175**—Western extent of Ogallala Formation in New Mexico, by John C. Frye, A. Byron Leonard, and H. D. Glass, 1982, 41 p. This study defines the western limits of the Ogallala Formation (upper Tertiary) west of the Pecos River and documents the late Cenozoic geology of the region, including fragmentary deposits of early Pleistocene age and molluscan faunas of Wisconsinan and Holocene age. Included are 10 figures and an appendix containing clay-mineral analyses and measured stratigraphic sections. $6.00

***Circular 182**—Industrial rocks and minerals of the Southwest, by G. S. Austin, compiler, 1982, 111 p. On May 13–15, 1981, in Albuquerque, New Mexico, the 17th Annual Forum on the Geology of Industrial Minerals was held. This volume contains 18 expanded papers from the Forum, along with 2 abstracts of papers given at the Forum but not presented for publication. In addition to technical papers on the major industrial minerals of New Mexico and adjoining states, the circular contains articles on potash in Libya and perlite in El Salvador. $13.00

***Geologic Map 52**—Geology of Florida Gap quadrangle, Luna County, New Mexico, by Russell E. Clemons, 1982, 1 sheet with text. Florida Gap quadrangle is in east-central Luna County, approximately 6 mi east-southeast of Deming. The quadrangle covers the Lewis Flats area of the Mimbres Basin, Rock Hound State Park, and Florida Gap which separates the Little Florida Mountains from the Florida Mountains. This map is the first phase of a comprehensive geologic and mineral-resource investigation of the Florida Mountains; other quadrangles to be mapped for this investigation will be Capitol Dome, South Peak, and Gym Peak. $3.50

***Pricelist 16**—Publications available from the New Mexico Bureau of Mines and Mineral Resources, March 1982 FREE

***Open-file List 1**—Open-file reports available from New Mexico Bureau of Mines and Mineral Resources, February 1982 FREE

Open-file reports

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***131**—Water-quality data compiled for hydrogeologic study of Animas Valley, Hidalgo County, New Mexico, by K. O'Brien and W. J. Stone, 1982, 26 p., 4 maps $9.20

***145**—Stratigraphic sequence and drilling data from Fence Lake area, by F. Campbell, text, maps $20.00

***155**—Radioactive occurrences in veins and igneous and metamorphic rocks of New Mexico with annotated bibliography, by V. T. McLemore, 1982, 267 p., 5 tables, 13 figs., 2 plates $57.40

***158**—Geology and geochemistry of Ordovician carbonatite dikes in the Lemitar Mountains, Socorro County, New Mexico, by V. T. McLemore, 112 p., 3 maps $25.40

***165**—Reconnaissance report Brush Heap mine, Kingston mining district, Sierra County, New Mexico by R. W. Eveleth and R. M. North, 21 p. $4.20

***166**—Report on the Battleship Group of patented mining claims, Lordsburg mining district, Hidalgo County, New Mexico, by R. W. Eveleth and R. M. North, 24 p. $4.80

USGS

79-0112—Coal resource occurrence and coal development potential maps of the Mule Dam quadrangle, Sandoval County, New Mexico, by Dames and Moore, 1982, 26 p., 14 over-size sheets, scale 1:24,000

79-0114—Coal resource occurrence and coal development potential maps of the Pueblo Alto Trading Post quadrangle, McKinley and Sandoval Counties, New Mexico, by Dames and Moore, 1982, 31 p., 17 over-size sheets, scale 1:24,000

79-0152—Coal resource occurrence and coal development potential maps of the Huerfano Trading Post SW quadrangle, San Juan County, New Mexico, by Dames and Moore, 1981, 25 p., 13 over-size sheets, scale 1:24,000

79-0153—Coal resource occurrence and coal development potential maps of the Blanco Trading Post quadrangle, San Juan County, New Mexico, by Dames and Moore, 1981, 23 p., 9 over-size sheets, scale 1:24,000

79-0156—Coal resource occurrence and coal development potential maps of the Pueblo Bonito quadrangle, San Juan and McKinley Counties, New Mexico, by Dames and Moore, 1982, 19 p., 3 over-size sheets, scale 1:24,000

79-0158—Coal resource occurrence and coal development potential maps of the Deer Mesa quadrangle, Sandoval County, New Mexico, by Dames and Moore, 1981, 26 p., 11 over-size sheets, scale 1:24,000

79-0161—Coal resource occurrence and coal development potential maps of the Ojo Encino Mesa quadrangle, McKinley and Sandoval Counties, New Mexico, by Dames and Moore, 1982, 30 p., 12 over-size sheets, scale 1:24,000

79-0601—Coal resource occurrence and coal development potential maps of the Bisti Trading Post quadrangle, San Juan County, New Mexico, by Dames and Moore, 1982, 27 p., 12 over-size sheets, scale 1:24,000

79-0602—Coal resource occurrence and coal development potential maps of the Alamo Mesa West quadrangle, San Juan County, New Mexico, by Dames and Moore, 1982, 34 p., 20 over-size sheets, scale 1:24,000

79-0604—Coal resource occurrence and coal development potential maps of the Pillar 3 NE quadrangle, San Juan County, New Mexico, by Dames and Moore, 1982, 24 p., 8 over-size sheets, scale 1:24,000

79-0605—Coal resource occurrence and coal development potential maps of the Tanner Lake quadrangle, San Juan County, New Mexico, by Dames and Moore, 1982, 35 p., 25 over-size sheets, scale 1:24,000

79-0621—Coal resource occurrence and coal development potential maps of the SW quarter of the Nageezi 15-min quadrangle, San Juan and Rio Arriba Counties, New Mexico, by Dames and Moore, 1981, 18 p., 9 over-size sheets, scale 1:24,000

79-0798—Coal resource occurrence and coal development potential maps of the Bloomfield NW quadrangle, San Juan County, New Mexico, by Dames and Moore, 1981, 21 p., 17 over-size sheets, scale 1:24,000

79-1114—Coal resource occurrence and coal development potential maps of the Youngs Lake quadrangle, San Juan County, New Mexico, by Dames and Moore, 1981, 25 p., 13 over-size sheets, scale 1:24,000

81-0117—Seismicity near Albuquerque, New Mexico, 1976–1978, by L. H. Jaksha and Jerry Locke, 1981, 18 p.

81-0161—Fission-track ages of air-fall tuffs in Miocene sedimentary rocks of the Española Basin, Santa Fe County, New Mexico, by G. A. Izett and C. W. Naeser, 1981, 10 p.

81-0172—Geophysical log suite from drill holes No. 1 and 2, Mariano Lake–Lake Valley drilling project, McKinley County, New Mexico, 1981, 8 p., 7 over-size sheets

81-0487—Water resources of the Rincon and Mesilla Valleys and adjacent areas, New Mexico, by C. A. Wilson, R. R. White, B. R. Orr, and R. G. Roybal, 1981, 447 p.

81-0921—Annual water resources review, White Sands Missile Range, New Mexico, 1980, by R. R. Cruz, 1981, 32 p.

81-1071—Summary of basin and flood characteristics for unregulated basins in New Mexico, by R. P. Thomas and April Dunne, 1981, 243 p.

81-1201—Lithologic descriptions of cutting samples, Mariano Lake–Lake Valley drilling project, McKinley County, New Mexico, holes no. 9 and 10, by A. C. Huffman, Jr., D. J. Hammond, R. F. Dubiel, D. S. Mruk, and P. L. Hansley, 1981, 31 p.

81-1202—Lithologic descriptions, core and cutting samples, Mariano Lake–Lake Valley drilling project, McKinley County, New Mexico, hole no. 3, by A. C. Huffman, Jr., A. R. Kirk, D. J. Hammond, R. S. Zech, K. J. Franczyk, B. A. Steele-Mallory, L. C. Gundersen, P. G. Sikkink, S. M. Condon, D. S. Mruk, M. Moore, L. A. Indelicato, and P. Hildebrandt, 1981, 33 p.

Abstracts

PRELIMINARY REPORT ON SEDIMENTOLOGY AND GAS PRODUCTION OF TIGHT ABO FORMATION SANDSTONES, CHAVES COUNTY, NEW MEXICO

by *R. F. Broadhead,* Petroleum Geologist, New Mexico Bureau of Mines and Mineral Resources

Red bed sandstones located on the northwest shelf of the Delaware Basin are tentatively correlated with the Abo Formation (Permian) and are currently the most sought after targets of natural-gas drilling in southeast New Mexico. The Federal Energy Regulatory Commission has approved a tight gas-sand designation for the Abo. Because of this designation, gas produced from the Abo red beds can be sold for as much as $4.92 per thousand ft^3 ($5.15 per thousand ft^3 as of June 1982), $2.11 ($2.34–June 1982) more than the regulated ceiling price for gas produced from formations not designated as tight. More than 250 wells have been completed as Abo gas producers since the initial discovery in 1977. Production is currently confined to an area of approximately 700 mi^2 in northern Chaves County. Several wildcats drilled to the west in Lincoln County and to the north in DeBaca and Guadalupe Counties have encountered promising shows of gas in the Abo. The Abo is composed predominantly of red mudstones and very-fine-grained arkosic sandstones. To the west of the producing area on the Pedernal uplift, the Abo unconformably onlaps Precambrian basement rocks. Elsewhere, the Abo conformably overlies marine limestones and mudstones of the Hueco Formation (Permian). The Abo is conformably overlain by the marine anhydrites, dolostones, and fine-grained sandstones of the Yeso Formation (Permian). Sedimentologic study indicates that the Abo was deposited as a fluvial delta which prograded southward over a marine shelf. The lower part of the Abo was deposited as marine delta-front muds and sands; the upper part was deposited in the nonmarine portion of the delta. Gas is produced mostly from nonmarine, lenticular sandstones. Because the nonmarine facies extends for almost 100 mi to the north, the area potentially underlain by similar Abo reservoirs is at least five times greater than that which is currently productive.

The above abstract is of an article appearing in the Annual Report July 1, 1980, to June 30, 1981, of the New Mexico Bureau of Mines and Mineral Resources. Other articles included in the report available for $2.00 are ones on an Upper Cretaceous guide fossil, reminiscences of a former Bureau director, uranium severance taxes, coal-resources and paleontology workshop, and mineral and fuel production for 1980.

PLATE-TECTONICS MODEL FOR PROTEROZOIC CONTINENTAL ACCRETION IN THE SOUTHWESTERN UNITED STATES, by *K. C. Condie,* 1982, Geology, v. 10, no. 1, p. 37–42

THE UPPER CRETACEOUS BEARTOOTH SANDSTONE OF SOUTHWESTERN NEW MEXICO—A TRANSGRESSIVE DELTAIC COMPLEX ON SILICIFIED PALEOKARST, by *H. S. Chafetz,* March 1982, Journal of Sedimentary Petrology, v. 52, no. 1, p. 157–169, 16 figs.

AN IRRIDIUM ABUNDANCE ANOMALY AT THE PALYNOLOGICAL CRETACEOUS–TERTIARY BOUNDARY IN NORTHERN NEW MEXICO, by *C. J. Orth, J.S. Gilmore, J. D. Knight, C. L. Pillmore, R. H. Tschudy,* and *J. E. Fassett,* 1982, Science, v. 214, no. 4527, p. 1,341

Mineral Notes

The U.S. Bureau of Land Management returned $128.8 million to New Mexico during fiscal year 1981 (October 1980–September 1981) for the State's 50% share of payments to the BLM from mineral royalties, rentals, and fees. New Mexico received the largest payment for a state; Wyoming was second with $120.9 million, out of a total of $482.7 million returned to the states. For the first half of fiscal year 1982 (October 1981–March 1982), the BLM paid $79.4 million, an increase from the $55.8 million paid in March 1981.

Companies paid $2.79 million for coal leases on 19,116 acres of State Trust Lands in September 1981. Most of the leases, which are in McKinley, Catron, and Cibola Counties, were obtained by Salt River Agricultural Improvement and Power District of Phoenix and Santa Fe Mining Company of Albuquerque.

The U.S. Department of Energy reported (May 1982) that uranium production and drilling for 1981 decreased compared with 1980. Ore processed in New Mexico was 5.4 million tons (total U.S., 14.5 million tons) containing 6,510 tons (total U.S., 16,690 tons) U_3O_8. This resulted in a concentrate of 6,210 tons (total U.S., 19,240 tons) U_3O_8. Drilling in New Mexico for uranium dropped from 4.5 million ft (U.S., 27.9 million ft) in 1980 to 1.5 million ft (U.S., 13.0 million ft) in 1981.

State taxes on all minerals are a major part of the state government's revenues. In fiscal year 1980–81 (July 1980–June 1981), taxes and royalties from the oil and gas industry were $494 million, along with an additional $130 million from metallic minerals and industrial rocks and minerals.

ENERGY COSTS—MARCH 1982 (SOCIETY OF PETROLEUM ENGINEERS). $100 WOULD BUY:

	Cost per million Btu
3.8 tons of bituminous coal	$ 1.00
25.5 Mcf of natural gas	3.84
3.6 bbls of crude oil	4.84
114.5 gallons of diesel fuel	6.33
102.2 gallons of heating oil	7.05
81.9 gallons of gasoline	9.77
1,866 kwh of electricity	15.71
a cord of wood	357.00

The New Mexico Oil Conservation Division of NMEMD reported that crude oil production for the first third of 1982 (January through April) was 23,579,206 bbls, down from 24,123,039 bbls in 1981 (decrease of 2.3%) and natural gas production was 379,587,362 Mcf, down from 385,273,810 Mcf in 1981 (decrease of 1.5%).

Crude oil production for calendar 1981 (NMOCD) was 72,155,017 bbls (down 4.20% from 1980), worth an estimated $2.47 billion. National gas production was 2,415,032,759 Mcf (down 1.21%) valued at $2.42 billion. The New Mexico Oil and Gas Association estimated total 1981 state revenues from oil and gas activities in New Mexico at $975.9 million. The six taxes directly imposed on the oil and gas industry produced $365.4 million. Nontax state income, including lease and bonus payments, royalties, and earnings from investment of the State (Land) Permanent Fund were $610.5 million. The (Land) Permanent Fund totaled almost $1.3 billion on 31 December 1981. Interest is used by the State Educational System for capital expenditures.

The state severance tax Permanent Fund totaled $602 million on 31 December 1981, being increased by $72.7 million in the last six months of 1981. Interest is used to pay for bonds, most of which are for state buildings.

With the stoppage of waste-stripping operations at Kennecott's Chino mines at the end of May, large-scale mining ceased in Grant County, awaiting improvement in the price of copper. Essentially all of the mining-related employees of Chino mines, the Tyrone mine of Phelps Dodge, and Sharon Steel's underground and small open-pit copper mines were laid off. Minor repairs are being made on two concentrators at Sharon Steel, and Chino is making major repairs on one of the furnaces at the Hurley smelter. Chino is also nearing completion of the first section of its new $280 million concentrator. This concentrator will be able to handle 75,000 tons of ore per day.

The Copper Flat open-pit mine of Quintana Minerals Corporation and Philbro Mineral Enterprises Inc. began production in the early part of 1982. The porphyry copper deposit is just northeast of Hillsboro and will have an estimated annual production of 40 million lbs of copper, 1 million lbs of molybdenum, 12,000 oz of gold, and 350,000 oz of silver. On the surface, the orebody is 600 ft by 1,400 ft but enlarges 150 ft below the surface and minable ore continues to 700 ft. This is an underground mine. The grade of the copper is about 0.44% for the cut-off of .25%; 55 to 60 million tons of ore are available. Expected life of the mine is 15 yrs.

Exxon Minerals announced in March 1982 that it had reached an agreement with Boliden Minerals, whose parent company is a Swedish mining firm, whereby Boliden will take over exploration and development of Exxon's Pinos Altos property near Silver City. Boliden will conduct additional surface diamond drilling and could begin underground work late in 1982. Should Boliden decide to go into production with the property, that company would have full ownership; Exxon would receive a royalty from the production.

U.S. Department of Energy reported (May 1982) that New Mexico's $50/lb. U_3O_8 reserves, as of 1 January 1982, were 163 million tons of ore, at 0.15% grade, giving 243,000 tons of U_3O_8. This is 41% of total U.S. reserves.

Desi Apodaca of Socorro and Carlsbad was appointed State Mine Inspector by Governor Bruce King in May. Part of the duties of the SMI is to collect production data and other statistics from the mining industry in New Mexico.

—F. E. Kottlowski

Pajarito fault zone

(continued from p. 41)

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Late Cretaceous leaf locality

(continued from p. 45)

APPENDIX A *(continued)*

Total thickness—16.84 m (55.9 ft)

Unit No.	Description	Thickness (cm)	(*inches*)
010	White sandstone, medium-grained; with large plant fragments up to 5 cm²; well indurated and forms characteristic popcorn surface texture upon weathering; some hoodoo (columns or pinnacles) development	89	*36*
009	White sandstone, fine-grained; about 5% plant debris concentrated in laminae. Undulating bedding finely developed; well indurated with fine laminations and mud partings	60	*24*
008	Dark gray-green mudstone with 15-20% plant debris up to 3.5 cm²; coarsens upward	30	*12*
007	Gray-green mudstone with about 5% plant fragments and stems; grades upward into 008	28	*11*
006	Sandstone, white, medium-grained; with large fragments of plants up to 5 cm²; about 10% plant content	25	*10*
005	Mudstone, gray-green; with approximately 10% carbonaceous debris; coarsens upwards into 006	61	*24*
004	Carbonaceous mudstone, dark-gray; up to 40% plant debris is up to 2 cm² poorly sorted; coarsens upwards; becomes much less carbonaceous laterally (about 10%)	28	*11*
003	Olive sandstone, medium-grained; with some iron staining along bedding planes; 5-10% plant debris	117	*47*
002	Gray siltstone; 5% plant debris; iron staining in fractures	18	*7*
001	White sandstone; fine-grained lenses of sand rich in carbonized plant debris and silt lacking plant debris; lenses subparallel to bedding; fines upward into 002; much lateral variation in plant debris content (5-20%)	30	*12*

APPENDIX B—MEASURED SECTION.

Unit No.	Description	Thickness (cm)	(*inches*)
A	Concretion, dark-brown; siderite with veins of barite; rare, poorly preserved leaf impressions extend laterally 1.8 m (5.9 ft)	35.6	*14.2*
B	Siltstone, gray-green; scattered subrounded plant fragments; well-sorted, averaging 5 mm (.2 inches) in diameter	15.2	*6.1*
C	Mudstone, gray-green; a few scattered stem fragments; poorly sorted up to 3 x 5 cm (1.2 x 2 inches)	3.8	*1.5*
D	Mudstone, gray-green; occasional horizons with leaves 3 cm (1.2 inches) in length and also horizons of poorly sorted stems up to 1.3 x 2 cm (.5 x .8 inches)	22.8	*9.1*
E	Mudstone, gray-green; many jumbled leaves, many of which overlap; leaves subcomplete 2-5 cm (.8-2 inches) in length, small fragments up to 5 mm (.2 inches) in length; poorly sorted stem fragments 1-5 cm (.4-2 inches) in length and up to .75 cm (.3 inches) wide; slickensides up to 39 cm (16 inches) in length, leaves on laminae averaging .3 cm (.12 inches) apart	17.8	*7.1*
F	Mudstone, gray-green; scattered leaves few in number: (a), lens of few scattered complete leaves grades laterally into stems and poorly sorted small plant fragments, but no leaves; stems 5-10 cm (2-4 inches) long and up to 1 cm (.4 inches) wide, fragments are subrounded 2-.25 mm (.08-.01 inches) in diameter; (b) same as lateral, stem-rich portion of (a), sharp contact with plant-rich portion of (a)	a) 7.6 b) 5.0	*3.0* *2.0*
G	Lateral from (a) and (b) siltstone, yellow-green; few broken plant fragments (no leaves); lens-shaped cross section 7 x 60 x 15 cm (2.8 x 24 x 6 inches)	7.0	*2.8*
H	Mudstone, gray-green; full of overlapping complete leaves that cover 100% of surface on laminae about every .5 cm (.2 inches); intervening layers produce complete leaves not overlapping	7.7	*3.1*
I	Mudstone, gray-green; large stems 5-10 cm (2-4 inches) long and 1 cm (.4 inches) wide, also many small stem pieces, subrounded from 3 to 8 mm (.12 to .32 inches) in diameter	15.2	*3.1*
J	Grades down with less stem to subrounded fragments less than 2 mm (.08 inches) in diameter to unfossiliferous gray-green mudstone	45.9	*18.4*

□

New Mexico GEOLOGY

• Science and Service

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