GRAND CANYON
Nature Notes

August 1932

Vol. VII No. 5

GRAND CANYON NATURAL HISTORY ASSOCIATION

ADVISORY COUNCIL

Educational Development:
Dr. John C. Merriam, President Carnegie Institution,
Dr. Homer LeRoy Shantz, President University of Arizona.
Dr. Harold S. Colton, Director Museum of Northern Arizona.
Geology:
Dr. David White, U. S. Geological Survey,
Mr. Francois E. Matthes, U. S. Geological Survey.
Paleontology:
Dr. Charles E. Resser, U. S. National Museum.
Dr. Charles W. Gilmore, U. S. National Museum.
Mammology:
Dr. Vernon Bailey, U. S. Biological Survey.
Ornithology:
Mrs. Florence M. Bailey, American Ornithological Union.
Herpetology:
Mr. L. M. Klauber, San Diego Museum of Natural History.
Botany:
Dr. Forrest Shreve, Desert Laboratory, Carnegie Institution.
Entomology:
Dr. Frank Lutz, American Museum of Natural History.
Ethnology:
Dr. Clark Wissler, American Museum of Natural History.
Archaeology:
Dr. Harold S. Gladwin, Gila Pueblo,
Mr. Jesse L. Nusbaum, Director Laboratory of Anthropology.

BOARD OF DIRECTORS

Victor Patrosso, Mrs. E. J. Kirwan,
James V. Lloyd, Emery C. Kolb,
Frank C. Spencer, L. G. Carr,
M. R. Tillotson.

TREASURER

B. G. Carson, M.D.

EXECUTIVE SECRETARY

Edwin D. McKee, Park Naturalist

GRAND CANYON
NATURE NOTES

Volume 7, Number 5
August, 1932.

National Park Service
Grand Canyon National Park

Grand Canyon Natural
History Association

This publication is issued monthly for the purpose of recording observations and of making known the results of research and scientific investigation in the Grand Canyon region in the fields of natural history, history and related subjects. It is published by the Natural History Association for the Grand Canyon National Park. Membership in this Association is $1.00 per year and includes a subscription to Nature Notes. Additional copies of Nature Notes may be obtained at 10¢ each by addressing The Grand Canyon Natural History Association, Grand Canyon, Arizona.

M. R. Tillotson,
Superintendent

Edwin D. McKee,
Park Naturalist

Table of Contents

Illustrations by George Smithson

A SUMMARY — of — GRAND CANYON MINERALS

By Ranger Naturalist H. H. Waesche

THE QUESTION is often asked, "What minerals are found in the Grand Canyon?" This cannot be answered in a few words as is usually expected by those who ask the question and who are probably not familiar with the true meaning or inclusiveness of the term "mineral". Most people associate minerals with the metals or with the ores from which various commercial materials are derived. True, these are minerals and many of them are found in the walls of Grand Canyon. Ores from which copper, iron, vanadium, asbestos, plaster of paris, lead and zinc are obtained, are represented there. They have been mined for their values although limited quantity and difficulties peculiar to the region have prevented their exploitation and further development. These, however, are not the dominant minerals of the region.

In the Grand Canyon there are vast quantities of the non-metallic minerals which are quite as interesting as the ores in spite of the fact that they are very seldom used commercially. This leads back to the question of, "What is a mineral?" E. S. Dana, the accepted authority, gives the following definition. "A mineral is a body produced by the processes of inorganic nature, having a definite chemical composition and, if found under favorable conditions, a certain characteristic molecular structure which is exhibited in its crystalline form". If this is the case, every inorganic material in the earth must be either a mineral or composed of minerals with possibly the exception of certain rock glasses, shells formed by organic agencies, and petroleum. Thus it may be seen that the walls of the Grand Canyon are composed of minerals. Probably the only exceptions are some volcanic rocks of a basaltic nature and these are rare. Even the fossils may be classed as minerals as they, for the most part, have had mineral matter substituted for the original material.

It would seem from this discussion that in an area

as large as Grand Canyon National Park, there would be a limitless variety of minerals. This is not true, however, and with comparatively few exceptions it is not true of any part of the earth's crust. The past and the present geology of the Grand Canyon limits its mineral possibilities. The major part of the building of the canyon walls has been through processes of sedimentation. Primarily this restricts all of the material above the inner gorge to three principal minerals.

The most important of the three great minerals of Grand Canyon is quartz which is the chief constituent of most sandstones. Sand grains which form them are derived usually from previously crystallized quartz of igneous origin. Also, primary crystalline quartz, deposited from solution, is quite common in cavities in the various Grand Canyon formations. Quartz is, as almost everyone knows, silicon dioxide ($Si\ O_2$). It is the most plentiful mineral in the earth's crust.

Second most abundant mineral is calcium carbonate which is deposited from water solutions. This is another of the three most important minerals of Grand Canyon. If crystalline it is known as calcite, (rocks composed of crystalline calcite

are called marbles), but if not crystalline, it forms limestones which are chemically similar. Various forms of calcite are plentifully distributed in most of the lime bearing formations of the canyon. Addition of magnesium to the calcite gives a very similar mineral known as dolomite. It can be distinguished ordinarily only by chemical tests.

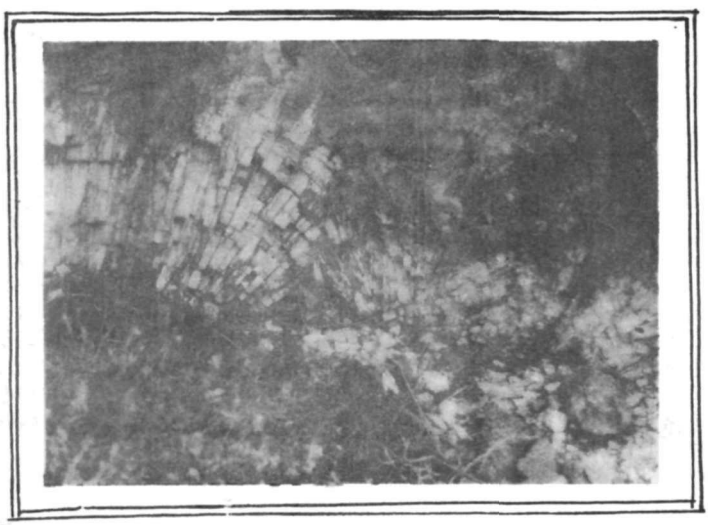
The third major sedimentary mineral is kaolin which makes up a high percentage of the material composing the shales or mud formations of Grand Canyon as elsewhere. Shales are derived from rocks which on weathering have altered to kaolin. Kaolin is a hydrous aluminum silicate (H_4 Al_2 Si_2 O_9).

Minor minerals found in the sedimentary rocks of the region are: iron oxides, manganese oxides, barite, coppers, leads, etc. The common forms of iron are hemetite and limonite (Fe_2 O_3 and 2 Fe_2 O_3 - $3H_2$ O). It is these minerals which give the familiar red and yellow colors to so many of the formations. Hemetite or limonite, along with calcite, are often the cementing materials which hold together the sand grains of a sandstone. Manganese oxides are often found in dendritic form in several formations. Barite, a barium sulfate, (Ba S O_4) is found along the Kaibab Trail in the Redwall formation. It is probably of secondary origin, replacing the carbonate of the original limestone. In other places in the Redwall, copper has replaced the calcium, leaving green and blue copper carbonates known as malachite and azurite as replacements in the limestone. These minerals were mined for copper near Grand View Point and at other places in the Canyon a number of years ago. The chemical composition of malachite is Cu CO_3. Cu $(OH)_2$; that of azurite is 2 Cu C O_3. Cu $(OH)_2$. The Redwall is also the home of the lead and zinc ore minerals, galena (Pb S) and sphalerite (Zn S), and associated with them one finds some pyrite (Fe S_2) and other sulfides of similar occurrence. In the much metamorphosed Bass limestone of Algonkian age is found a fibrous mineral known as asbestos. It is a secondary mineral formed in magnesian limestone as a product of metamorphism.*

In the Inner Gorge of Grand Canyon among the old Archean rocks exists a mineral world entirely different from that of

the other formations of the Canyon. Here the minerals are primary ones of igneous origin associated with granite dikes, or secondary ones formed as a result of dynamic metamorphism in the schist. Partial alteration causes the formation of still other minerals and lastly there is a series of minerals resulting from solutions of mineralized waters in the fractures or brecciated zones.

The minerals in the granite are the usual types one would expect to find in that rock with quartz and orthoclase ($KAlSi_3O_8$), a feldspar, predominating. The principal feromagnesium minerals are black mica (biotite, which is a hydrous iron, magnesium aluminum, silicate)and hornblende which is a silicate of calcium and magnesium, with iron and aluminum. Another mica is also common. It is muscovite-a hydrous sodium, potassium aluminum silicate. The microscope shows, in addition, small amounts of another feldspar (microcline ($KAlSi_3O_8$) and also apatite and soda-lime feldspars.



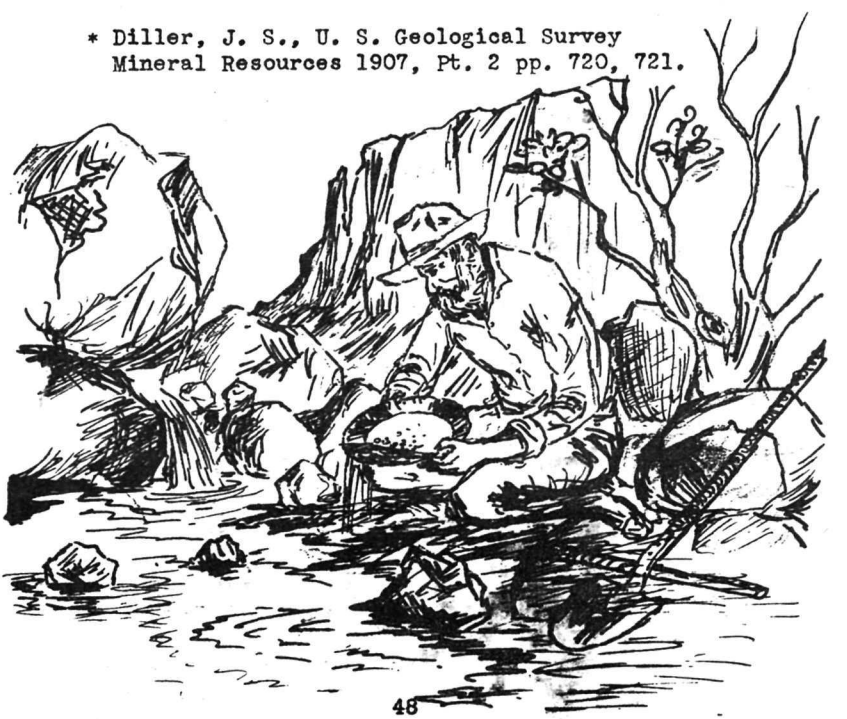
Barite Crystals in Redwall Limestone
Kaibab Trail

The schist of the Canyon bottom is made up mostly of mica biotite and quartz, with minor amounts of hornblende. Where the biotite and the hornblende have altered, chlorite has been formed. Chlorite is a hydrous magnesium aluminum silicate colored green by ferrous iron.

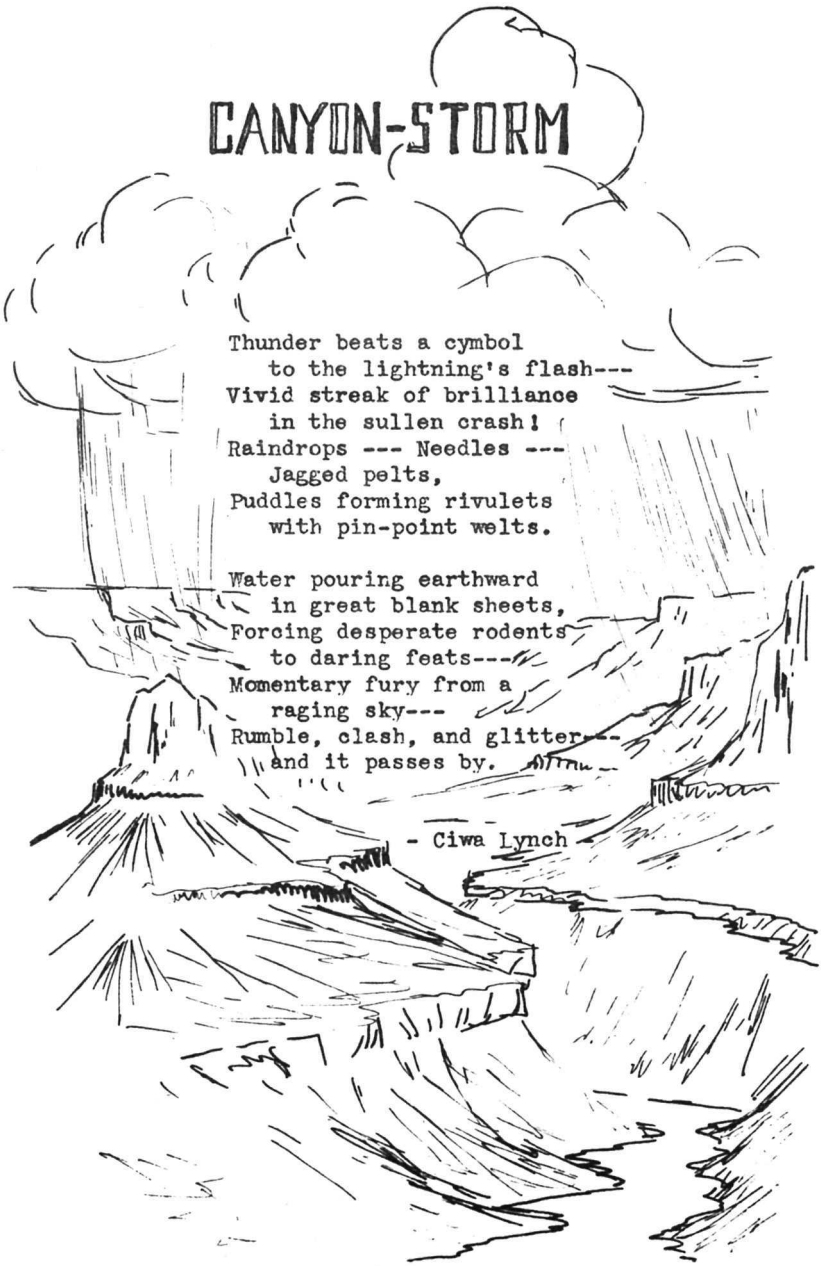
Sulfides of iron and copper are commonly found in places where water has been able to circulate in the Archean formations.

The preceding brief description covers most of the minerals that have been found in the Grand Canyon. Of course, other less common ones will be found from time to time, but those listed are the ones a visitor would expect to see if he cared to look for them. Some very interesting varieties of these minerals are distributed through the various formations and descriptions of some of them will be given in future issues of Nature Notes.

* Diller, J. S., U. S. Geological Survey Mineral Resources 1907, Pt. 2 pp. 720, 721.



CANYON-STORM



Thunder beats a cymbol
to the lightning's flash---
Vivid streak of brilliance
in the sullen crash!
Raindrops --- Needles ---
Jagged pelts,
Puddles forming rivulets
with pin-point welts.

Water pouring earthward
in great blank sheets,
Forcing desperate rodents
to daring feats---
Momentary fury from a
raging sky---
Rumble, clash, and glitter---
and it passes by.

- Ciwa Lynch

A Lesson in Erosion

By Ranger Naturalist A. R. Croft

ON FRIDAY, July 8th, nature provided an excellent demonstration of the effectiveness of a heavy rain in eroding the walls of Grand Canyon. At that time about twenty five people were in the vicinity of Yavapai Observation Station when a storm broke. All the adjectives usually applied to a raging rain could have been used in that case without danger of exaggeration. The rain came down "in sheets -- in buckets full".

Beyond the large west window at the Observation Station this somewhat rare demonstration of erosion was being staged by the forces of nature -- the same forces that have been operative in eroding the canyon walls for vast numbers of years. The crowd watched, first in silence and then with mild exclamations of astonishment. The canyon side as far as visible was literally a sheet of water. The water was thick with sand and mud, and rocks of considerable size were being moved downward by its force. The entire surface seemed to be moving toward the canyon bottom.

The storm raged for twenty minutes and when it lifted, every side canyon and depression contained a stream of liquid mud. Through half a dozen binoculars the crowd watched. Some streams of very large size could be seen in washes that are usually dry. The reflection of the sun's rays on the water revealed hundreds of silvery streamlets making their way to the river laden with upland sand. A few thousand more tons of sediment had been started towards the flood plain of the Colorado and a small group of tourists had received an excellent lesson in erosion.

An Insect Observation

By Ranger Naturalist Clyde C. Searl

RECENTLY, while cataloging the type photographs belonging to the department of research and education of the Grand Canyon National Park,three splendid photographs of an insect were found to which were attached two letters.

The first letter, dated April 3, 1928, was written by Maynard L. Parker of Brooklyn, N. Y., and addressed to the Information Bureau of the Grand Canyon National Park. It was a query in regard to an insect which Dr. Parker had seen and photographed at the Grand Canyon in May, 1927. An excerpt from the letter reads: "The insect was very common, crawling on the tires of the car and on the trees. It only took about half an hour for it to change from a crawling insect to a flying one".

Apparently the letter just referred to was given to Park Naturalist Glen E. Sturdevant, now deceased, for an answer. Mr. Sturdevant informed Mr. Parker that the insect in question was a cicada, but he was unable to give either the generic or specific name of the insect. Mr. Sturdevant wrote: "They were particularly abundant on the South Rim of Grand Canyon during May and June, 1927. That is the only year I have seen them during my three years at this place".

During May, 1931, the writer collected a number of cicadas on the South Rim of Grand Canyon, later determined as Platypedia lutea Davis. During two other seasons at the park the insect had not been collected. In fact, many people who had spent several years here did not remember ever having seen it before, and inasmuch as it is an insect which readily attracts attention by its habits, any occurrence would probably have been noted. An account of the general habits of cicadas appears in Grand Canyon Nature Notes.(Vol. 5, No. 7, May, 1931). In that article was mentioned the

Photo by M.L.Parker

Cicada

fact that the length of the life cycle of the local cicada was unknown.

As soon as the photographs sent by Mr. Parker came to the writer's attention, a specimen collected in May, 1931, was secured and compared with the photographs. The wing venation on the photograph determined that the cicada observed in 1927 and referred to by Mr. Parker, was without doubt Platypedia lutea Davis, and thus was established the local life cycle of the particular insect. Although it only took half an hour to change from a crawling insect to a flying one as observed by Mr.Parker,the insect actually required four years from the time the egg was laid until the adult stage was reached. Reference books are not locally available,so it is impossible to check up on the life cycle of Platypedia lutea Davis,but the writer is reasonably certain that four years is the correct length. Many cicadas require a much longer life cycle, such as the seventeen year "locust" of the middle west. Many "crops" of cicadas overlap in their life cycles, thus giving the appearance that their cycle is short. Only by segregation and careful observation can this be definitely determined. Climatic conditions also tend to vary the length of a life cycle.

Recent Bird Records —« from »— Havasu Canyon

(Note: The following material on bird observations in the Havasu Canyon of Grand Canyon National Park was recently submitted by Mr. Randolph Jenks, Curator of Ornithology, Museum of Northern Arizona. Since it was presented in the form of field notes, only the more unusual of the records are here given. E.D.M.)

ON JUNE 21st and 22nd fifteen species of birds were observed between Pasture Wash and Hilltop - an area of sagebrush and pinyon-juniper forest in western Grand Canyon. Among these birds were the following: one Arkansas Kingbird, two Western Vesper Sparrows, one Western Lark Sparrow. Most noteworthy record from this area is that of the Western Burrowing Owl. Several were flushed on June 22nd and one was seen at its hole beside the road on the same date.

Several observations made down in Havasu Canyon are also of especial interest. An adult Duck Hawk with food in its claws was watched near camp for some time on June 22nd. On the same date a California Cuckoo was repeatedly flushed about half a mile above the village. Long-tailed Chats were both noisy and numerous. They were heard day and night. An evasive oriole which could not be specifically identified, and a Lazuli Bunting were seen. Desert Song Sparrows were found breeding commonly along the creek. In all, twenty-six species of birds were seen in the Canyon.

Field Observations

For the third successive year Pigmy Nuthatches have been found nesting in a small hole near the top of a Juniper tree in front of the Hopi House, South Rim, Grand Canyon.

- E. D. McKee -

* * * * * *

A mountain lion was seen on the road about five miles north of Cape Royal, North Rim, on July 14th. This is an animal that few people are privileged to see in a wild state.

- R. A. Redburn -

* * * * * *

A Grand Canyon Rattlesnake (Crotalus c. abyssus) was collected on the west slope of Cedar Mountain on July 17th, 1932, by Bert Long and David Smith. This is the first definite record of this rare snake from above the Canyon rims. It was the typical salmon pink form.

- Charles Bogert -

* * * * * *

Kaibab Squirrels appear to be common in the vicinity of the Camp Ground, North Rim, this year. I recently watched a mother transport five young to a new nest, and now know of four litters containing a total of sixteen young squirrels.

- R. A. Redburn -

* * * * * *

On July 2nd an Audubon's Hermit Thrush was heard singing in the pines near the Yaki Point road. There is only one other record of this bird from the South Rim of Grand Canyon.

- E. D. McKee -