Service/News

Starred items (*) available from New Mexico Bureau of Mines and Mineral Resources

New publications

USGS

MISCELLANEOUS FIELD STUDIES MAPS

MF-924—Geologic map of the Coyote Peak and Brockman quadrangles, Hidalgo and Grant Counties, New Mexico, by C.H. Thorman, 1977, scale 1:24,000

MF-1031—Geologic map of the Wind Mountain quadrangle, Grant County, New Mexico, by D.C. Hedlund, 1978, scale 1:24,000

MF-1203—Geologic map of the Saliz Pass quadrangle, Catron County, New Mexico, by J.C. Ratte, 1980, scale 1:24,000

MF-1219—Geologic map of the Pueblo Pintago quadrangle, McKinley County, New Mexico, by D.L. Weide, G.R. Scott, and J.W. Mytton, 1980, scale 1:24,000

REVISED TOPOGRAPHIC SHEETS (PHOTOREVISION)

Twin Buttes, 1963, revised 1978-79, scale 1:24,000, 20 ft interval

Youngsville, 1953, revised 1977-79, scale 1:24,000, 20 ft interval

LASL

LA-8002-MS—Uranium hydrogeochemical and stream sediment reconnaissance of the Gallup NTMS quadrangle, New Mexico/Arizona, including concentrations of forty-two additional elements, by L.W. Maassen and C.M. LaDelfe, 1980, 164 p., 5 pl.

LA-8008-MS—Uranium hydrogeochemical and stream sediment reconnaissance of the Dalhart NTMS quadrangle, New Mexico/Texas/Oklahoma, including concentrations of forty-two additional elements, by T.L. Morgan and others, 1980, 108 p., 3 tables, 5 figs., 6 pls., 3 appendices, scale 1:250,000

LA-8015-MS—Uranium hydrogeochemical and stream sediment reconnaissance data release for Saint Johns NTMS quadrangle, Arizona/New Mexico, including concentrations of forty-two additional elements, by L.W. Maassen and others, 1980, 158 p., 6 pls., scale 1:250,000

New Western Mining Directory now available

The third edition of the *Western Mining Directory* is now available for purchase. This publication, which covers thirteen western states, includes information on active/producing hard rock mines, oil shale, mining companies, consultants, contractors, developers, equipment suppliers, and exploration and drilling companies. The 242-page directory also lists state associations, state agencies, state Bureau of Land Management offices, and state Geological Survey offices. Cost of this year's edition will be $18, which includes postage and handling. Prepaid orders are accepted, with checks payable to *Western Mining Directory,* 311 Steele Street, Suite 208, Denver, CO 80206.

Announcements

Rocky Mountain sections, AAPG–SEPM

The annual meeting of the Rocky Mountain sections, American Association of Petroleum Geologists and Society of Economic Paleontologists and Mineralogists will be held April 12–15 in Albuquerque. (T.E. Kelley, Geohydrology Associates Inc., 3225 Candelaria Road NE, Albuquerque, NM 87107)

Abstracts

New Mexico Academy of Science Fall Meeting

The New Mexico Academy of Science 1980 fall meeting was held in Española, New Mexico, in October. Following are abstracts of papers dealing with geology. Other subjects included mathematics, chemistry, biology, sociology, economics, and physics.

PERMIAN BRACHIOPODS FROM THE HUECO CANYON FORMATION, FRANKLIN MOUNTAINS, TEXAS AND NEW MEXICO, by R. Simpson and D. LeMone, Department of Geological Sciences, University of Texas (El Paso), El Paso, TX

The Franklin Mountains are located in the extreme western tip of Texas. They extend northward into south-central New Mexico for approximately 23 mi (36.8 km) from El Paso, which is built around the southern end of the range. The outcrops of Permian strata in the Franklin Mountains consist mainly of small outliers on the western edge that are separated from the main range. The Permian is represented by the Hueco Group which is divided into three formations (in ascending order): Hueco Canyon Formation, Cerro Alto Formation, and Alacran Mountain Formation, with a cumulative thickness of approximately 2,514 ft (766.2 m). The 1,350-ft- (411.5-m-) thick Hueco Canyon Formation contains 26 genera and 29 species of brachiopods. These are *Acosarina* sp., *Orthotichia kozlowskii* (R. E. King), *Rhipidomella hessensis* R. E. King, *Derbyia carteri* Cooper & Grant, *Micraphelia* sp., *Hystriculina sulcata* Cooper & Grant, *Kozlowskia capaci* (d'Orbigny), *Echinauris* cf. *E. boulei* (Kozlowski), *Nudauris transversa* Cooper & Grant, *Cancrinella parva* Cooper & Grant, *Linoproductus angustus* (R. E. King), *Kochiproductus quadratus* Cooper & Grant, *Dasysaria wolfcampensis* (R. E. King), *Acritosia silicica* Cooper & Grant, *Pontisia franklinensis* Cooper & Grant, *Stenocisma hueconiana* (Girty), *Rhynchopora molina* Cooper & Grant, *Hustedia* n. sp., *Hustedia huecoensis* R. E. King, *Crurithyris tumibilis* Cooper & Grant, *Cleiothyridina rectimarginata* Cooper & Grant, *Composita cracens* Cooper & Grant, *Reticulariina powwowensis* Cooper & Grant, *Gypospirifer anancites* Cooper & Grant, *Neophricadothyris catatona* Cooper & Grant, *Chondronia obesa* Cooper & Grant, *Dielasma diabloensis* Stehli, and *Dielasma* spp.

STRATIGRAPHY AND SEDIMENTARY HISTORY OF THE DAKOTA SANDSTONE, ACOMA BASIN, NEW MEXICO, by Russell Robinson, Department of Geological Sciences, The University of Texas (El Paso), El Paso, TX

In the Acoma Basin of west-central New Mexico, the Upper Cretaceous (Cenomanian to Turonian) age Dakota Sandstone is represented by three discrete sandstones: the main body of the Dakota, the Paguate tongue, and the Twowells tongue. Regionally the three sandstone bodies merge west of D Cross Mountain and are a single sandstone package. East of D Cross Mountain, the Paguate and Twowells tongues pinch out in the Mancos Shale. The main body of the Dakota is 32 ft (9.7 m) thick at D Cross Mountain and is a fining-upward sequence of chert pebble conglomerates and chertarenites that rest with angular unconformity above the Chinle Formation (Triassic). Crossbedding is well developed in the unit, and scour and fill structures are common. The Paguate tongue is composed of 32 ft (9.7 m) of coarsening-upward, glauconite-bearing subarkoses to quartzarenites. The lower 25 ft (7.6 m) of the unit are homogenous, bioturbated, very fine sandstones that grade vertically into a 5-ft- (1.5-m-) thick zone of slightly bioturbated, horizontally laminated, fine-grain sandstones. The upper 2 ft (0.6 m) of the unit are upper fine-grained to lower medium-grained and tabular cross-stratified. The Twowells tongue is 42 ft (12.8 m) thick and similar in in texture and mineralogy to the Paguate. The main body of the Dakota Sandstone accumulated in both fluvial and transitional marine environments and was deposited during the earliest encroachment of the Upper Cretaceous seaway into New Mexico. The Paguate and Twowells tongues represent regressive sandstone packages that either formed during regional shoaling or by the lateral migration of shallow-shelf sheet sands.

PETROGRAPHY AND STRATIGRAPHY OF THE REEF LIMESTONE AND SUPRAREEF LIMESTONE MEMBERS OF THE U-BAR FORMATION, SOUTHEASTERN BIG HATCHET MOUNTAINS, HILDAGO COUNTY, NEW MEXICO, by James R. Weise, Department of Geological Sciences, University of Texas (El Paso), El Paso, TX

The Cretaceous U-Bar Formation (Aptian-Albian) consists of five members (in ascending order): Brown limestone, Oyster limestone, limestone-shale, reef limestone, and suprareef limestone. The reef limestone and suprareef limestone members are lower to middle Albian in age and overlie the highest stratigraphic occurrence of *Douvilleiceras mammillatum* which has been collected from the underlying limestone-shale member. The reef limestone and suprareef limestone members have been described in three stratigraphic sections: Roberson Ranch, lower U-Bar Ridge, and Pierce tank. The reef limestone member has a maximum thickness of 200 ft (61 m) at the lower U-Bar Ridge section and thins to 19 ft (5.8 m), 8.5 mi (13.7 km) to the southeast at Pierce tank. The reef limestone member consists of massive limestones that are dominantly packstones to grainstones. Mesopore and small megapore vugs, channels, and less common intraparticle porosity which is restricted to caprinid rudistids and dasycladacean algae are observed. *Orbitolina* and *Dictyoconus* spp. are common. The suprareef limestone member has a maximum thickness of 277 ft (85 m) at the Roberson Ranch section and thins to 2 ft (0.6 m), 8.5 mi (13.7 km) to the southeast at Pierce tank. This member consists of massive- to medium-bedded, styolitic limestones that are dominantly wackestones to packstones. Irregular patches of chert, caprinid rudistid mounds, and large *Nerinea*-type gastropods are common in the middle portion of the member. *Orbitolina,* miliolids, and extensively recrystallized dasycladacean algae are common to abundant.

STRATIGRAPHY OF THE LATE MIDDLE DEVONIAN CANUTILLO FORMATION IN THE FRANKLIN MOUNTAINS OF TEXAS AND NEW MEXICO AND THE BISHOP CAP HILLS, NEW MEXICO: A PRELIMINARY REPORT, by Jeffrey H. Danko, Department of Geosciences, University of Texas (El Paso), El Paso, TX

The late Middle Devonian Canutillo Formation, named by Nelson (1940), crops out on the west slope of the Franklin Mountains of Texas and New Mexico and the Bishop Cap hills, New Mexico. The Canutillo Formation disconformably overlies the Fusselman Dolomite (Silurian) and disconformably underlies the Percha Shale (Late Devonian). Six sec-

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tions were measured in the Franklin Mountains and one section in the Bishop Cap hills. Rosado (1970) divided the Canutillo Formation into four basic units. They are (in ascending order): unit one—very thin-bedded, shaly dolomite; unit two (the most easily distinguishable)—very thin, wavy-bedded, silty to shaly dolomite with interbedded chert nodules, lenses, and beds; unit three—very thin-bedded, shaly dolomites and limestones in the Franklin Mountains and a cherty dolomite in the Bishop Cap hills; and unit four—thin-bedded, sandy limestone in the Franklin Mountains and cherty dolomite in the Bishop Cap hills. The stratotype has been redefined at Vinton Canyon and is a composite of two sections measured at the canyon base; however, because of lack of exposure of the basal unit, a hypostratotype has been established at the exposed Anthony Pass section. Fossils in the formation are rare and occur chiefly in unit three. These fossils include brachiopods, tentaculids, ostracodes, conodonts, and possible fish plates.

PRELIMINARY REPORT ON THE STRATIGRAPHY OF THE HELMS FORMATION (CHESTERIAN), FRANKLIN MOUNTAINS, TEXAS, AND BISHOP CAP HILLS, NEW MEXICO, by Robert D. Rinowski, Department of Geoscience, University of Texas (El Paso), El Paso, TX

The Helms Formation (Chesterian) as defined by Laudon and Bowsher (1949) represents cyclic sedimentation occurring in the nearshore environment of the Oro Grande Basin during Late Mississippian time. Calcareous shale, comprising the bulk of the Helms Formation, represents deep water environments, while the interbedded limestones represent a relatively shallower environment. Oolitic limestone beds with bioclastic debris in the Bishop Cap hills suggest the highest energy and shallowest water environment observed in the study area. The overall thickness of the Helms Formation generally decreases northward while the carbonate content increases. In the Franklin Mountains the Helms is sparsely fossiliferous with the exception of a few beds near the top of the formation. In contrast, the limestone beds in the Bishop Cap section are commonly fossiliferous. Megafossils in the Helms Formation include the bryozoans *Polypora, Fenestella,* and *Rhombopora,* several species of brachiopods, abundant crinoid columnals, and a few corals. Gastropods have been observed in only one limestone bed at Bishop Cap. A distinct disconformity exists between the Helms Formation and the Lower Pennsylvanian (Morrowan–Atokan) La Tuna Formation. Another disconformity is suspected between the underlying Rancheria Formation (Meramecian) and the Helms. At present, conclusive evidence of this disconformity has not been clearly observed.

STRATIGRAPHY OF THE LA TUNA FORMATION (MORROWAN), FRANKLIN MOUNTAINS, TEXAS AND NEW MEXICO, AND BISHOP CAP HILLS, NEW MEXICO, by David Osleger, Department of Geosciences, University of Texas (El Paso), El Paso, TX

The La Tuna Formation (Lower Pennsylvanian) is a thick section of cherty limestones and intermittent shales that is particularly well exposed along the west flank of the Franklin Mountains of west Texas and New Mexico and within the Bishop Cap hills of southern New Mexico. Four complete sections were measured, described, and sampled in preparation for future microfacies analysis. Lithologically, the La Tuna consists of massively bedded, medium-grained, dark gray limestones near the base that continually thin upward into thin beds of fine-grained, dark gray limestone. Chert lenses, layers, and nodules are interspersed throughout the section. Deeply-weathered, mostly covered shales are common toward the top of the unit. Certain beds exhibit dark gray, coarse-grained, well-rounded limestone intraclasts within a finer grained limestone matrix. One 12-inch- (30-cm-) thick unit of coarse-grained, well-sorted, red quartzitic sandstone is observed in the Bishop Cap hills section. The contact with the underlying Helms Formation (Mississippian) is disconformable and is represented by an iron-stained, 8–12 inch (20–30 cm) layer of primary nodular caliche. The upper contact with the Berino Formation (Atokan) is conformable and delineated by a thick unit of shale containing *Fusulinella* at the base of the Berino. Numerous fossil assemblages are found throughout the formation. Crinoid stems are present in virtually every unit and are by far the most abundant taxon found in the formation. *Caninia* and *Lophophyllidium* are two prominent rugose corals found in all sections while the tabulate coral *Lithostrontionella* forms widespread colonies in one unit at the Bishop Cap hills section. *Chaetetes* is utilized as an important fossil in correlation between sections. Many species of brachiopods plus bryozoans and molluscs are interspersed throughout all the sections.

PRELIMINARY ANALYSIS OF THE CRETACEOUS CORALS FROM CRISTO REY, DOÑA ANA COUNTY, NEW MEXICO, by Dragica Turnsek and David V. LeMone, SAZU, Institut za paleontologijo, Novi trg 3, pp. 323, 61001 Ljubljana, Yugoslavia and Department of Geological Sciences, University of Texas (El Paso), El Paso, TX

Preliminary analysis of the Cretaceous (Albian–Cenomanian) coral fauna at Cristo Rey, New Mexico, reveals the presence of a number of heretofore unreported genera and species. Six of the nine lithostratigraphic units present have identifiable corals. The formations and preliminarily identified corals are in descending order:

Boquillas:
- (no record)

Buda:
- *Caryophyllia* cf. *dentonensis* Wells 1947

Del Rio:
- (no record)

Anapra:
- (no record)

Mesilla Valley:
- *Parasmiliopsis cenomana* (Fromentel 1862)
- *Diegosmilia complanata* Collignon
- *?Sphaenotrochus* sp. (= *?Placosmilia texana* Aguilera)
- *Conicosmilotrochus* sp.
- *Rennensismilia* sp.

Muleros:
- *Platytrochopsis* cf. *lashensis* Siharulidze 1955

Smeltertown:
- *Paratrochocyathus* cf. *crassus* Alloiteau 1958
- *Calostylopsis* aff. *sakalavensis* Alloiteau 1958
- *Dimorpharaea manchacaensis* Wells
- *Stenocyathus* sp.
- *Columnocoenia* sp.
- *Actinaraea* cf. *tenuis* Morycowa 1971
- *Microsolena distefanoi* (Prever 1909)

Del Norte:
- *Paratrochocyathus conulus* (Phillips 1892)
- *Paratrochocyathus* cf. *crassus* Alloiteau 1958
- *Stylocyathus gracilis* (M.Edw. & H.)
- *Coelosmilia texana* Conrad
- *Platytrochopsis lashensis* Siharulidze 1975

Finlay:
- *Paratrochocyathus crassus* Alloiteau 1958

DE-NA-ZIN COAL MINE, SAN JUAN COUNTY, NEW MEXICO, by David V. LeMone, Department of Geosciences, University of Texas (El Paso), El Paso, TX

The De-Na-Zin mine (N½ sec. 16, T. 23 N., R. 13 W., San Juan County, New Mexico) is part of the State of New Mexico lands held jointly in the Bisti area by Western Coal Co. and Sunbelt Mining Company, Inc. These lands (including the De-Na-Zin mine) were subject to an exhaustive surface paleontological assessment and clearance process in 1979. The results of that study include some 619 collected sites of some 1,458 recorded. Only 16 sites were collected of 33 recorded in the area of the De-Na-Zin mine; all of the sites were fossil woods. A portion of these woods are probably Ojo Alamo Sandstone (Maastrichtian) lag or late Cenozoic alluvial deposits on the basis of the high mixture (approximately 50/50) of angiosperms and gymnosperms in a locally dominant gymnosperm suite. The outstanding preservation of this silicified wood is typical of the Ojo Alamo Sandstone and atypical of the generally poorly preserved Fruitland Formation fossil woods. The exposed upper Campanian (Upper Cretaceous) lithostratigraphic units at De-Na-Zin include (in ascending order): the uppermost marine Lewis Shale, the shoreline complex Pictured Cliffs Sandstone, and the lower portion of the coastal swamp Fruitland Formation; however, most of the area is covered with Quaternary alluvium, soil cover, and blow sand. Exposures, with the exception of the Pictured Cliffs Sandstone, are uniformly poor. The Fruitland Formation in the mine area will produce 1.3 million tons of coal over a 4-yr period in the process of disturbing approximately 214 acres.

Second Annual New Mexico Minerals Symposium

The second annual New Mexico Minerals Symposium was held October 25–26 at the New Mexico Institute of Mining and Technology in Socorro. The symposium, jointly sponsored by the Albuquerque Gem and Mineral Club, the New Mexico Bureau of Mines and Mineral Resources, and the NMIMT Geoscience Department, was attended by 103 participants from as far away as Columbus, Ohio.

The purpose of the symposium is to bring together amateurs and professionals interested in the mineralogy of the state and afford them a forum for discussion of mineral occurrences in New Mexico. Two new localities for minerals were reported at the symposium: mangano-pickeringite (a manganese-magnesium-aluminum sulfate) from the Ortiz mine of Santa Fe County and beryl (beryllium-aluminum silicate) from Iron Mountain, Sierra County. Another important development was the suggestion of a New Mexico issue of the *Mineralogical Record.* Plans are under way to obtain articles to assemble a New Mexico issue. Interested persons should contact Robert North, Mineralogist, New Mexico Bureau of Mines and Mineral Resources, Campus Station, Socorro, NM 87801.

Two noteworthy events in conjunction with the symposium were the third annual silent auction sponsored by the NMIMT Mineralogical Society and the symposium field trip held on Sunday, October 26. The silent auction, held on Saturday evening, had many mineral specimens for sale in a wide range of price and quality. The field trip was to the Graphic and Linchburg mine dumps in the Magdalena mining district. At the Linchburg, considerable iron carbonate (probably ankerite, $CaFe(CO_3)_2$) and a few small ilvaite crystals ($CaFe_3(SiO_4)_2OH$) were found, neither recorded in a published report.

Planning for a third New Mexico Minerals Symposium will begin after the first of the year. The 1981 symposium will probably take place in Albuquerque. Following are abstracts of papers presented.

METAMICT MINERALS, by Rodney C. Ewing, Department of Geology, University of New Mexico, Albuquerque, NM and Bryan Chakoumakos, Department of Geological Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA

Metamict minerals are a special class of amorphous materials which were initially crystalline.

Although the mechanism for the transition is not clearly understood, radiation damage caused by alpha particles and recoil nuclei is critical to the process. Metamict minerals are generally optically isotropic, lack cleavage, display a distinct conchoidal fracture, and are less dense than their crystalline equivalents. Metamict minerals recrystallize on heating, but the original pre-metamict phase may not form because of compositional changes caused by post-metamict alteration. The microlite of the Harding pegmatite is noteworthy because it occurs in both the crystalline and metamict state. Microlite belongs to the pyrochlore group, a complex group of cubic Nb-Ta-Ti oxides with the general formula $A_{2-m}B_2O_6(O,OH,F)_{1-n} \cdot pH_2O$ where A = Na,Mg,K,Ca,Mn,Fe^{2+}, – Sr,Sn,Sb,Ba,Pb,Bi,REE, Th,U^{6+},U^{4+} and B = Ta,Nb,Ti,Fe^{3+}; m = 0 to 1, n = 0 to 1, p = 0 to ?. For the Harding microlite, A-site cations are dominantly Ca, Na, and U; the dominant B-site cation is Ta. The Harding pegmatite probably contains the largest deposit of microlite in the world. During a 5-yr period (1942–1947), the pegmatite yielded over 10,000 kg of Ta-Nb concentrate. Microlite occurs late in the paragenesis of the pegmatite and is a common accessory in three of the eight lithologic units, in replacement masses of the wall zones, and in core units of the eastern extensions of the dike system. Anhedral to euhedral crystals range from 0.1 to 25 mm in size, most commonly 0.5–3 mm. Crystals occur dispersed and isolated and display modified octahedral and dodecahedral forms. The degree of metamictness is directly related to the amount of uranium and thorium. The maximum uranium content in metamict microlites approaches five percent of the A-site cations. During annealing experiments in air over the range of 300°C–1000°C, the metamict microlites recrystallize. Recrystallization begins at 300°C with a decrease in unit cell parameters with increasing temperature.

GOLD IN NEW MEXICO, by Robert M. North, New Mexico Bureau of Mines and Mineral Resources, Socorro, NM

Gold mining in New Mexico was reported as early as 1828, but was undoubtedly carried on much earlier by the Spanish and possibly by Indians. Total recorded production in New Mexico from 1848 to 1977 is 2,394,930 troy oz, ranking New Mexico 12th among the 50 states in gold production. Production peaked in 1915 at 70,681 troy oz. Most of the gold produced in New Mexico in recent years has been a byproduct of copper mining, most notably at the Chino and Continental mines in Grant County. The gold deposits of New Mexico are, in general, distributed in a belt 50–100 mi wide extending from Hachita, Hidalgo County, in the southwest to Elizabethtown, Colfax County, in the northeast. The gold deposits are most commonly associated with intrusive rocks of Cretaceous or Tertiary age ranging in composition from quartz monzonite to granodiorite (Elizabethtown, Central, Pinos Altos, Lordsburg, White Oaks, Nogal, Cochiti, Old Placers, New Placers, and Organ districts). To a lesser extent, the deposits are associated with Tertiary extrusive rocks (Mogollon, Steeple Rock, Hillsboro, and Rosedale districts) and Precambrian rocks (Hopewell, Willow Creek, and Hell Canyon districts). Placer deposits have been important in the Elizabethtown, Pinos Altos, Hopewell, Old Placers, New Placers, and Las Animas districts. At the present in New Mexico, gold is being produced as a byproduct of copper mining in Grant County, by cyanide heap leaching at Mogollon in Catron County and at the Ortiz mine in Santa Fe County, and as lode gold mining in the Steeple Rock district, Grant County, and at the Bluebird mine in Santa Fe County. In addition, a number of small operations are also producing minor amounts of gold.

LANGBEINITE: A UNIQUELY NEW MEXICAN POTASH MINERAL, by Norbert T. Rempe, Sr. Geologist, International Minerals & Chemical Corporation, Carlsbad, NM

Langbeinite ($K_2SO_4 \cdot 2MgSO_4$), an accessory in many potash deposits, is mined only in New Mexico. Used as specialty fertilizer, langbeinite's mineralogy is well known, but its genetic position in the depositional and metamorphic sequence of the Carlsbad district is not yet fully understood.

BERYL AT IRON MOUNTAIN, SIERRA COUNTY, NEW MEXICO, by Ramon S. DeMark, Zuni Minerals, Albuquerque, NM

Iron Mountain, located approximately 28 mi northwest of Truth or Consequences, NM, on the border between Socorro and Sierra Counties, has been intensely explored and mined on a small scale because of the occurrence of magnetite, fluorite, and beryllium and tungsten-bearing minerals. The beryllium mineral helvite was first noted in November 1941 by L.W. Strock during an examination of ores. Previous investigations and analyses of the minerals in the area have attributed all of the beryllium present to the minerals helvite and danalite and trace amounts in garnets, idocrase, chlorite, and members of the epidote group. Beryl, however, has now been positively identified from what has been termed the Scheelamite area of the North Peak section of Iron Mountain. In October 1978 numerous small prismatic crystals of an opaque, cerulean blue mineral were recovered from this area. The rock at this location is a coarsely crystalline tactite in which large euhedral crystals of helvite, fluorite, and albite occur in vugs, intimately associated with more finely crystalline quartz, chamoisite, and hematite. Subsequently, several transparent, aquamarine-colored, hexagonal prisms were recovered from the same area. These transparent crystals were found as inclusions in clear and purple fluorite. The opaque crystals are frequently surrounded by an alteration rim of helvite crystals. Maximum dimensions of the opaque beryl crystals have been 3×10 mm. In light of the relative abundance of beryl in the Scheelamite area of Iron Mountain, further explorations could reasonably expect to reveal additional occurrences.

ZEOLITE AND PALAGONITE MINERALOGY OF VOLCANIC GLASS ALTERATION—ISLETA AND CANJILON VOLCANOES, NEW MEXICO, by Carlton C. Allen, Department of Geology and Institute of Meteoritics, University of New Mexico, Albuquerque, NM

Palagonite tuff samples from two maar volcanoes in central New Mexico were examined in order to characterize the process of alteration of basaltic glass. This work is part of a larger study of altered glass as a possible analog to the soil of Mars. Isleta volcano is a 2.8-m.y.-old feature located just west of Isleta Pueblo. The Canjilon Hill complex, dated at 2.6 m.y., is north of Bernalillo. In both areas phreatomagmatic explosions produced deposits of glassy basaltic ash mixed with olivine and palagonite crystals. The glass is orange-brown sideromelane, the characteristic product of rapid quenching of basaltic liquid. Alteration to palagonite occurs exclusively in zones up to 30 microns thick at the surfaces of glass grains and on the walls of vesicles. Palagonitization generally involves 10–20 percent hydration of the glass combined with selective leaching of elements and oxidation of iron from Fe^{2+} to Fe^{3+}. Sodium, calcium, manganese, and phosphorus are strongly depleted in the palagonite relative to the glass, while silicon, aluminum, iron, and potassium remain relatively constant or display apparent enrichment. Titanium and magnesium are concentrated in sections of the palagonite rinds and depleted in other sections. Material leached from basaltic glass during palagonitization may be lost to the system or may be locally reprecipitated. Zeolites, apparently chabazite and analcite, as well as calcite and amorphous silica, occur along with palagonite in some samples. These minerals are indicative of low temperature (below 80°C) alteration, possibly in a posteruptive hydrothermal environment.

EFFLORESCENCE OF MANGANOAN PICKERINGITE AT THE ORTIZ MINE, SANTA FE COUNTY, NEW MEXICO, by Peter J. Modreski, U.S. Geological Survey, Denver, CO

A sulfate mineral of composition intermediate between pickeringite [$MgAl_2(SO_4)_4 \cdot 22H_2O$] and apjohnite [$MnAl_2(SO_4)_4 \cdot 22H_2O$] occurs as an efflorescence in mines at Cunningham Hill in the Ortiz Mountains. The mineral was found at the old "Dolores tunnel" adit and in an exploratory incline sunk in 1975 at the present site of the Ortiz open-pit gold mine of Gold Fields Mining Corporation. The mine is in a breccia pipe, part of a volcanic vent of Tertiary latite that intruded sandstone of the Mesaverde Formation (Upper Cretaceous). Gold, scheelite (some as pale-yellow bipyramidal crystals as large as 0.5 cm), pyrite, hematite, and magnetite are disseminated in the breccia. Bladed crystals (about 0.5 cm across) of intergrown magnetite and hematite are rimmed and partially replaced by manganoan siderite. This manganese-bearing carbonate is the apparent source of the manganese in the sulfate deposits. The pickeringite has formed where ground water seeps into the mine tunnels along fracture zones. Pickeringite (Mg), apjohnite (Mn), and halotrichite (Fe) are isostructural and have nearly identical lattice dimensions and powder diffraction patterns. Divalent cation compositions of the mineral from the Dolores tunnel and the Ortiz mine are, respectively, about $Mg_{.51}Mn_{.44}(Fe,Co,Ca)_{.05}$ and $Mg_{.48}Mn_{.45}(Zn,Co,Cu,Fe,Ca)_{.07}$. These manganoan pickeringites form pink to white crusts of hairlike crystal fibers about 1–2 mm long by 0.01 mm thick and solid masses of parallel fibers as much as 1 cm long. The strongest x-ray diffraction maxima are at d = 4.81 Å (100), 3.51 Å (85), and 4.31 Å (55); unit-cell parameters are a = 6.19 Å, b = 24.35 Å, c = 21.26 Å, and β = 100.3°. This occurrence of manganese-rich sulfates precipitating from waters acidified by the oxidation of pyrite appears to be unusual, but such deposits may be more common than is generally recognized. Pickeringite containing variable amounts of Fe, Co, Cu, and Mn has been found at surface outcrops of sulfide veins near Jackass Creek, Lemhi County, Idaho.

MINERALS OF THE MAGDALENA MINING DISTRICT, SOCORRO COUNTY, NEW MEXICO, by Mark R. Leo, Geoscience Department, New Mexico Institute of Mining & Technology, Socorro, NM

One of the most profitable mining districts in the "Land of Enchantment," both for the miner and the mineral collector, is the Magdalena district. The district, located in the Magdalena Mountains about 26 mi west of Socorro, produced approximately $8 million from 1880 to 1900, mostly in lead ores. After 1900 the district produced large amounts of zinc, mostly from the mineral smithsonite. Although the district is pockmarked with mines and prospect pits, the three most important mines (both for ore production and for mineral specimens) are the Kelly, Juanita, and Waldo-Graphic mines. The Kelly mine, which is located closest to the actual town site of Kelly, produced the world-famous apple-green specimens of smithsonite. Although prize specimens of the green variety are rare today, small white or gray botryoidal masses are not uncommon. Cream to brown-colored blades of barite have also recently been collected, as well as good specimens of fluorescent dogtooth calcite. Also near the townsite of

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Kelly, and at one time connected to the Kelly mine, is the Juanita mine. This mine has recently produced many fine, brown, bladed clusters of barite, as well as specimens of calcite, malachite, and smithsonite. Some fine metallic goethite specimens and a rare mineral barytocalcite ($BaCa(CO_3)_2$) have also been collected here. Finally the Waldo-Graphic mine, located about 1 km north of the town of Kelly, offers a wide range of mineral species. The pyrite room of the ninth level has produced many fine pyrite specimens, especially small (1-2 cm) cubic crystal clusters. Between the fifth and sixth levels is a large copper oxidation zone producing such minerals as chalcanthite, aurichalcite, tenorite, malachite, azurite, and rosasite associated with hemimorphite, smithsonite, hematite, and ilmenite. Throughout the mine there are several occurrences of prize calcite specimens, especially the masses of hexagonal plate crystals from the ninth-level aragonite room (misnamed).

MINERALS OF THE SOCORRO PEAK DISTRICT, by W. P. Moats and L. D. Queen, New Mexico Institute of Mining & Technology, Socorro, NM

Socorro Peak (elevation 7,280 ft) is located approximately 4 mi west of Socorro, Socorro County, New Mexico. The Socorro Peak mining district is centered southeast of the peak, low on the east slope. Smaller mines and prospects extend to the north and south and toward the crest. Silver was discovered in the district in 1867 by prospectors from nearby Magdalena. Silver production peaked by 1880 and terminated in the mid 1890's, producing $760,000–1,000,000 in silver values; however, profits were low. Socorro Peak is made up of Tertiary volcanic rocks (trachytes, rhyolites, andesites, and tuffs) and interlain sediments. These rocks rest on a thick series of Pennsylvanian rocks (Magdalena Group) which overlie Precambrian granite. The whole sequence is faulted and dips to the west. The ore zone on the east face of the mountain is the most complexly faulted. There are two general systems of faults. The most prominent group strike roughly parallel to the elongation of the Socorro Mountains (N. 20° W.-N. 15° E.). The second group dip steeply and strike N. 60° E.–N. 70° E. These faults provided channels for subsequent mineralization; thus, the veins are all fault controlled, occurring mostly in trachytes, spherulitic rhyolite, and limestone. The Merrit and Torrance mines were the only commercially productive veins of the Socorro Peak district. These two mines could be on faulted segments of the same vein. Inclined shafts were sunk along the veins to recover the ore which consisted of sparsely disseminated silver halides and traces of malachite. The best ore was said to occur associated with fluorite but at best averaged 15–20 oz Ag/ton. Mining terminated in the Torrance and Merrit mines where the veins were faulted out. The Silver Bar mine is located on the faulted segment of the Merrit vein, which was displaced 50 ft to the west by a fault striking near east-west dipping 75° N. The primary vein minerals are barite and quartz with lesser amounts of calcite, fluorite, and manganese oxides. The most interesting of the minerals are the secondary lead, copper, and zinc minerals. Mimetite, wulfenite, hemimorphite, willemite, anglesite, and mottramite constitute the suite of known secondary minerals. For the most part these minerals are distributed evenly throughout the mines in the district. The notable exception is mottramite. Mottramite appears to occur along a faulted zone which trends N. 69° W. The main occurrence does not come from a mine but occurs at a surface exposure of a fault. The lead minerals are oxidation products of the galena which occurs only sparingly in the barite. Wulfenite was found by the authors only at the Silver Bar mine and an unnamed mine near the peak. Vanadinite, though reported to occur in the district, was not found.

SOME COLLECTABLE MINERALS FROM THE REX AND SMUGGLER, PETROGLYPH, AND MACY'S MINES, HILLSBORO, NEW MEXICO, by Frank S. Kimbler, Geoscience Department, New Mexico Institute of Mining & Technology, Socorro, NM

The Rex and Smuggler, Petroglyph, and Macy's mines of the Hillsboro district have been fairly well known mineral-collecting localities for several years. Good specimens of wulfenite ($PbMoO_4$), vanadinite ($Pb_5(VO_4)_3Cl$), endlichite ($Pb_5[(As,V)O_4]_3Cl$), melanotekite ($Pb_3Fe_4Si_3O_{15}$) and calcite ($CaCO_3$) have been found on the dumps and in the workings of these mines. At the Macy's mine endlichite and calcite are found scattered throughout the underground workings. Several high-quality specimens were obtained here at the turn of the century and are now in the collections of the Smithsonian Institute. Melanotekite occurs at the Rex and Smuggler group of mines as small ($\simeq$ .5 mm) orthorhombic crystals in cavities of brown jasperoid. This is the second known world occurrence of melanotekite. The Petroglyph or Miners Dream claim is known for its small pockets of wulfenite and vanadinite crystals. The wulfenites are found as rough crystal clusters and as single, thin, square tabular crystals, sometimes coated with chalcedony. The red-orange vanadinites occur as small hexagonal prisms with smooth faces and sharp edges. Occasionally the crystals occur as hollow prisms. Willemite, reported to occur in the Hillsboro district, was not found. A colorless, glassy, pseudo-hexagonal zeolite, identified as heulandite by x-ray diffraction, was found in abundance. This is the first reported occurrence of heulandite from the district. The Petroglyph and Macy's mines are presently under claim. Permission to collect should be obtained from the owners before entry. The Rex and Smuggler group are open for collecting.

CASSITERITE AT TAYLOR CREEK, SIERRA COUNTY, by Robert J. Narsavage, New Mexico Institute of Mining & Technology, Socorro, NM

Tin remains an important commodity in today's technology and one of which the United States has little. Although we consume in excess of 60,000 long tons per year, we produce less than 100 tons yearly. Therefore, any deposit of tin ore is of interest. In New Mexico, three distinct types of tin deposits occur: two in northern New Mexico, and one in the southern half, specifically in the Black Range Mountains. Located in Catron and Sierra Counties, the cassiterite deposits of the Taylor and Squaw Creek area are the most important in the state. These sites include both lode and placer deposits and represent a very unusual type of mineralization. The Taylor Creek tin deposits are disseminated over some 450 sq mi of the Mogollon plateau, on the west side of the Black Range. The deposits, discovered in 1918, are small veins and placers with total production no more than 15 tons. The tin veins occur in rhyolite and rhyolite tuff and consist of cassiterite, hematite, quartz, chalcedony, and calcite. Topaz, bixbyite, beryl, and pseudobrookite are found in the rhyolite, but outside the Taylor Creek district. Small crystals of cassiterite (up to 2mm) and attractive nuggets of stream tin (placer cassiterite) can be collected in the district. □

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