COLORADO MINERALS

A SYMPOSIUM

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COLORADO CHAPTER

SEPTEMBER 19, 1982

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Rocky Mountain Federation of Mineralogical Societies
Convention and Show
Denver Merchandise Mart
Denver, Colorado

COLORADO MINERALS

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PROGRAM

12:00 pm - 12:10 pm	*INTRODUCTION*	Joe Taggart
12:10 pm - 12:40 pm	*COLORADO AMETHYST*	Tom Michalski
12:40 pm - 1:05 pm	*COLORADO WESTERN SLOPE MINERALS*	Arnold Hampson
1:05 pm - 1:30 pm	*HISTORY OF THE COLORADO-WYOMING DIAMOND AREA*	Rich Collins/Allen Heyl
1:30 pm - 2:00 pm	*MT. ANTERO, CHAFFEE COUNTY, COLORADO: PAST & PRESENT*	Mark Jacobson
2:00 pm - 2:15 pm	*BREAK*	
2:15 pm - 2:30 pm	*UPDATE AND REVISION OF THE U.S. GEOLOGICAL SURVEY BULLETIN 1114:* MINERALS OF COLORADO: A 100 YEAR RECORD	Gene Foord
2:30 pm - 3:00 pm	*MINERAL DEPOSITS OF THE ITALIAN MOUNTAIN AREA, COLO.*	Henry Truebe
3:00 pm - 3:30 pm	*ZEOLITES OF THE DENVER FOOTHILLS*	Pete Modreski
3:30 pm - 4:00 pm	*CLASSIC COLORADO MINERALS*	Barb Muntyan

COLORADO AMETHYST

By

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Amethyst, the purple variety of crystalline quartz, has been admired for centuries because of its beauty and supposed mystical powers. In more recent times it has been closely studied because of its unique color, crystallography, and restricted modes of occurrence. The unique color and anomalous biaxial nature of amethyst is due to Fe_2O_3 within the lattice structure. Mineral-forming solutions at temperatures below 285°C and small amounts of radiation are also necessary for the formation of amethyst. Despite the restricted conditions necessary for its formation, Colorado has many occurrences of this unique variety of quartz.

Examination of amethysts from several Colorado localities indicates that the crystal form, intensity of color, type of color zonation, and associated mineralization can be used to distinguish crystals from each locality. Amethysts from the Crystal Hill mine near La Garita generally have long slender prisms, small rhombohedral terminations, and are of a pale-lavender color. The colorless basal portions of most crystals contain many fluid inclusions with moveable bubbles. Several forms of manganese oxide are associated with the Crystal Hill amethysts. By contrast, amethysts from the Rainbow Lode claim near Red Feather Lakes tend to be of much darker color and have prism and rhombohedral faces that are more equally developed. Many crystals are doubly terminated and exhibit complex scepter development. They often have a thin outer layer of translucent milky quartz and are associated with various forms of iron oxide. Amethysts from the Creede mining district tend to be small, pale crystals often intergrown with milky

quartz in banded layers. Geode-like vugs filled with pale crystals are also common. Pyrite, chalcopyrite, galena, sphalerite, chlorite, and occasionally native silver are associated with the Creede amethysts. Crystals from the Amethyst Queen claim in Unaweep Canyon are dominated by large rhombohedrons and small prisms. The color tends to be either very pale lavender or an extremely dark "Siberian-amethyst" color. The dark crystals exhibit extreme color zonation, with alternating colorless and dark purple zones. Green fluorite, calcite, barite, and several types of copper minerals are associated with this amethyst locality. The abundance and variety of amethyst in the state of Colorado have commonly been overlooked by the gem cutter, mineral collector, and professional mineralogist.

COLORADO WESTERN SLOPE MINERALS

By

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Some new mineral localities and new species from established localities on the Western Slope have been introduced in the past few years. Many of the older, more well known, localities continue to produce specimens of particular interest to the collector.

The volcanics of the Treasure Falls area near Wolf Creek Pass, Mineral County, are presently yielding some fine crystallized zeolites. Mordenite, heulandite, analcime, and natrolite occur in moderate abundance along with the rarer new species for the area, gmelinite and wellsite. These zeolites are associated in amygdaloidal cavaties with clinochlore, nontromite, calcite, quartz, and semi-opal.

The old dumps of the Longfellow Mine on Red Mountain Pass, San Juan County, have recently yielded wurtzite, a new species for Colorado,

occurring in dark brown hexagonal hemimorphic crystals. This locality continues to produce enargite, tetrahedrite, and octahedral pyrite. The Longfellow Mine is also a new locality for zunyite.

Crystallized rhodochrosite has recently been found at the Micky Breen Mine and on an extension of the Grizzly Bear Vein in Ouray County; barite near Crater Creek in Rio Grande County; enargite, covellite, and barite in the Summitville District of Rio Grande County; gold, hessite, krennerite, and sylvanite at the Bessie G. Mine, La Plata County; fine pyritohedrons of pyrite at the Mountain Spring Mine at Rico, Dolores County; and, most recently, micro molybdenite crystals with ferrimolybdite near Ophir, San Miguel County.

HISTORY OF THE COLORADO-WYOMING DIAMOND AREA

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By

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Diatreme is a general term for a breccia-filled volcanic vent that was forced through enclosing rocks by the explosive energy of gas-charged material. Although fragments of many types and ages of rock are included, kimberlite is the main rock type in the diatremes of the northern Front Range of Colorado and Wyoming. Kimberlite is a form of peridotite, an ultramafic igneous rock principally composed of olivine, pyroxene, melilite, and biotite. It is the only commercial diamond-bearing rock in the upper parts of the Earth's crust.

The first discovery of diamond-bearing kimberlite in the United States was near Murfreesboro, Ark., in 1906. An earlier report of a diamond field at Diamond Peak, Colo., proved to be a hoax and was promptly discredited by the

eminent geologist Clarence King in 1872. Diamond-bearing kimberlite was not documented in the Colorado and Wyoming localities until 1975, when diamonds were found unexpectedly in a misidentified rock nodule.

Kimberlite had been previously overlooked or misidentified for a number of years in the Colorado-Wyoming area. For example, the Sloan quarry originally was mined for "serpentine," which was used as a decorative stone, and not until 4 years after the quarry closed, in 1960, was the "serpentine" correctly identified as kimberlite. Other kimberlite bodies in the area were described in the geologic literature as "Paleozoic outliers," but since the initial kimberlite identification, more that 90 occurrences have been documented, either by reidentification or as new discoveries.

The discovery of the diamond-bearing nodule in Wyoming has stimulated quiet exploration by private industry.

MT. ANTERO, CHAFFEE COUNTY, COLORADO: PAST & PRESENT

By

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Mt. Antero first became known as a mineral locality through the discoveries of aquamarine, phenakite, and bertrandite by Nelson D. Wanemaker. He spread its reputation in the 1880's by directly and indirectly transmitting specimens to such people as R. T. Cross, G. F. Kunz, G. L. English, R. C. Hills, and W. B. Smith. Aquamarines collected during this period were often heavily etched and sometimes had phenakite and bertrandite emplanted on them. Several of these specimens can be found at the Denver Museum of Natural History, Yale University, and the U.S. National Museum. From 1928-1953, collecting on Mt. Antero was dominated by Ed Over

and later by the Ed Over-Arthur Montgomery team. In 1932, Over collected his famous seven-inch long aquamarines which are now present in the Harvard Museum. Ed Over is credited with obtaining and disseminating "large quantities" of Mt. Antero and White Mountain aquamarines, phenakites, bertrandites, and smoky quartz specimens. His specimens can be found today at the Denver Museum, Harvard Museum, National Museum, and in private collections.

The known activities of recent collectors (1960-1982) indicate that the specimens being found now equal the quality of those found in years past. Although the California Mine was underplayed in the past as a beryl producer, several weekend "miners" have obtained large quantities of pocket aquamarine and goshenite from it. One such aquamarine is 2½ inches high by 1 1/8 inches thick. Gem clear, terminated crystals are still being found on Mt. Antero from several locations. Amber-yellow and white phenakites, some on matrix, have been found in crystal sizes to 1 3/4 inches. Purple and green octahedral fluorite, smoky quartz, and topaz are also still being found. Perhaps the only elusive mineral is bertrandite.

UPDATE AND REVISION OF U.S. GEOLOGICAL SURVEY BULLETIN 1114: MINERALS OF COLORADO: A 100 YEAR RECORD

By

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A cooperative project has been under way since 1977 to update and revise United States Geological Survey Bulletin 1114 -- Minerals of Colorado: a 100 year record, by Edwin B. Eckel. Many people have contributed data and information for the new book, including members of the U.S. Geological Survey,

Friends of Mineralogy (Colorado Chapter, FMCC), the Denver Museum of Natural History, the Colorado School of Mines, and other professional geologists - mineralogists as well as non-professional contributors.

As of August, 1982, about 690 terrestrial mineral species have been identified as occurring in Colorado. Of these, about one-third have been identified since the original publication of Bulletin 1114 in 1961.

Funding for the book has been provided by the Denver Museum of Natural History, the FMCC and private individuals. The book will include both color and black and white photography by Mr. and Mrs. John Muntyan, and is scheduled for publication sometime in 1983 by the Denver Museum of Natural History. The text is being prepared and the final remaining pertinent references from the published literature are being abstracted.

MINERAL DEPOSITS OF THE ITALIAN MOUNTAIN AREA, COLORADO

By

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Over eighty mineral species have been identified from the Italian Mountain area, located about 170 km southwest of Denver, Colorado. The area has been prospected for base metals, lapis lazuli, and mineral specimens. Mineral deposits are zonally arranged around a 33.8 million year old quartz monzonite porphyry stock that intrudes complexly faulted Paleozoic sedimentary rocks. Most distant from the stock are the base-metal replacement deposits in Mississippian Leadville Limestone that have a paragenesis typical of oxidized sulfide ore deposits. Closer to the stock at a particular horizon in the Pennsylvanian-aged Belden Formation are lapis lazuli deposits composed of a mixture of calcite, pyrite, and lazurite. And, at the contact of the stock with the Belden Formation are the skarn deposits of diopside,

grossular, and vesuvianite for which the Italian Mountain area is famous.

ZEOLITES OF THE DENVER FOOTHILLS

By

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The best known zeolite occurrences in the Denver area are in the lava flows of North and South Table Mountains near Golden. Zeolite minerals, including thomsonite, analcime, chabazite, natrolite, mesolite, and laumontite, are associated with apophyllite and calcite in amygdules and fractures in the potassium-rich basalt (shoshonite) of the Table Mountains. Mordenite (originally described as "ptilolite") and heulandite have also been reported from a small exposure of basalt on Green Mountain. Heulandite or clinoptilolite has been known since the early 1960's as a minor constituent of the sedimentary rocks of the Denver Formation, of Late Cretaceous to early Tertiary (Paleocene) age.

An unusual occurrence of well-crystallized zeolites within fossil plant material was found this year in housing excavations south of Jewell Ave. and Union Blvd. in Lakewood. Heulandite (as colorless, "coffin-shaped" crystals about 2-4 mm long) and stilbite (as typical, tan, sheaflike crystal clusters about 4-10 mm long) occur as partial replacements of carbonized fossil wood (lignite). The heulandite also occurs as drusy fine-grained linings within hollow fossil fruits or seeds, and it forms casts of plant roots. The "heulandite" has not unambiguously been distinguished from the very closely related zeolite, clinoptilolite; chemical analyses or heating experiments will be required to make this distinction. Pyrite nodules and minor calcite are also associated with the zeolites in carbonized wood. Some of the wood is also hard and silicified.

Abundant well-preserved plant fossils (leaves, twigs, stems, roots, and seeds) are in the finer-grained, silty strata. The fossil wood occurs in coarser grained sandstone and conglomerate and seems to have been transported in stream channels, whereas the leaves and seeds probably accumulated in muddy, overbank, flood-plain deposits. The Denver Formation consists of tuffaceous strata that are rich in feldspar and clay minerals but poor in quartz. The original andesitic volcaniclastic sediment was eroded from unknown source areas somewhere within the Front Range; the Denver Formation is contemporaneous with the Table Mountain and other lava flows. An abundance of sodium- and calcium-rich volcanic glass in the source materials is most likely responsible for the unusual development of zeolite minerals in this sandstone.

CLASSIC COLORADO MINERALS

By

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Colorado is one of the most highly mineralized states in the Union and has produced many outstanding mineral specimens, rivaling the best found anywhere for aesthetics, perfection, and association. Perhaps the two minerals most often connected with Colorado are amazonite and rhodochrosite. Gold and silver were, of course, the great wealth-producing minerals of the last century. There are many very fine specimens from the mines of Colorado but, perhaps they are no better that the golds of California or Michigan's silvers. But mention "rhodochrosite," and one thinks immediately of the great Wilbur-Bancroft blood red rhomb from Alma on its bed of quartz needles. Or say "amazonite," and one calls to mind lovely blue-green crystals nestled with balck smoky quartz on a matrix of snow-white

clevelandite; perhaps a few fluorites or a goethite spray complete the assemblage.

In the brief time available, we will examine some of the best locales for rhodochrosite and amazonite in Colorado. The mines of the San Juan mountains and the Alma district in central Colorado have produced the state's best rhodochrosite and associated species. The pegmatite suite for amazonite comes from various locales near Lake George-Florissant, Harris Park, and Wigman Creek.

Since many of the best Colorado mineral specimens are presently held in private collections, this program will feature minerals in the collections of Colorado collectors. Many of the specimens were self-collected in the field by the owners within the last ten years. For quality, perfection, rarity, beauty, and association, the specimens are truly "Colorado classics."

SPEAKERS

DONLEY S. COLLINS. Mr. Collins is a geologist with the U.S. Geological Survey - Branch of Engineering Geology. He received his B.S. degree from Colorado State University and did graduate work at CSU on the Colorado-Wyoming diamond deposits. He is currently pursuing graduate work at the Colorado School of Mines. Mr. Collins has been a mineral collector for 25+ years and is particularly interested in pyrite, smokey quartz, amazonite, and minerals from Mt. Antero. He is a member of the Geological Society of America, Colorado Scientific Society, and Denver Regional Exploration Geologists.

EUGENE E. FOORD. Dr. Foord is a geologist-mineralogist at the U.S. Geological Survey - Branch of Central Mineral Resources. He received his A.B. degree from Franklin and Marshall College, his M.S. from Rensselar Polytechnic Institute and his PhD in 1976 from Stanford University. Dr. Foord's research has involved the study of quartz-huebnerite veins in Nevada, mineralogy of the Himalaya dike system in California, economic geology of the Mescalero Indian Reservation in New Mexico, and the mineralogy of niobium and tantalum. He has written several articles for the American Mineralogist and the Mineralogical Record. He has also been both vice president and president of the Colorado Chapter of Friends of Mineralogy. For the last five years Dr. Foord has been in charge of the Friends of Mineralogy committee to update the U.S.G.S. bulletin 1114: Minerals of Colorado: A 100 Year Record

ARNOLD G. HAMPSON. Mr. Hampson is a civil-geological engineer employed by Nielsons Inc. of Cortez, Colorado as Vice President of Engineering. He has been collecting minerals for 30+ years and is particularly interested in collecting and mounting microscopic minerals. Mr. Hampson won the prestigious "Best Mineral Exhibit, Master Competition" at the 1981 Tucson Gem and Mineral Show. He is a member of Friends of Mineralogy, Ute Mountain Gem and Mineral Society and Mineralogical Society of America.

ALLEN V. HEYL. Dr. Heyl is a staff geologist with the U.S. Geological Survey - Branch of Central Mineral Resources. He received his B.S. degree from Pennsylvania State University and his PhD in 1950 from Princeton University. He spent five years doing geological field mapping for the Newfoundland Geological Survey. Dr. Heyl is particularly interested in lead-zinc deposits of the tri-state area, chromite deposits of the eastern United States. He has also spent much time sampling and dating alkalic igneous rocks of the mid-continent region. Dr. Heyl has made several trips to examine the Colorado-Wyoming diamond deposits and is very familiar with their occurrence.

MARK IVAN JACOBSON. Mr. Jacobson is a senior geophysicist with Chevron, USA. He received his B.S. degree in geology from Pennsylvania State University and his M.S. in 1976 from the University of California at Berkeley. Mr. Jacobson has been studying pegmatites and their minerals since 1966. He has visited and collected samples at most U.S. pegmatite districts. Mr. Jacobson has written several articles on pegmatite minerals from the Mineralogical Record and Rocks and Minerals Magazine. He has been studying the Mt. Antero area since 1975 and is very familiar with the minerals that occur there.

THOMAS C. MICHALSKI. Mr. Michalski is the geologist-curator in charge of the U.S. Geological Survey - Branch of Oil and Gas Resources, Core Library. He received his B.S. degree and did graduate work at Wayne State University in Detroit. He has been collecting minerals for 17 years and has studied and collected at the copper deposits of Northern Michigan, pegmatite and metamorphic mineral deposits near Bancroft, Ontario, various New England pegmatite areas, and several calcite-celestite producing areas in Michigan and Ohio. Mr. Michalski has recently become interested in gemstone deposits of the Continental U.S. He is a member of the Friends of Mineralogy, Littleton Gem and Mineral Club, and Rocky Mountain Association of Geologists.

PETER J. MODRESKI. Dr. Modreski is a geochemist for the U.S. Geological Survey - Branch of Central Mineral Resources. He received his B.A. in chemistry from Rutgers College and his PhD in geochemistry from Pennsylvania State University. Dr. Modreski worked for Sandia Laboratories in New Mexico before joining the U.S.G.S. His current work involves high-pressure, high-temperature experiments and geologic mapping and study of cobalt deposits near Salmon, Idaho. Dr. Modreski is a member of the Mineralogical Society of America, Geological Society of America, Littleton Gem and Mineral Club, and is currently Secretary of Friends of Mineralogy.

BARBARA L. MUNTYAN. Mrs. Muntyan is Director of Personnel for Affiliated Bank **Shares** of Colorado. She has been collecting minerals for 20+ years and has taught introductory courses in mineralogy at Parkman Junior College in Illinois. Mrs. Muntyan has personally visited most "classic" mineral collecting localities in Colorado. She has recently become involved in the cleaning and preparation of fine mineral samples. Mineral photography is also one of Mrs. Muntyan's recent interests and she is quickly becoming one of the best mineral photographers in Colorado. She is currently on the Board of Directors of Friends of Mineralogy, Colorado Chapter.

JOSEPH E. TAGGART, JR. Mr. Taggart is a geochemist and x-ray Project Chief for the U.S. Geological Survey - Branch of Analytical Laboratories. He received his B.A. in geology from Syracuse University and a M.S. in geochemistry from Miami University. Mr. Taggart worked as a mineralogist for the New Mexico Bureau of Mines before coming to work for the U.S.G.S. He is a member of the Mineralogical Society of America and is currently President of Friends of Mineralogy, Colorado Chapter.

HENRY A. TRUEBE. Mr. Truebe is a geologist currently employed on a project to integrate micro-computers into the operations of a mineral exploration company in Tucson, Arizona. He has a B.S. and a M.S. in mining engineering from the Colorado School of Mines and recently completed a second M.S. in geoscience at the University of Arizona. Mr. Truebe has worked as a geologist, Peace Corps volunteer, teacher, and mineral dealer. He has published several articles in the Mineralogical Record as well as an extensive volume on the minerals of the Montrose quadrangle, Colorado. Mr. Truebe has had a long time interest in the mineral deposits of the Italian Mountain area and is considered "the expert" on this locality.