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C O N T E N T S

GEOLOGICAL SOCIETY OF MINNESOTA

631 SECOND AVE. SO.
MINNEAPOLIS, MINN.

The Geological Society of Minnesota is devoted to the study of geology and mineralogy for their cultural value.

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Our Society meets every Monday evening, not a holiday, in the large auditorium in the Museum, on the 4th floor of the Public Library at Hennepin Avenue and 10th Street, Minneapolis, Minnesota, at 7:30 P. M., from October to May. From May until October, we endeavor to have a field trip each week (when gasoline rationing doesn't interfere). Visitors are very welcome. Dues are $3.00 annually, and $1.00 additional for your wife or husband, or dependent family members.

THUMBNAIL SKETCH * DR. LESLIE O. DART

The subject of this sketch is DR. LESLIE O. DART, one of our most outstanding and enthusiastic members. Dr. Dart is a real authority on minerals, particularly, but is equally familiar with birds, plants and animals of land and sea. He is a Charter Member of our Society and rarely misses a meeting.

Dr. Dart, says he, was born "So long ago that I don't remember". However, don't take that too seriously. He was born in Meeker County, Minnesota, and attended the public grade and high schools there. He took some of his academic work at Columbia University, New York City, but later transferred to the University of Minnesota. He took Medicine at the University of Minnesota, graduating in 1901. He comes from a family of long "livers". His grandfather lived to the extreme age of 109. His grandmother lived to within three days of being 100 years old, and an uncle lived to be 98. He has one brother and four sisters.

Dr. Dart was born with a keen observation and an abiding interest in nature. As a boy, he closely observed and investigated natural phenomena, and at the early age of 14, was conducting scientific correspondence with Dr. Elliot Coues, Secretary of the United States Geological Survey, a great naturalist and traveler, who rewrote the History of the Lewis and Clark Expedition. Dr. Dart also became acquainted with Dr. William Bebe, the great Naturalist, at an early age, and was greatly impressed by this association. Later, he was with Dr. Bebe on a trip to the Galapagos Islands, a group of islands West of Equador While here, they investigated an erupting volcano, and fell into imminent danger of destruction. Approaching the source of the eruption from the sea, the water was so hot that it literally cooked the fish and seals. The real danger, however, came from the fact that the water, greatly heated, lost considerable of its bouyancy, causing the ship to settle dangerously deep in the water.

Dr. Dart has made in all 9 or 10 trips to South and Central America in the interest of Science. He was a personal friend of President Theodore Roosevelt, with whom he became acquainted while the former president was ranching in North Dakota, and was invited by the Ex-president to accompany him on his trip to Africa. Dr. Dart was appointed by Grover Cleveland as the Naturalist with the Venezuela Boundary Commission, and while there, had bestowed upon him the honorary degree of Doctor of Medicine by the Governor of Venezuela, in recognition of his services in treating the natives and other people in the communities visited by the Commission.

He has had many thrilling and exciting adventures while in pursuit of scientific facts. On one occasion, while investigating the Mayan Civilization remains, he stumbled into a pit, having a single opening at the top, then to find himself and a large Boa Constrictor sole occupants of the pit. He was rescued by his companions who lowered strong vines to him. On another occasion, he investigated stories of people being bitten by sharks, but was never able to find an authentic case. He attributes all such bites to the Barracuda.

While exploring the Delta of the Orinoco, he collected many varieties of mosses. When these were scientifically identified, it was found that more than 50 varieties had been previously unknown to science. Upon another occasion, he

conducted a scientific expedition, cruising along both coasts of the Peninsula of Lower California for the purpose of investigating certain species of birds that nest on the Cape. On this trip, he found,also, an unusual species of large mountain sheep, inhabiting the craigs on the highlands. He has lived through 4 or 5 revolutions in Venezuela and has traveled extensively in Venezuela, Bolivia, Columbia, the states of Central America, and Brazil.

For 18 years, Dr. Dart was a member of the faculty of the Medical School at the University of Minnesota, teaching Internal and Clinical Medicine.

How Dr. Dart has found time in such a busy professional life to accomplish, explore and enjoy so much is a mystery. Small wonder, then, that he has never found time to investigate the fairer sex, as he remains single. Dr. Dart is most interesting and entertaining as a conversationalist with friends in a small group. He is a man of broad views and tremendous tolerance for the faults of others. His humility is outstanding. If you would like to know someone really worth-while and to spend a very profitable and pleasant hour, just corner Dr. Dart when he is not too busy. He is extremely approachable and will leave you with the feeling that you are doing him a favor.

BULLETIN BOARD

1-24-44 THE DEVONIAN PERIOD: Its major geologic and biologic events. Minnesota, Rocks of the Upper Mississippi Valley.

1-31-44 THE MISSISSIPPIAN PERIOD: Its major geologic and biologic events.

2-7-44 THE PENNSYLVANIAN PERIOD: Its major geologic and biologic events. The coal measures and related rocks.

2-14-44 THE PERMIAN PERIOD: Closing geologic events of the Paleozoic Era.

MESOZOIC ERA

2-21-44 MESOZOIC ERA: Triassic and Jurassic rocks of North America.

2-28-44 THE CRETACEOUS PERIOD: Its major geologic and biologic events.

CENOZOIC ERA

3-6-44 THE TERTIARY OR PRE-GLACIAL EVENTS OF THE CENOZOIC ERA: The beginnings of the development of the present landscape of North America and Minnesota.

3-13-44 PLEISTOCENE PERIOD: Special reference to glacial deposits of Minnesota and neighboring states.

"SORRY"

We are very sorry that the cover of this issue was printed before the election of of our new Board of Directors and new officers. We have only space to list the new officers, and they are as follows: President, Charles H. Preston; Vice President, Charles B. Howard; Treasurer, Joseph W. Zalusky; Secretary, Lorreta Koppen; Counselor, Edward P. Burch.

EDITORIALS * ALGER R. SYME

This is the third issue of THE MINNESOTA GEOLOGIST. The Directors have about come to the conclusion that the expense of publishing the Bulletin will have to be met in a large part by voluntary contributions. In fact, as we see it, we have only three choices: (1) Increase the dues 50¢ per member; (2) Make an annual charge for the Bulletin, itself, and (3) Request voluntary contributions. For the present, we think it is best to try the third method, as some have already made contributions (in amounts ranging from $1.00 to $5.00). We would like to publish the Bulletin 8 times during the present year. If you think it is worthwhile, will you send such amount as you are to give for that purpose to the Treasurer.

In this issue, you will undoubtedly enjoy the thumbnail sketch of Dr. L. O. Dart. Dr. Dart is one of our very quiet and very humble members, but certainly one of our most interesting ones, and he is one whom you should know.

Mr. Hanley's condition is unchanged. He has been moved to the Veteran's Hospital.

Interest in Dr. Thiel's lectures on Historical Geology continues in high. If any of you are able to attend and are not doing so, you are missing something.

We think you will enjoy reading Professor Stauffer's article on Historical Geology in this issue. Pass it on to a friend.

We would like to give you more details of the program for the Annual Dinner Meeting, but we have been warned that this would "spoil" it. Just assume that the dramatic part of the program will be filled with wit, humor and laughs. The moving pictures will be well worth seeing. The story of Evolution will supplement nicely the course on Historical Geology.

The Society sold 50 copies of "NE SAW JE WON", a Tale of the Waters That Run Down From Lake Superior to the Sea. We have had numerous requests for this very interesting book, describing the Geologic History of the Great Lakes, and have secured 15 additional copies. They cost 60¢ and may be obtained from the Secretary.

We would welcome more suggestions and any material which you may think helpful or useful in connection with this publication.

We can supply you with additional copies of the Geologic Column at 10¢ each. You may want one to keep in your pocket, another to keep at the office, one for your home, one for your notebook, and one for a friend. How many, please?

* THIS AND THAT *

MILITARY SECRET

Many Geologists are entitled to be classified as 4 B's: (Baldness, Bifocals, Bridgework and Buldge).

* * * * * *

"BALANCE OF POWER"

Near Tregastel in Brittany, there is a large mass of red granite, 20 Feet long, weighing over 1,000,000 Pounds, so finely balanced in position by erosion that it can be oscillated by the touch of the hand. Yet it is so firmly in position that it would require a great force to dislodge it.

* * * * * *

OUR ATMOSPHERE

The atmosphere is so common to us we hardly ever think of it. Yet, it is a very important part of the earth. It envelopes the earth completely and extends to a height of approximately 150 miles. It weighs nearly 15 pounds to the square inch, at sea level, and has a total weight of 5,000,000,000,000,000 long tons, or one-millionth of the entire weight of earth, itself. Without the atmosphere, there would be no life on earth, plant or animal. There would be no erosion, save that caused by tidal action, and no sedimentary rocks. There would be no clouds to shield us from the piercing rays of the sun. There would be no wind, sotrms, sleet, hale, rain, snow or ice. The surface of the earth would be a barren, dusty, dry waste, subject to great extremes of heat and cold, much like the moon, which has no atmosphere. To us, therefore, as human beings, it is just about all-important, and it is one of nature's greatest wonders.

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OUR EARTH

Earth weighs	6,000,000,000,000,000,000,000	long tons
If Earth was all water, it would weigh	1,080,000,000,000,000,000,000	" "
If it was all iron, it would weigh	9,000,000,000,000,000,000,000	" "
If it was all rock, similar to the surface rocks, it would weigh	3,000,000,000,000,000,000,000	" "

ENERGY

Earth receives only one two-billionth part of the total energy radiated by the sun.

* SOME VALUES IN HISTORICAL GEOLOGY *

(From an address before our Society, made on October 11, 1943, by Clinton R. Stauffer, PhD., Professor of Geology, University of Minnesota.)

When one speaks of geology, many will think chiefly of metaliferous deposits, of coal, oil, gas, water or the things which civilized man must win directly from the Earth in his daily life. Others will think of the huge volcanic masses poured out from the interior of the Earth, the great folded and uplifted areas or their carving by running water, the great areas covered by snow and ice, or the sediments being deposited beneath the sea. These are all interesting and important geologic phenomena of more than passing concern to any geologist but they are not isolated subjects capable of independent treatment. They are all related and recorded events or happenings to the Earth during some past time. Such a record of events is history and so we have Historical Geology. Whether we like it or not the historic approach pervades all geologic thought and is of prime importance in every phase of our subject. The sequence of events or the relation which one series of events bears to another must always be determined if we expect to solve any problem in geology, whether it be the base leveling of a continent, the solidification of a magma or the crystalization of a mineral. The recording of these events is always going on, but many of the records are difficult to interpret. Many others are destroyed and we get only fleeting suggestions of them in other events which are more perfectly recorded. So, we speculate or theorize on what has caused certain things and on when such and such events took place. If we are good at such speculation, we may arrive at an approximate truth. But the why and the when always go together.

In the broader phases of Historical Geology, we have come to rely on the great diastrophic movements as the major events that punctuate our time scale. But we know that even diastrophism requires time - much time - in its completion, and that other events are also happening while a mountain chain is forming, or a continent is being raised into prominence. So our punctuation point poaches on the preceding event and encroaches on those that follow.

We like unconformities and disconformities as the markers between formations, periods and eras. But an unconformity generally represents a surface that was undergoing erosion, and the products of that process were being deposited as sediment somewhere off the borders of the erosion surface.

Great as is the value of these major events in Earth history, they still fail to give the desired sequence of events, or a measure of the time during which they were taking place. It is true that the order of occurrence of events may often be established by these and other physical events but they fail us under so many circumstances that we look further for help. We study the sediments under the microscope; we do the same with thin sections of igneous rocks and add much to our ability to classify them. Even the chemical

composition is used with good results. These all contribute to the solution of the problem of age and are of high value to us. They are the real geologic attempts to solve geology's own domestic problems. But it is to the English Surveyor, the amateur fossil hunter William Smith, that we are indebted for the greatest help in arranging a time scale and classifying rocks as to their age. Smith, you know, discovered the sequence of faunas and hence the order of deposition of the rocks in which these faunas occur as fossils. But a lot of time has elapsed since the day of Smith's discovery and other contributions have been made by many men. So we find ourselves as geologists turning to biology to solve one of our perplexing problems, the relative age of rock formations. And we try to speak biologically when we refer to fossils but they are just as much rock as any other chunks of the same formation. Unfortunately fossils are of little or no value to us until relatively late in the Earth's history, because life was so late in being introduced. But it is the meaning of certain fossil forms in historical geology that we want to point out here.

Just the abundance of fossils means something, Cambrian or later. Of course we have Algal masses in the Proterozoic and occasionally in abundance too, but we seldom think of them as a means of correlation. High English authorities even call the pre-Cambrian Algal masses concretions. Then we know that Trilobites mean Paleozoic and that the highly ornamented Trilobites mean Silurian or Devonian. Compound corals mean Ordovician or later and the Tetracoralla mean Ordovician to Permian. Favosites mean Silurian to Mississippian. Halysites means Ordovician or Silurian, Heliophyllum means Onondaga or Hamilton. And Calceola sandalina means European Middle Devonian just as does Stringocephalus burtoni. But both of these are found in Western and Northwestern North America--a telltale index of sea distribution during that period. Then we have Conodonts meaning Paleozoic, Fishes Ordovician or later; Dinosaurs Mesozoic; Horned Dinosaurs late Mesozoic perhaps Cretaceous; Birds Jurassic or later, and the toothed birds Jurassic to early Cretaceous. One could go on indefinitely with these major faunal changes and point out their index values. There are, however, certain other means of arriving at age determinations through the use of fossils and these may be of prime importance. An inspection of the detailed characteristics of certain Brachiopoda will illustrate this point. In the Middle Ordovician there appeared several genera of Brachiopods of semi-circular outline and very thin space between the valves. This gave much shell as compared to the tissue involved and may have been a development to discourage the ravages of the shell-crushing or pavement-toothed shark. In other words he had to chew too much shell for the amount of meat he got out of it. Two of these genera with interesting histories are Rafinesquina and Streptomena. Rafinesquina is a normal type, Streptomena is a resupinate form, that is the pedicle or higher beaked valve started out convex but soon changed to concave. These two genera occur together and are characteristic Ordovician forms. Then they acquired teeth along the hinge line and Rafinesquina became Strophoedonta, while Strophomena became Strophonella, two characteristic Silurian and Devonian Genera. Strophonella did not live through the Devonian but the Rafinesquina-like form (Stropheodonta) continued and next acquired a

spriny surface becoming Productella - a characteristic Devonian and Mississippian species. Finally the Productella lost its hinge teeth and became Productus a characteristic Mississippian, Pennsylvanian and Permian form. The line was extinct by the end of the Permian.

Then there are the punctate forms characteristic of different horizons. And again the loop-bearing and spine-bearing forms. Among the latter is Spirifer - a genus characteristic of the periods from Silurian to the end of the Paleozoic and World-wide in distribution. Spirifer is an interesting Brachiopod with high index value. The early forms occur in the Silurian and show a smooth shell surface, then a striated surface, then a ribbed or costate surface with smooth fold and sinus, then in Devonian a costate fold and sinus, then ribs on either side of fold and sinus bifurcating, then secondary costae appeared on the ribs themselves in Pennsylanian and Permian time, and the genus disappeared with the close of the Paleozoic. A punatate derivative, however, continued on as Spiriferina down to the present time. Other similar series of species may be traced, each having a fixed or limited place within the evolutional sequence, hence fixing the age of the rocks within which they are found as fossils.

With the beginning of the Mesozoic the dominance of the Mollusca began. Although the most abundant Mollusca were among the Pelecypoda or common clams the high index value falls to the Ammonites. The cephalopoda had an earlier great expansion and high index value in the Orthoceratites or the great straight-shelled simple sutured forms common in the Ordovician. The Ammonites were another strain descended from an off-shoot that dates back to the Silurian or possibly earlier. During the Mesozoic they were mostly great coiled forms ranging up to three feet or more in diameter and with a suture line of high complexity. This suture line is the line of contact between the edges of the chamber divisions and the inside of the shell. When the interior is filled with hardened sediment and the shell peeled off, these sutures show up prominently as intricate edges of the shell division. And this complexity of the suture line increased from the Triassic to the end of the Cretaceous when the last of the Ammonites appeared and the line passed into extinction. So faithfully has this suture been traced and its increasing complexity noted that the Mesozoic has been carefully zoned on its Cephalopod content.

And so the events of Historical Geology are pinned down by the life that lived during their occurrence and we unravel them by a study of the remnants of the hard parts of that same life left in the sediments then accumulated. It happens to be almost a demonstration of the theory of evolution. From the oldest to the youngest fossil bearing sediments there is gradual progress from the primitive ancient forms to the highly developed modern plants and animals. But the geologist's interest is in the possibility of accurate age determination fossils offer.