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THE MINNESOTA GEOLOGIST

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OFFICIAL BULLETIN  
OF  
THE GEOLOGICAL SOCIETY OF MINNESOTA

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VOL IV

JULY 15<sup>TH</sup>, 1947

NO. 4

"A PERSON CAN HARDLY STEP OUT OF DOORS OR LOOK  
THROUGH A WINDOW WITHOUT SEEING SOME ASPECT OF  
GEOLOGY, WHILE ON HIS TRAVELS GEOLOGIC HISTORY  
IS DISPLAYED EVERYWHERE."

RUSSELL C. HUSSEY,  
PROFESSOR OF GEOLOGY,  
UNIVERSITY OF MICHIGAN.

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

ANNUAL DUES: Residents of Hennepin and Ramsey Counties \$3.00  
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ily members; for students and non-residents, \$1.00.

Member of  
MIDWEST FEDERATION OF GEOLOGICAL SOCIETIES

BLACK HILLS FIELD TRIP:-

The most important event affecting our Society which has occurred since our last issue of this Bulletin is, of course, the recent field trip to the Bad Lands and the Black Hills of South Dakota. We wonder if everyone appreciates the tremendous task it is to organize a week's tour for fifty people. If you doubt that it is a really big job, just volunteer to do just a little part of it some time. In undertaking a project of this size, there are bound to be some little misgives. Someone is bound not to be one hundred percent satisfied. Someone is bound to be annoyed some time, but these occurrences are so insignificant compared to the final results that they are hardly to be mentioned. We can truthfully say that everyone who took the trip to the Black Hills was not only satisfied, but elated, and their joy and enthusiasm knew no bounds. That, in the largest measure, this was due to the leader, Past President Charles H. Preston, goes without saying, and we wish to take this opportunity to acknowledge our appreciation of his ability, his energy and will to perform this task. All those who went, and, indeed, the entire Society congratulate the leader.

Fifty-two people assembled in the Black Hills. Thirty-five went in the bus; others provided their own transportation. Those who took the bus seemed to enjoy it immensely. When you get someone to take you to the Black Hills, then carry you around the Hills for a whole week and bring you back for \$23.00, you should enjoy it. That is a real bargain. The bus driver was an outstanding character. He was not only an efficient driver, but he had a very pleasing personality and made himself one of the group. He attended all the lectures and helped his passengers in many ways. We congratulate the group on having such a fine driver.

The study of the Pegmatites was a revelation. Many of us had little comprehension of their construction, importance and distribution. We visited nine mines in three days, all located in Pegmatites, and saw them mining Mica, Spodumene, Feldspar and Beryl. In addition we visited Wind Cave, Devils Tower, Bear Butte, Mt. Rushmore, the Needles and other physiographic features of the Hills.

Then on Friday came, what for many of us, was the climax when Dr. Gruner combined his class with our Society and took us through the Spearfish Canyon where he pointed out many of the things we had been taught and had read about in the text books but had never seen. That was a very wonderful day and we are indebted to Dr. Gruner for his kindness. We certainly appreciated it very much.

Some of the party actually panned some gold from Deadwood Creek and a nugget or two was obtained. The party returned to Minneapolis after an absence of nine days having had a most wonderful time. It made history. The moral of this little story is that if you again have an opportunity of taking a trip like this with the Geological Society of Minnesota, do not fail to take advantage of it.

"MIDWEST GEOLOGIST":-

The second issue of the "MIDWEST GEOLOGIST", official bulletin of the Midwest Federation of Geological Societies, has just been published, and a very creditable number it is. The Michigan Mineralogical Society who will be host at the Midwest Convention at Detroit, Michigan, on August 23rd, 24th, and 25th, prepared and printed this issue. James Wm. Ray was the editor and Mrs. John F. Mihelcic was responsible for the typing and art work. This issue is devoted to the Convention but is extremely interesting to anyone even though they do not attend the Convention. The issue is unusually well done and we congratulate the editor and the Detroit Society.

(Reprinted from the "Conservation Volunteer", published by the Minnesota Department of Conservation with permission from the author.)

**PEAT:** The material called peat is partly decomposed and disintegrated vegetable matter that has changed chemically and physically but still retains most of the carbon of the original plant tissues. Many stems, roots, leaves and seeds are still present in a state of good preservation. From a geologic point of view, peat is the first intermediate product in the series from vegetable matter to coal.

There are hundreds of peat deposits in Minnesota and from a study of the topography of the bottoms of the bogs, it is possible to divide them into two major types: (1) deposits formed by the filling of shallow lakes or ponds with plant remains and (2) deposits which have been built up on flat marshy surfaces. Many of the deposits in northern Minnesota are known as "muskeg" swamps which are largely made up of successive layers of sphagnum or peat moss. They are the largest, the deepest and of the best quality in the state. A single deposit may cover an area of more than 50 square miles with a mantle of peat from seven to ten feet thick. Locally it may reach a thickness of more than 20 feet. The deposits in the central and southern part of the state are smaller and represent accumulations of grasses, rushes, cattails and other marsh vegetation.

Peat is excavated and used extensively as a fertilizer filler and soil conditioner on farms, golf courses, gardens, nurseries, and greenhouses; as packing material for plants, shrubs, fruit and a variety of fragile objects; as litter for cattle and poultry; as surgical dressings, and in the manufacture of artificial wood, coarse woven fabrics, tanning materials, nitrates, ammonium sulphate, tars and dye-stuffs, etc. Much of the peat in Minnesota is suitable for fuel, but at present it is not in a position to compete with other fuels. The estimated tonnage of air-dried peat in this state is more than six and one-half billion tons.

**FELDSPAR:** The feldspars are essentially aluminum silicates containing more or less potassium, sodium, and calcium. These minerals occur mainly in granite, but the soda-lime feldspars are constituents of darker colored igneous rocks, such as the gabbro that crops out in the vicinity of Duluth. In exceptionally coarse grained granitic dikes called pegmatites, the feldspar grains may be from three or four inches to more than two feet across. Such feldspar is blasted from the rocks and finds a ready market.

Crushed and ground feldspar is used in the manufacture of glasses and metal enamels. It is used also as a flux in the manufacture of glass and in the ceramic industries where it is mixed with clays to make porcelain ware, china, pottery, earthenware, wall and floor tile and other clay products.

The only feldspar mine in Minnesota is located in the Northwest Angle northwest of Lake of the Woods. The hand-picked ore is carried by barge to a mill at Warroad where it is crushed and bagged for shipment to various manufacturers.

**WOOL ROCK:** Fibrous insulating materials made from rock is known in industry as rock wool. The raw material commonly used for making the fine glassy fibers is a clayey limestone or dolomite. If such rocks have a carbon dioxide content of 20 to 30 percent, they can be satisfactorily melted and blown into wooly fibers. Analyses of Minnesota limestones and dolomites indicate that most of the St. Lawrence dolomite which is about 30 feet thick and thinner layers in the Platteville, Galena and Oneota dolomites are wool rocks.

A plant at Hankato uses an argillaceous dolomite near the base of the Onecta formation and the rock wool plant at Red Wing has quarried and used many tons of the St. Lawrence dolomite.

There is virtually an unlimited supply of suitable wool rock in the sedimentary strata of southeastern Minnesota.

**POTASH-BEARING MINERALS:** The Franconia formation that occurs at or near the surface along the valleys of the St. Croix and Mississippi rivers contains an appreciable amount of the mineral glauconite. This mineral is essentially a hydrous silicate of iron and potassium. At some places the glauconite contains seven or eight percent of potash. Although this potash is only slightly soluble in water, small amounts of it are available for plant use. For this reason glauconitic sands are used as a fertilizer filler with some success. Because of its base-exchange characteristics, glauconite is used extensively also for water softening. There are accessible locations near rail or river transportation where millions of tons of highly glauconitic sands and silts can be excavated in east central and southeastern Minnesota.

**SULPHUR COMPOUNDS:** There are no deposits of pure sulphur known in Minnesota; however, compounds of sulphur and iron are common sources of sulphur. If at some future date large quantities of sulphuric acid are needed for leaching and concentrating low-grade ores or for other chemical processes, sulphides of iron might be obtained in commercial amounts at several points in the region of Long Lake, about 12 miles southeast of Aitkin. Preliminary drilling has demonstrated the presence of both pyrite and pyrrhotite in the graphitic slates of that area. Pyrite,  $FeS_2$  (Fool's Gold) is a very common mineral and it is present in small amounts in a great variety of rocks; however, few large deposits are known.

**GRAPHITE:** The graphite in metamorphic rocks such as slate and schist is a residue derived from the cellulose of plant tissue that was deposited in the sediments from which the rocks were formed. Graphitic slates are very common in northern Minnesota and at several places test pits have been excavated in an attempt to locate material of commercial grade. A pit northwest of Mahtowa is in the Carlton slates; one on Pigeon Point is in gray quartzite and another in that area has small quantities of graphite in the "red rock." No commercial deposits have been found.

**GAS AND OIL:** Methane or marsh gas has been encountered in the glacial drift in numerous areas. It occurs in pockets that "bounce the tools" as well-drillers penetrate them. Occasionally it throws out quantities of mud and other rock debris. These "puffs" are of short duration and further drilling does not increase the flow of gas. The highest pressure recorded is 22 pounds. Such pressures subside in a few hours, but small quantities of gas may issue from the wells for many years. No methane has been encountered in holes drilled into the bedrock beneath the glacial drift.

There has been considerable drilling for oil in Minnesota beginning as early as 1857. However, the age and structure of the rocks are such that commercial production is very doubtful. There has been an occasional leak from some storage tank of gasoline or fuel oil into the soil and glacial drift, which created much unjustified hope of commercial accumulation of petroleum.

**SALT:** No deposits of rock salt are known in Minnesota, but many wells produce salt water. This is especially true in the Red River Valley region where salt was obtained from brine as early as 1864. Although there are numerous salt springs, no large brine industry has developed.

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OIL GEOLOGY OF THE AFRICAN GOLD COAST

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(Condensed from an article in the Oil Weekly, issue of May 5th, 1947. Please study the Paleogeographic map on the next page before and after reading this article.)

Sporadic attempts have been made to discover oil and gas in the Gold Coast region of Africa. About a dozen exploratory wells have been drilled during the last 40 years. Most of these were drilled at random, with no regard to local structure, and since for the most part no geological logs were kept, these unsuccessful tests cannot be considered as providing any evidence one way or another on Gold Coast oil prospects. Traces of oil and gas were found in most of these early wells, but no commercial shows were discovered, although gas and oil seepages are not uncommon.

Much of the Gold Coast territory is made up of Archaean rocks. These are locally divided into two classes, those which are older than the main period of granitic intrusion, Archaean gneisses and pre-Cambrian (Birimian) phyllites and schists, and those which are younger than the granites, Tarkwaian, Akwapimian and Euen, all of which are probably pre-Cambrian in age. There is no possibility of oil in the areas occupied by these rocks.

A belt of sedimentary deposits, possibly containing oil accumulations, occurs approximately 20 miles inland from the sea coast. These rocks comprise Devonian, Carboniferous, Cretaceous and Tertiary strata. Of these, the Cretaceous is by far the most important, since it consists of more than 4000 feet of alternating sandy and clayey sediments, with occasional limestone bands.

It is interesting to note that most of the interior of the Gold Coast territory is made up of extensive sedimentary deposits, comprising Voltaian system of rocks, whose maximum thickness is about 2600 feet. These Voltaian sediments form part of the horizontal sandstone series exposed in the Ivory Coast and French Guinea, and are probably of Ordovician or Devonian age, although diagnostic fossils have not been found. They were deposited in a gentle basin and are flat or slightly inclined except at the eastern margin where folds occur. Although comprising many suitable sandy reservoir horizons, it is doubtful whether the Voltaian sediments are thick enough to have engendered and preserved commercial oil accumulations.

GEOLOGICAL SOCIETY OF MINNESOTA

831 Second Avenue South  
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APPLICATION FOR MEMBERSHIP

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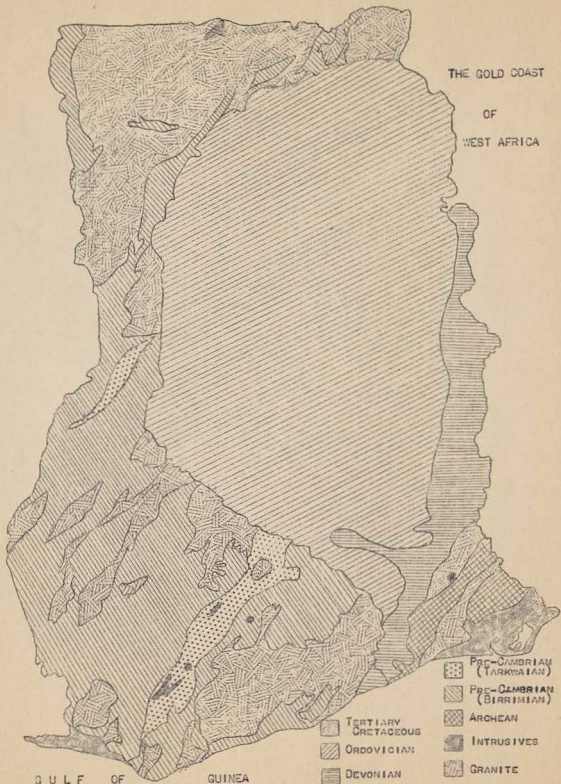
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THE GOLD COAST  
OF  
WEST AFRICA



GULF OF GUINEA

## FIELD TRIP SCHEDULE, 1947

NOTE: Some of our best field trips are still to come as witness the following schedule. New members can hardly know what they have missed until they have formed the habit of attending all field trips. A field trip offers not only an opportunity to be in the great outdoors with genial companions but here you come face to face with the realities of Geology so that you soon begin to recognize physiographic features no matter where you find them. We urge you to attend the field trips. There must be something in it when fifty-two ventured from Minneapolis to the Black Hills and back to see and enjoy the wonders of nature!

- JULY 27TH ST. CLOUD GRANITES: Leader, Mr. Alger R. Syme.
- AUGUST 10TH LAWN PARTY, GUESTS OF MR. AND MRS. CHARLES H. PRESTON  
at their Lake Minnetonka home. Edward W. Hawley, speaker.
- AUGUST 17TH MISSISSIPPI RIVER BOAT TRIP: Leader, Miss Elsie Hinchley.
- SEPTEMBER 6 & 7TH ROOT VALLEY, MINN.: Root Valley Formation; Leader, Dr. George A. Thiel.
- SEPTEMBER 14TH FAULTS NORTH OF MARINE, MINN.: Leaders, Mr. and Mrs. L. W. King.
- SEPTEMBER 21ST NORTHFIELD AREA: Geology of the Northfield-Faribault Area; Leader, Dr. Duncan Stewart, Jr., Professor of Geology, Carlton College.
- OCTOBER 5TH BARRON HILLS, WIS.: Leader, Mr. Hal E. McWethy.

## In memoriam

Just before final assembly of this Bulletin, we received the announcement of the passing of DAN A. G. RYDER on Monday, July 14, 1947. Mr. Ryder was a charter member of this Society. We will make further mention of him in our next issue. We extend to his family the sympathy of each of our members.

*Alger R. Syme*  
EDITOR



Reprinted from Ethyl News.

In Lumpkin County, Georgia, at the southern end of the Blue Ridge mountains, is a town named Dahlonega which has an unusual claim to fame. Dahlonega is the site of the oldest known mines in America. These mines have been in continuous operation for over 400 years.

Less than 50 years after Columbus discovered America, the first white men worked these mines. Even before them, native Cherokee Indians living in the region swarmed over its sandbars and gravel banks after each rainfall and freshet, gathering bright pinpoints and nuggets of gold. The lure of its buried treasure attracted the attention of some of the most noted figures of the last century.

Besides its historical interest, Dahlonega was actually America's first Eldorado. While its production has been nowhere near the fabulous output of the mines later discovered in California, Dahlonega has in a way been a sort of Old Faithful among mining camps. It is impossible to estimate its total production during the last four centuries. Yet it is known that in the years 1834 to 1908, the mines yielded \$17.5 million in gold; in all, probably \$25 to \$30 million has been taken from the region.

There have been numerous lucky strikes in the district. Nuggets, the size of a man's hand, taken from these mines, have not been an uncommon sight. A miner once took eleven ounces of gold from less than two pounds of ore. One of the mines paid its stockholders 23 monthly dividends of \$4,000 each, or \$92,000 in all for each share owner. A casual seeker found a chunk of yellow metal weighing 300 pennyweights (15 ounces), which was worth a dollar a pennyweight. To serve the bonanza, a branch of the United States Mint was established at Dahlonega in 1837. It was the only mint in American history to coin gold exclusively. When the outbreak of the War Between the States closed its doors in 1865, the Dahlonega Mint had coined \$6,121,919 of local gold, most of it in quarter and half eagles (equal to \$2.50 and \$5.00, respectively), but some small one-dollar pieces as well. Coins with its mint mark today are collectors' items among numismatists.

For unnumbered years before the white man came, the Cherokees recovered gold from the Dahlonega area. They had none of the white man's later tools--shafts and tunnels, drills and powder--but they were content with surface findings. "Tau-lau-ne-ka," they called it, "the place of yellow money," which is not far different from the present Anglicized version of its name.

The Conquistadores under Hernando de Soto were the first white men to mine the region. It is known that they worked the mines in the year 1540, for 300 years later Anglo-Saxon miners unearthed an alabaster burial urn containing the ashes of one of the Spanish leaders, bearing that date. De Soto was destined to discover the Mississippi river, and to find a grave in its muddy waters, leaving the Dahlonega mines to their redskinned owners. But three centuries later, another generation of white men were to displace the Cherokees, this time for good.

Previously, the Cherokee tribe had been pledged by the United States Government that it might freely inhabit northern Georgia "as long as water runs and grass grows." The Cherokees, it might be said, were the most advanced of Indian tribes, living in sound log cabins, surrounded by well-tilled fields, and possessing a written alphabetical language and a newspaper, the "Phenix," which was printed in English and Cherokee. The wealth and fame of Dahlonega spread, and the "Intrusion" of 1829-31, thousands of Georgian, Tennessee and Carolinian frontiersmen invaded what is now Lumpkin County. They elbowed the Indians aside and forbade them to work their own mines. Washington bowed to political pressure, and the American Army drove the Cherokees to the then wilderness of Oklahoma. But ironically, the palefaces drove the red men only to greater wealth. For from deep beneath the "worthless" lands of the Cherokee Reservation, in Oklahoma, black gold was to arise through many oil wells, repaying the Indians many times over what they had lost in the yellow metal.

A champion and beneficiary of the "Intrusion" was John C. Calhoun, Senator from South Carolina and Vice President of the United States, who was to become a fiery advocate of secession. The lands seized from the Cherokees were distributed in 1832, and according to one account, Calhoun "did right well." From the tract owned by his family for 40 years, two miners, using only crude hand tools, took \$24,000 in gold in one month's work. As early as 1842, English miners appeared in Lumpkin County, bringing European methods with them. A Major John Hockenmull retired with 80,000 pennyweights of gold, won from ground abandoned by less expert diggers. And side by side with engineering skill, age-old processes persisted. Negro slaves, who had learned their trade in Africa, heated large chunks of ore over log fires, then doused them with cold water which split the gold-bearing stone. As long ago as 218 B.C., Hannibal used the same method to build his Alpine invasion highway. Freed negro slaves were also attracted by the easy fortunes to be made. They were permitted to hold land, but their names could not appear on the title deeds. As a result, the "white brother-in-law" became a local institution.

By 1858, Northerners became prominent among the mine owners and investors at Dahlonega. Dr. Van Dyke remained in Lumpkin County throughout the Civil War without molestation, operating his mines despite conscription of his workers for the Confederate Army and despite the soaring price of gunpowder, which reached \$2 a pound.

A year after the war ended, a boom set in, and among those active in buying land and forming mining companies was the victorious Union general, Ulysses S. Grant. Subsequently, however, as the Presidential campaign of 1868 neared, it was suggested he sell his mining interests to Samuel J. Tilden, lest he be accused of drawing a fortune from mines in late "rebel" territory. This he did. Tilden, who won--and lost--the Presidential election of 1876, is said to have purchased the interests of Grant and Windom in the famous Barlow mine in Dahlonega, and to have realized four million dollars on his investment. At any rate, he was a wealthy man when he died in 1886. Besides Grant, two other Civil War generals figured in the history of Dahlonega. One was the former Confederate general, James Longstreet, who in 1882, as a United States Marshal, sold the local mining property of an unsuccessful operator. Earlier, a Union general, Thomas Francis Meagher, was military governor of the district.

One of the most ambitious ventures was undertaken in 1890 by the Dahlonega Consolidated Gold Mining Co., which erected a 200-stamp mill, second in the United States only to the famous Homestake mine, and spent over three million dollars outfitting and sinking shafts. The operation was unsuccessful, for the stamp mills could treat only oxidized ores lying at the surface, and most of this ore had been worked out. The deeper-lying veins carry gold in combination with iron and sulphur, termed "refractory," and require roasting or smelting. Operations continued on a smaller scale, cleaning up the surface deposits. Now a chemical process has been developed to separate and save the mineral constituents of the primary ores.

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#### WHERE DOES THE ICE GO?

(Conservation Volunteer)

Water, as it runs from taps, is a mixture of three substances; steam or hydrol ( $H_2O$ ), true water or dihydrol ( $2H_2O$ ), and ice or trihydrol ( $3H_2O$ ). The proportions of these substances depend upon temperature. The number of molecular ice particles increases as the water cools and the number of molecular steam particles increases as water warms.

Where does the ice go in the spring? Some melts--that is, changes from the trihydrol to the dihydrol state. A lot of it doesn't go anywhere. It breaks up into particles of molecular size. These are dissolved in the water.

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