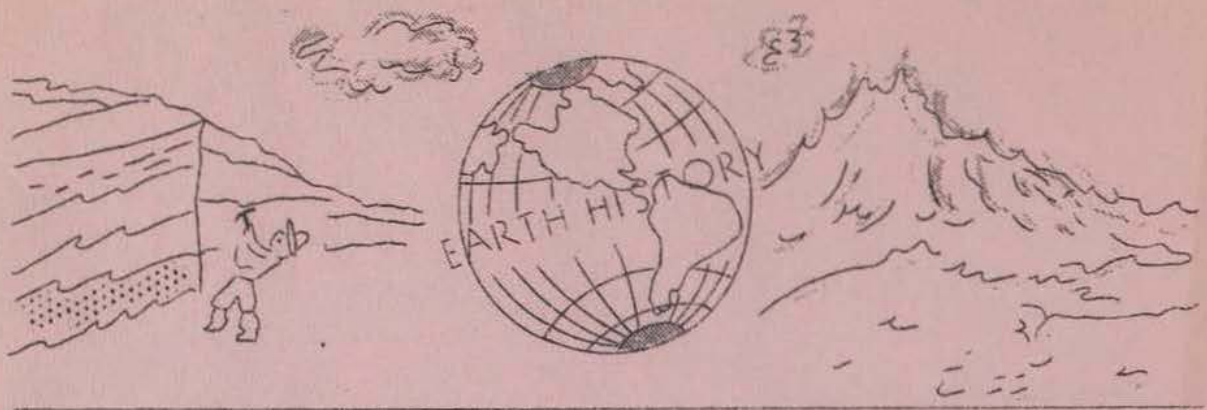

THE MINNESOTA GEOLOGIST

OFFICIAL BULLETIN

OF

THE GEOLOGICAL SOCIETY OF MINNESOTA

VOL III NOVEMBER 15th, 1946 No.6

"COME, JOHN AND JENNIE- COME GEORGE AND JULIA- LET US HAVE A TALK ABOUT GEOLOGY. COME, JOHN'S MOTHER AND AUNT. COME, EVERY BODY THAT WISHES. WE SHALL FIND SOME OF THE MOST DELIGHTFUL THINGS TO TALK ABOUT WHICH ANY BODY EVER HEARD OF."

ALEXANDER WINCHELL

GEOLOGICAL SOCIETY OF MINNESOTA

831 SECOND AVENUE SOUTH
MINNEAPOLIS 2, MINNESOTA

The Society is devoted to the study of GEOLOGY and MINERALOGY for their cultural value.

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MEETINGS: October to May inclusive, 7:30 P.M. every Monday, not a holiday, large auditorium, 4th floor, Public Library, Hennepin Avenue and 10th Street, Minneapolis, Minnesota.

FIELD TRIPS: June until September inclusive. Visitors are very welcome, always.

ANNUAL DUES: Residents of Hennepin and Ramsey Counties $3.00 plus $1.00 additional for husband, wife, or dependant family members; for students and non-residents, $1.00.

Affiliated with
MID WEST FEDERATION OF GEOLOGICAL SOCIETIES

MID WEST FEDERATION OF GEOLOGICAL SOCIETIES - CONVENTION

Judging by the comments of the members of the various Societies constituting the Federation, including both our own members and those who came as delegates, and the letters we have since received from those in attendance, the Convention held October 19th and 20th was a decided success. For this we are very happy, and those who took part in it should, and do, feel well pleased and well repaid for any effort they may have put forth. Fortunately, the work was spread over a considerable period of time so that there was a minimum of confusion at the last minute.

At this time we wish to publicly express our appreciation of the efforts of ALL of those who in any way contributed to making the meeting a success. Without limiting such generality, and at the risk of leaving someone "off the record", we might mention particulary, Loretta E. Koppen our co-editor and Secretary of the Society who took care of room reservations, printing 250 extra bulletins, registering guests, such things as table decorations and a multitude of other details; Mrs. Mary Lupient who took care of banquet tickets and assisted with the decorations; Charles E. Preston, Junior F. Hayden, Stanford P. Bordeau, William E. Bingham, Joseph W. Zalusky, Mrs. Lulu Zalusky, B. H. Wilson, Frank Fleener, Elmer H. Brown, Thelma Sneed, Prof. Geo. A. Thiel, Dr. D. B. Lawrence and Mrs. Lawrence, Patricia Knox, Dr. John W. Gruner, Milton Thompson. The part played by each made the occasion a success. No one who was requested to undertake any task, refused, and all cooperated beautifully. Our thanks to each and every one.

The Minnesota colors, maroon and gold, were applied to the programs and table decorations and even the flowers. The grand ball room of the Leamington Hotel was very appropriate and suitable for the occasion. The faculty of the Geology Department of the University were our especial guests. Dr. Lawrence of the Botany Department gave a splendid lecture on Paricutin and won our highest praise.

All in all, it seemed to be an occasion to be remembered, and a very good time and pleasant evening was enjoyed by everyone.

The Federation has added four new Societies during the year, namely: the Michigan Mineralogical Society of Detroit, the Chicago Rock and Mineral Club of Chicago, the Central Iowa Mineral Club of Des Moines, and the Minnesota Mineral Club of Minneapolis. The Convention made plans for publication of a Federation Bulletin to be published, possibly twice a year. It was felt that this would do more than anything else to bring the member Societies of the Federation closer together and to unite them in their common purpose and for usefulness to each other. The Association also made plans to be of some use and service in fostering a study of geology and kindred subjects in the secondary schools, and the Association looks forward to success in these endeavors during the next year or two.

Detroit was chosen as the meeting place for the 1947 meeting, and it was suggested that the meeting be held in August rather than October. John F. Mihelcic of

Detroit was elected President; Benedict P. Bagrowski of Milwaukee, Vice-President; Loretta E. Koppen, Minneapolis, Secretary; C. W. Yaggy, Des Moines, Treasurer; and Alger R. Syme, Minneapolis, Director for three years.

The Federation also established the office of Historian and elected Ben Hur Wilson, one of the founders of the Society, to that office. Mr. Wilson has had the welfare of the Federation foremost in his interest since the beginning, and surely no one could organize this office and preserve for the future the record of its life so well as he. We think that this was an excellent step in the right direction.

We regret that the Minnesota Mineral Club was not an active member of the Federation soon enough to be able to take a more active part in the Convention, but we look forward to some future time when the Federation will again return to Minneapolis for their annual meeting and possibly then as the guests of the Minnesota Mineral Club.

There is a movement already started to form a national association, and the Federation resolved to become a part of that movement. We can very confidently look forward to the time, within the next year or two, when such an organization will be perfected.

We are grateful for the opportunity of acting as host to the Federation and trust that our guests will return at some future time. And now we look forward to another successful year.

DR. SCHWARTZ'S LECTURE COURSE

Dr. Schwartz is now well started on his course of lectures to the Society. The first few lectures are devoted to laying a foundation for a proper understanding of the economic wealth of geologic materials we have in our natural resources. When the course is completed, those who will have attended will be, we believe, especially well pleased to have had the opportunity to learn something of the importance of the mineral wealth of the World. It should give us an understanding and comprehensive knowledge of such great mines as those producing our copper, nickel, lead, zinc, iron, coal, aluminum, etc.

We are justified, we believe, in using this opportunity to interest others in the subjects of geology and mineralogy. Our membership fees are extremely meager when you consider the opportunities afforded. We not only offer our members this splendid course of lectures, but in addition thereto there will be other courses, valuable data sheets and outlines distributed from time to time, and, of course, the Bulletin of the Society every other month. In addition thereto, we have well organized and conducted field trips and, of course, we should not overlook the fellowship and friendships we develop in the Society. No where else can you secure so much for your money. Will you please make a special effort to bring a friend, or your neighbor, to these lectures? You will do them a real service, particularly if you awaken in them some appreciation of these subjects which may lead them to some greater appreciation of the works of Nature.

NEW PRESIDENT

Dr. Edward H. Mandell has taken good hold of the "job" of being president and presiding officer of the Society, and he is doing, and we are certain will continue to do, a masterly job.

Professor George M. Schwartz, PhD., of the Department of Geology of the University of Minnesota, is giving the Society a course of sixteen lectures on ECONOMIC GEOLOGY. These lectures afford our members a splendid opportunity to become acquainted with the principal mineral deposits of the world and to get the information in an authoritive manner from a great teacher. Also, it is an opportunity we should make available to our friends. It is not too late. Bring one or two with you to the lectures. Perhaps they, too, will be greatly interested.

1946

III	NOVEMBER 18:	ORIGIN OF MINERAL DEPOSITS II
	NOVEMBER 25:	NO MEETING; to avoid conflict with Audubon Society meeting and lecture.
IV	DECEMBER 2:	ORIGIN OF MINERAL DEPOSITS III
V	DECEMBER 9:	RELATION OF MINERAL DEPOSITS TO GEOLOGICAL STRUCTURE
VI	DECEMBER 16:	WEATHERING AND ENRICHMENT OF MINERAL DEPOSITS

1947

VII	JANUARY 6:	IRON ORE DEPOSITS
VIII	JANUARY 13:	COPPER DEPOSITS
IX	JANUARY 20:	GOLD AND SILVER DEPOSITS
X	JANUARY 27:	LEAD AND ZINC DEPOSITS
XI	FEBRUARY 3:	DEPOSITS OF ALUMINUM, TIN AND NICKEL, etc.
XII	FEBRUARY 10:	COAL DEPOSITS: ORIGIN: Geologic Distribution.
XIII	FEBRUARY 17:	COAL DEPOSITS; Geographic Distribution and its Significance.
XIV	FEBRUARY 24:	SALT DEPOSITS; (The Salines)
XV	MARCH 3,	CLAY DEPOSITS AND CLAY PRODUCTS
XVI	MARCH 10:	DEPOSITS OF PHOSPHOROUS, GRAPHITE, SULPHUR, ASBESTOS, AND LESSOR NON-METALICS.

"THE SANDS OF TIME" BY GEORGE A. THIEL, PhD.

EDITOR'S NOTE: Some years ago, Dr. George A. Thiel addressed our Society on the subject of "SAND". Many of our members think of that lecture as being one of the best presented to us. With permission of the author and of the Minnesota Department of Conservation, we are pleased to reprint below an article on the same subject written by Dr. Thiel for the official bulletin of the Conservation Department.

THE SANDS OF TIME

By George A. Thiel, PhD.
Chairman, Department of Geology
University of Minnesota

The poet Wordsworth once said, "Wisdom is ofttimes nearer when we stoop than when we soar." Such a statement contains good geological advice and therefore let us stoop and take an excursion among the sand grains. Each grain of sand--and there are billions of them on even a small beach--could tell a long geological story. Such a biographical tale would include the events leading up to the formation of the crystals and grains of minerals in the igneous rocks long before the individual crystals became grains of sand.

Most sands are composed mainly of grains or pieces of quartz (SiO_2) but many contain varying amounts of such minerals as feldspar, hornblende, magnetite, mica, garnet, tourmaline, apatite, zircon, and other minerals. All of these minerals were once constituents of massive rock formation such as granites, diorites, and others, that were subjected to decomposition and disintegration under the ever-active processes of weathering and erosion. These processes liberate and sort the unaltered mineral grains and the unconsolidated aggregates of such grains are called sand.

Sands may be classified in many different ways--by origin, chemical or mineralogical composition, geological or geographical distribution, grain size uses, or combinations of two or more of these methods. The principal types of deposits based on the manner of deposition are (1) river sands, (2) lake-bed sands, (3) beach sands, (4) glacial sands, and (5) eolian (wind blown) sands.

All of the above types of sand deposits are found in Minnesota. Furthermore most of the sands are very complex mineralogically. The reason for this complexity is that most of the sands in the state are of glacial origin. In other words, great, slowly-moving ice sheets crushed and ground millions of granite and other types of boulders to particles the size of sand grains. As the glaciers melted, the water derived from the ice tended to sort the sand from the coarser pebbles of gravel size, and much of the fine clay was carried in suspension to more distant basins of accumulation by the glacial outwash streams. In many deposits, however, the sand and gravel occur as an intimate mixture.

Some sands are nearly pure quartz (silica sand). One of the purest quartz-sand formations in the world (99%SiO_2) is the white sandstone formation that crops out in the walls of the Mississippi River valley, in the Twin Cities area. The sands of this formation, called the St. Peter Sandstone, have had a long and varied history. From the fact that only quartz grains are present in the formation, one concludes that all the other less resistant minerals were removed by decomposition and disintegration prior to the deposition of the quartz sand. Since the formation contains marine fossils, it undoubtedly accumulated in an ancient epi-continental area. Its geographic distribution indicates that similar sands were deposited over an area from eastern Colorado to central Kentucky and

from Minnesota southward into Oklahoma and Texas. Because of the high silica content of this formation, it is mined at many places and used as the chief raw material in the manufacture of plate glass. A typical installation is the glass plant of the Ford Motor Company in St. Paul, where the sand is mined by underground methods on the land at the plant.

The Jordan sandstone that is exposed in the walls of the St. Croix valley at Stillwater, and at several points in the valley of the Minnesota River, near Jordan, contains nearly as much silica as the St. Peter formation. The upper part of the Jordan, which has a total thickness of about 100 feet, is composed of sands with many reconstructed quartz crystals. The crystals are hexagonal with short, sharp pyraminds on both ends. Since quartz is very had (it will cut glass) such crystal sands are used for sandblasting. When the sand grains are forced through the nozzle of a blasting hose under high air pressure, the sharp edges and points of the crystals carve inscriptions or other designs on granite in a few minutes. It is used also quite extensively for cleaning metal castings and for redressing the exterior of stone buildings. Sands for such purposes are mined at Red Wing, Eggleston, and near the city of Jordan.

Sands from both the St. Peter and the Jordan sandstone formations are used for many other purposes, and consequently they may be shipped and sold under several names. A high-grade silica sand is glass sand to a glassmaker, steel sand to a steel molder, grinding sand to a stonecutter, asphalt sand to a pavement contractor, facing said to a concreteblock maker, and furnace sand to a foundryman.

Because of their many variations both physically and mineralogically, the sands of Minnesota are adaptable to many industrial uses. The foundries require sands that vary from loamy clay to clean silica sand or gravel, the character of the material used depending on the kind of metal to be poured, the size of the casting, the surface desired and the place in the mold where the sand is to be used. Fore core work a quartz sand free from clay is preferred. Some organic bonding material is added to the clean sand. Greater permeability is obtained in this manner than is possible where clayey or loamy sands are used. A molding sand is a silicious sand having a clay content just sufficient to bind the sand grains together, but not enough to fill the voids between the sand grains. When such a mixture is moistened slightly, the mass may be molded into any form desired, retaining this form when dry.

The Hinckley sandstone, which is quarried extensively along the Kettle River near the city of Sandstone, contains strata that crumble womewhat during quarry operations. The screenings from such layers are composed of subangular, rough grains which offer good attachment for bonding material and are consequently used for refractory purposes in foundry practice. The Galesville member of the Dresbach sandstone, the Jordan, and the St. Peter sandstones, are used also in many of the foundries in the southeastern part of the state.

Grinding and polishing sands are sharp, tough, hard sands free from clay or foreign material and sized for use in sawing, cutting and polishing stone and for grinding and etching glass. The size of the sand varies with the character of the material to be worked and the kind of work to be done. A plant for processing such sands is operated at Mendota.

Burnishing sand is a fine-grained, clean, tough, silica sand with grains as nearly round as possible used in rolling down and burnishing gold decorations on chinaware and porcelain. The sand should be very uniform in size with the grains about seven thousandths of an inch in diameter (80 mesh). The quartz grains of the St. Peter sandstone are exceptionally well rounded and much of the sand is of the size indicated.

By far the greatest tonnage of sand and gravel is used for constructional purposes. These sands are all of glacial origin and were deposited as alluvial sediments in the major valleys or as products of glacial outwash at the margin of the retreating ice sheet. Some deposits occur as alluvial cones known as kames and others are serpent-shaped ridges or eskers that represent deposits made on

the floor of subglacial or superglacial streams. In most glacial streams the sands were washed free of clay before they were deposited.

The accompanying table shows the amount and value of the sand and gravel produced in Minnesota in 1944.

SAND			GRAVEL		
USE	SHORT TONS	VALUE	USE	SHORT TONS	VALUE
Molding sand	18,502	$ 21,107	Building		
Building purposes			Commercial	684,369	$ 304,114
Commercial	442,453	401,477	Gov't contracts	41,578	21,155
Gov't contracts	2,786	1,017	Paving		
Paving			Commercial	426,423	201,534
Commercial	223,740	97,720	Gov't Contracts	5,287,990	363,129
Gov't contracts	42,217	14,101	Railroad ballast	2,128,350	584,914
Grinding and polish'g	1,603	1,509	Other uses	173,945	42,226
Furnace	103	103	TOTAL (Gravel)	8,742,655	$1,517,072
Engine	31,081	7,254			
Filter	664	2,158			
Railroad ballast	171,949	37,928			
Other uses	26,399	5,358	Total (Sand)	961,497	589,732
TOTAL (Sand)	961,497	$589,732	TOTAL S. and G.	9,704,152	$2,096,804

ANENT RECENT METEORIC SHOWER

The recent meteoric shower, observed in this party of the country, prompted us to look up a few definitions. These may be interesting to you, too, as they were to us.

METEOR: A term applied generally to any phenomenon or appearnace in the atmosphere and even to whirlwinds, clouds and rainbows. Meteors are often classified as "Aerial"-winds, tornadoes, etc.; "Aqueous"-rain, hail, snow, dew, etc.; "Luminous"-rainbows, halos, etc.; and "Igneous"-shooting stars. Geologically, it is a celestial body that enters Earth's atmosphere.

METEORITE: A stony or metalic body that has fallen to Earth from outer space. Note the difference between "meteor" and "meteorite". The visible light phenomenon in the sky is a "meteor", whereas, a body fallen to Earth is a "meteorite".

METEORITICS: The science which treats of meteorites.

METEORIST: A specialist on the subject of meteors.

METEORIC SHOWER A large number of meteors appearing on the same night or on successive nights.

METEOROID: One of the countless small solid bodies in the solar system which become meteors upon entering the Earth's atmosphere and meteorites if they fall to Earth.

THE GRAND CANYON FIELD TRIP BY CHARLES H. PRESTON

EDITOR'S NOTE

The trip to the Grand Canyon sponsored by the Society and lead by Past President Charles H. Preston, was so thoroughly enjoyed by those who went that we have asked Mr. Preston to give us an account of the trip so that we could pass on to you a description of the places and events which made the trip of such great interest. We feel that although this trip was a matter of great responsibility and stremuous effort on the part of the leader, it is a mile-stone in the history of the Society. Some of us have been so bold as to suggest to Mr. Preston that he repeat the performance next year, possibly to the Bad Lands and Black Hills of South Dakota. We would like to have your reaction to this suggestion.

The most extensive, and probably the most successful field trip sponsored by the Society, was undertaken during the last week of August, and the first week of September, 1946. Twenty-eight members and guests assembled at Salt Lake City for the trip to the Canyon. Our objective was to visit the Grand Canyon and adjacent regions where the greatest story of Geological history is unfolded in the most limited area, of any place in the world.

The group consisted of seven automobiles and assembled at Salt Lake City on the afternoon of August 26th, where comfortable accommodations had been arranged in advance at a modern Auto Court. Some drivers started a few days early, so that four groups visited the Yellowstone Park before meeting at Salt Lake City. All of the groups found time to visit the Bad Lands of South Dakota and the Black Hills en route.

Monday, August 26 - Most members took time at Salt Lake City to make a study of the various shore lines of Ancient Lake Bonneville, so plainly seen in the form of "benches" at various levels above the present Great Salt Lake. Some had time for a swim in that briny inland sea, six to eight times as salty as the ocean. Most members visited the Morman Tabernacle, and the Natural Science Museum at the State Capitol.

Tuesday, August 27 - Tuesday morning the party left singly and in groups southward over the High Plateaus of Utah, for a visit to Bryce Canyon National Park, where the spectacular erosion of pink sandstone presents a fantastic picture. This formation is of Eocene Age, representing terrestrial sediments of Cenozoic Era, the fifth and final chapter of Earth history. The beauty of the pinnacles and spires carved by the erosion cannot be described. Two cars of the group diverted to "Cedar Breaks", another nearby National monument, presenting a similar erosional "scarp" in the same bright pink sandstone at an elevation of over 10,000 feet. The entire party of Twenty-eight reassembled at Zion National Park for dinner and lodging in the rustic cabins at the Lodge in that park. In the evening a special illustrated lecture was provided for our group by Mr. Grater, the chief Park Naturalist.

Wednesday, August 28 - In the morning Mr. Grater led our party for a short trip in the Park, stopping at points of interest for short talks, and describing the significance of these points. Here the Virgin River has cut a narrow gorge 3,000 feet deep in the "Navajo Sandstone", of Jurassic period and "Mesozoic" Era or the fourth chapter in Earth History. The floor of the Canyon is flat, providing an excellent location for the Lodge and Park headquarters. It reminds one somewhat of Yosemite Park, though on a somewhat smaller scale.

At 10:00 A. M., the party left for the Grand Canyon Lodge on the North Rim of the Canyon, winding to the top of the Plateau, via "Switch backs", and then on through the unique one-mile tunnel, viewing Zion Canyon from the "windows" on the famous Carmel Highway. This route afforded beautiful views of the cliffs of the cross-bedded, windblown sands of the Navajo Sandstone Jurassic Age , above referred to, which also compose the White Cliffs of Southern Utah. Further south near Kanab one passes over the Vermillion Cliffs, composed of the Wingate Sandstone, of "Triassic" age, one period older than the Jurassic. Some of the party stopped for lunch at "Jacob Lake", beautifully located in the Kaibab National Forest, and which contains the largest stand of Pondirosa pine in America. Here wild deer are so plentiful that hunting is encouraged by the National Park Service. This excellent highway gradually rises to the summit of the plateau, 9,000 feet in elevation, and then, as gradually, descends to the North Rim of the Grand Canyon, about 8,000 feet in elevation. This plateau is apparently quite level, with nothing to indicate that it reaches such heights. At the North Rim, reservations had been made for the entire group. After getting "settled", and a first glimpse at the magnificent spectacle which is the Grand Canyon, the party drove to the Walla Walla Plateau, for a view from "Cape Royal" and "Point Imperial" which provide the greatest panaramas of the region covering a distance of over 50 miles. This view includes the Painted Desert to the East, San Francisco Mountains to the South, and Mt. Trumbell to the West, with the Canyon more than a mile deep in the foreground. The party returned to Grand Canyon Lodge in time for dinner and an illustrated lecture in the evening. They were then very glad to seek the comfort and repose of their Log Cabins.

Thursday, August 29 - In the morning the party gathered at the Hotel Patio overlooking the Grand Canyon and listened to a short lecture by the trip leader, explaining the various strata viewed from the rim of the chasm. Heretofore we had magnificent views of the rocks of the 5th era, then the 4th era. Here, at one glance, in the mile deep canyon, we saw rocks of the 3rd, 2nd and 1st eras, all before us at a single glance. It must be admitted, however, that those of the first two eras were almost too far down to be fully appreciated. The party left at about 10:00 A.M. for the trip to the South Rim and Bright Angel Lodge. This Lodge could be seen at about only ten miles distant although it was necessary to drive 215 miles to reach it, in the absence of wings to fly across this great chasm. The route led back through the Kaibab Forest, then eastward, over the down slope of the East Kaibab "Monocline", about 2,500 feet, through House Rock Valley, the home of the only herd of wild buffalo in America, over the Navajo Bridge, across the Colorado, though the Navajo Indian Reservation and Painted Desert, stopping at Cameron, then hence to the South Rim. Many of the party found time, en route, to gather quantities of the petrified wood, and we were tempted to linger at the Indian "villages". At Bright Angel Lodge, the party "got settled" in their quarters, reserved weeks in advance, and thereafter enjoyed a good dinner, and lecture and entertainment in the Lecture Room of the Lodge. Others, including the leader, were too tired for anything but a hot bath and sleep. The trip through the desert was somewhat hot.

Friday August 30 - Friday morning provided the real test. Most of the party wanted to study the rocks of the Canyon at close range. But some were too timid or tired to ride the mules into the Canyon. However, about half of the party went down, eleven of them for an overnight stop at Phantom Ranch, a mile deep from the rim and across the swirling Colorado River at the foot of Bright Angel Creek. Two of the party walked all the way down returning the next day. Two of the party shared one mule, one walking down and the other walking back up the trail. Others walked about half way down as far as Indian Gardens and back again in one day. Still others took but a short walk part way down and back. Thus, most of the party made a first-hand study of the various strata representing sediments of the 1st, 2nd and 3rd chapters of Earth History, that is, the Archeozoic, Proterozoic and Paleozoic Eras. Our party had the advantage of a special guide.

Saturday, August 31 - We spent Saturday returning from Phantom Ranch and nursing sore muscles or incipient blisters due to riding the mules. Many attended Kolb's illustrated lecture describing their hazardous boat ride through the Canyon from Green River, Utah, to the present location of Bolder Dam.

Sunday September 1 - Sunday morning was devoted to taking group pictures and more or less quiet rest. We had photographers in both quantity and quality, Hayden, Bordeau, Jacobs, Syme, Rowberg, and others. We had been invited by the Park Naturalist to visit "the work shop", and here we were shown an elaborate collection of fossils of plant and animal life and their methods of preparing and preserving them for public display. We later assembled at the Museum at Yavapai Point where a special lecture was given our party by the Park Natrualist. After luncheon, the party broke up into its individual groups to do as they pleased. Many took advantage of the opportunity to make observations from many points on the Rim and to make their own collection of camera souvenirs.

Monday, September 2 - We now left the Grand Canyon via the Highway through Cameron and Flagstaff, after taking a last look at the grand spectacle from various places on the South Rim, including "the Watch Tower". Shortly before reaching Flagstaff, most of the party detoured five miles off the highway to view "Sunset Crater", a recent (Geologically) volcanic cone at the eastern edge of the San Francisco Mountain Peaks. This extinct volcano which spread its cinders and ash over a large area of the surrounding territory, is the only prehistoric volcano in the world to be accurately dated as to time of its erruptions. This was done by a study of the timbers in the Indian huts buried by the ash and lava, and the application of the famous "Douglas tree ring chronology". The date is thus determined at 1066 A.D. The lava, however, looks as fresh as though the erruption had occurred but last year. The cone seems a good replica of that new Mexican Volcano, Paricutin. It is about 1,200 feet high compared to 1600 feet for Paricutin. The Ranger gave our group a short talk on the features of Sunset Crater, so named because of the bright colors of its rim, and of "Ice Caves" found in the lava flows near by. In two days time the party therefore saw rocks less than 1000 years old, others 2½ billion years old, and rocks of all intervening ages. The party left Sunset Crater about midday for Flagstaff where we visited the Northern Arizona Museum upon special invitiation of its director, Dr. Edwin D. McKee. Dr. McKee is the author of the little booklet "Ancient Landscapes of the Grand Canyon Region", a geologic history of the Canyon written by Dr. McKee for the government and which our members had learned to admire because of the fascinating Geological Story of that "Geologist's Paradise". Dr. McKee, recently Park Naturalist for the Grand Canyon, and now on the faculty of Arizona State University, had been referred to us by other naturalists of the region, as the best present day student of the Grand Canyon. We were delighted to have the opportunity of meeting him and to have him conduct us through that very interesting museum devoted to the natural history and archeology of Northern Arizona and surrounding areas. Dr. McKee proved to our party that he merited the distinction given him. He is still a young man and has many years of research before him. As though the visit at this museum and the personal talks by that high authority were not enough, the party pushed on to see "Meteor Crater" before dark, 35 miles east of Flagstaff. This is a sight well worth seeing, 4,000 feet wide, 600 feet deep, and clearly caused by the impact of a large meteorite in what a Geologist would call "very recent years". The party had reserved Auto Cabins at Winslow, twenty miles further east, where they were glad to rest after a long day of sight seeing.

Tuesday September 3 - The party "broke up" at Winslow, although their continual thirst for sight seeing had not been quenched. In individual groups they visited the Petrified National Forest, the Painted Desert, the Ancient Spanish capital of Sante Fe, Cripple Creek Gold Mines, and the very excellent museum at Denver.

We arrived home during the weekend, tired but greatly exhilerated. Every courtesy was shown our party by the National Park Officials at the various Parks, and we learned to sincerely appreciate the National Park Service. The trip made our members conscious of a great lack of museum facilities in our own State, and we determuned to do our bit to promote one here comparable to our geologic importance.