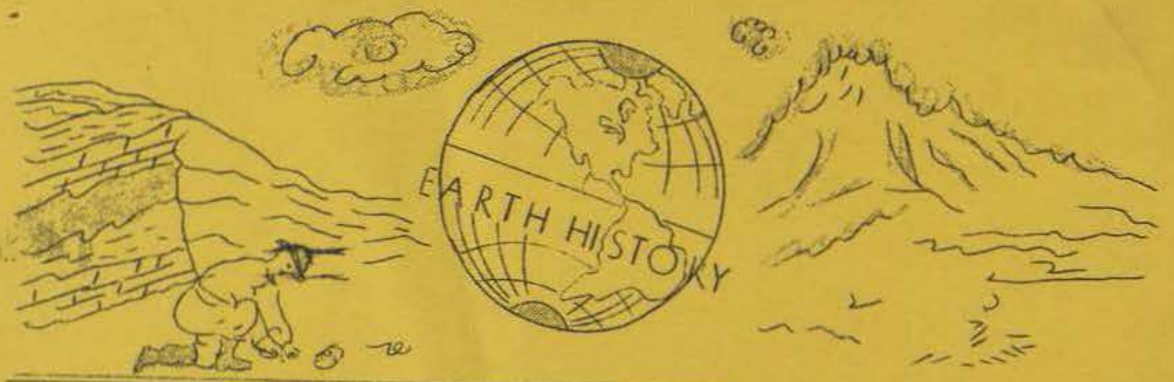

THE MINNESOTA GEOLOGIST

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PEOPLE NEVER IMPROVE UNLESS THEY
LOOK TO SOME STANDARD OR EXAMPLE
HIGHER OR BETTER THAN THEMSELVES.

TYRON EDWARDS.

GEOLOGICAL SOCIETY OF MINNESOTA

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FIELD TRIPS: May until October inclusive.

ANNUAL DUES: Residents in a 50 mile radius of the Twin Cities $ 5.00 plus $ 2.00 additional for husband, wife, or dependent family members. For students and non-residents, $ 2.00.

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MIDWEST FEDERATION OF MINERALOGICAL AND GEOLOGICAL SOCIETIES

and

THE AMERICAN FEDERATION OF MINERALOGICAL SOCIETIES

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Bulletin Board

1960
WINTER LECTURE PROGRAM

Feb. 8.
The glacial history of Minnesota, II. Major events from about 15,000 years ago to the present.

Feb. 22.
Clues to the past: old carbon. Technique and usefulness of dating by the radiocarbon method.

Mar. 14.
Clues to the past: pollen analysis. The study of vegetational changes and their relation to climatic change in the Pleistocene.

Mar. 28.
Geologic processes in very cold regions. Peculiarities of frozen ground in the Arctic, and the importance of frost processes during Pleistocene.

Apr. 11.
What caused it all? A review of the theories proposed to explain the climatic changes of the Pleistocene - but without definite conclusions.

Apr. 25.
Annual dinner and election of officers, Coffman Memorial Union, University of Minnesota campus.

EDITORS NOTE: One of the dreams of the early leaders of our Society was that interest in the earth sciences would spread, and that clubs and societies would spring up everywhere to further this interest.

Do you know that right here in Minnesota alone there are a half dozen or more? They are the Austin Gem & Mineral Society, the Mesabi Rock & Mineral Club, Chisholm, The Minnesota Mineral Club, St. Paul, the Rochester Earth Science Society, the Cook County Gem & Mineral Society, Grand Marais, and others. And the same thing has happened in every state in the Union. All of the clubs and societies in nine midwestern states are banded together in the Midwest Federation of Mineralogical & Geological Societies. And we as members of each club are therefore members of the Midwest.

Perhaps we should get to know each other better and by uniting our efforts we could accomplish something that one club or society could not do alone, namely, stimulate an interest in, and work for the teaching of more of the earth sciences in the elementary and secondary schools of the state.

FEARS AND HOPES ABOUT OUR CHANGING CLIMATE

by LUCIEN NERET
UNESCO Features Writer

Speaking before the American Chemical Society in December 1957, the famous physicist Edward Teller gave a solemn warning about the increase in the rate of carbon dioxide gas in the air. According to Dr. Teller, the carbon dioxide content of the air has gone up by 2% since the beginning of the Industrial Revolution. He said that if the rate of increase reached 10% the melting of Arctic ice would be apeeded, causing the level of the oceans to rise quite considerably.

The same view had been expressed some three months earlier by delegates at the International Congress of Geodesy and Geophysics meeting in Toronto, Canada. They stated that by the end of the century the level of the oceans would have risen by nearly 5 feet, enough to threaten many ports and seaside towns.

Adding to these observations, two well-known American scientists, Professors Maurice Ewing and William L. Donn, have stated that the gradual melting of the Polar ice-caps would lead to condensation of the water vapour which in turn would produce continuous snow-storms. Such phenomena, the two specialists believe, might well mark the beginning of a new ice-age in a hundred years' time. Both Western Europe and the eastern part of the United States would feel the effects of this cataclysm, and a layer of ice more than a mile thick might form in some parts of the world.

Such warnings, especially when they are voiced by such authorities, deserve to be taken seriously and that is why special attention was paid during the International Geophysical Year to glaciological and oceanographical research.

INCIDENCES on COD and CRICKET

Over the last ten years specialists have noted a marked change in meteorological phenomena. Generally speaking, the average temperature is rising both in the northern and southern hemisphere - a fact which fits in well with the observed melting of the Polar ice-caps.

But while the winters are getting warmer, the summers are now cooler. One result is that some of the fast-flowing glaciers are extending their surface; but there are other consequences. In England, cricket clubs complain their season grows shorter every year; fisheries experts have noted that the shoals of cod are tending to move northwards; and in the last few years the Great Salt Lake in Utah has dried up by half.

Ever since the present series of bad summers began, public opinion has put the blame on nuclear and thermo-nuclear explosions. Most meterologists, however, state this accusation is completely groundless. They stress that it would take tremendous energy, exceeding anything man is capable of producing, to exert an influence of anti-cyclones which lead to widespread weather disturbances.

Even a small local thunderstorm would require almost as much energy as that liberated by about fifteen hydrogen bombs. Scientists state that the average storm at sea is equal to the energy of hundreds of thousands of atomic explosions. To create a full-scale storm artificially you would have to let off atomic bombs almost every second.

Such is the opinion of most meteorologists. There are exceptions, however, and among them authorities such as Dr. Horace R. Byers, head of the

Meteorological Department of the University of Chicago, and Professor William H. Parker of the University of Manitoba.

Dr. Byers maintains that each atomic explosion increases the ionization of the atmosphere and compromises the electrical balance between the atmosphere's positive charge and the Earth's negative charge.

As for Professor Parker, he has noted "an abnormal sensitization of the ionosphere." Recalling that the eruption of the Krakatoa volcano in 1883 was followed by several disastrous summers, he asks: "Why shouldn't artificially-produced atmospheric disturbances have similar effects?"

Sunspots and Meteorites

During the fifth meeting of the special committee for the International Geophysical Year in Moscow last summer, I asked several meteorologists for their views on these theories. All of them expressed a negative opinion.

On the other hand, both Russian and American scientists stressed that the data transmitted by the artifical satellites has revealed a considerable density of meteoritic dust in the vicinity of our planet. They believe that this dust may play the role of ice-forming nuclei promoting the condensation of water droplets and thereby producing the abnormal rainfall which has been noted recently in various parts of the world.

Observations carried out during the IGY also seem to prove a relationship between the appearance of sunspots and solar protuberances and variations in the climate. During periods of intense solar acticity, specialists have noted an increased circulation of the air and temperature variations. It is cooler in the tropics and warmer in the polar regions. A mass of data on these phenomona has been collected all over the world during the IGY.

Once it is sifted we shall know a lot more about the influence that solar activity exerts on the Earth's atmosphere.

Already artifical satellites have proved to be excellent instruments of observations, and scientists are now contemplating sending aloft satellites equipped like real meteorological stations. Launched in an orbit 3,700 miles above the Earth, such stations would take about four hours to travel from one Pole to another. They would provide scientists with invaluable information on the evolution of hurricanes and the formation of cloud masses.

Unfreezing the Arctic

At this stage, man will have advanced a long way towards his dream of mastering the climate. Weather-making has become a necessity of modern living. As the world population grows and men strive to produce more and more food, it is important that agriculture should not be dependent on the whims of the weather.

Up to now man's "weather-making" activities have been on a very minor scale, such as inducing hail or thunderstorms over a limited area. Now two scientists - Harry Wechsler, in the United States, and Grigory Avsiuk, in the Soviet Union - speak of nothing less than changing the climate in the Arctic by melting the floating ice which has formed there over thousands of years. Technically, the plan could be successful. Its direct consequence would be to make the climate warmer and more humid over an area covering 7,5000,000 square miles. Since only the ice floating on the sea is involved, there would be no danger of flooding such as that mentioned at the beginning of this article. Vegetation would appear again in the coldest parts of Siberia and Alaska, though glaciers might form in the mountainous areas.

All this, however, is still only a dream.

EDITORS NOTE-

The above article was taken from The International Altrusan. We thought it particularly appropriate to our lecture program.

GEOLOGY OF THE MINNEAPOLIS-ST. PAUL REGION

Minnesota has three broad geologic divisions: the pre-Cambrian area in the northeast, the Paleozoic area in the southeast, and the largely drift covered western half of the state which is underlain by pre-Cambrian and Cretaceous rocks.

The bedrock geology of the western part of the state is imperfectly known because of the thick drift cover of drift. Exposures are found only along the Minnesota River Valley and on the high quartzite ridge near the southwest corner of the state. In the eastern portion rock exposures are more numerous although glacial deposits blanket large areas.

The northeastern part of the state forms a portion of the Superior Upland geomorphic province. The rocks are mainly pre-Cambrian with the Keewatin Ely greenstone as the lowest formation. Above the greenstone lies a thick series of metasediments usually classified as Huronian and above that an extremely thick series of relatively unaltered Keewnawan extrusives, intrusives, and sediments. This area includes the Cuyuna, Mesabi, and Vermillion iron districts. The nearest "iron range" to Minneapolis is the Cuyuna district, about one hundred miles due north. This northeast section roughly approximates the region popularly referred to as the "Arrowhead Country."

The southeastern area is in the Western Lake section, part of the Central Lowland geomorphic province, and in it are the cities, Minneapolis and St. Paul. Its bedrocks are Paleozoic, mainly of Cambrian and Ordovician age, lying on the older complex. The type locality of the St. Croixian series is in the St. Croix Valley which forms part of the boundary between Minnesota and Wisconsin. The extreme southeastern corner of Minnesota includes a small portion of the "Driftless area" of Wisconsin, Illinois, Iowa, and Minnesota. Since the immediately adjacent area was covered only by the older ice sheets, this portion of the state is now in a more mature state of dissection than prevails elsewhere in Minnesota. Exposures of bedrock are abundant along the valleys tributary to the Mississippi River and along the main valley itself.

The western portion of the state also belongs to the Western Lake section of the Central Lowland province. Beneath the prevailing deep glacial drift, thin remnants of Cretaceous rocks generally lie directly on a pre-Cambrian complex.

The surface features of the state are largely glacial in origin and broad belts of terminal moraine are conspicuous. Many of the 11,000 lakes in Minnesota are concentrated in these morainic areas. Minneapolis and St. Paul lie in the midst of such a belt cut by the relatively deep valleys of the Mississippi and Minnesota rivers. The St. Croix occupies a similar valley along the eastern border of the Metropolitan area.

STRATIGRAPHY OF THE MINNEAPOLIS-ST. PAUL AREA

The bedrocks exposed at the surface in and near the Minneapolis and St. Paul Metropolitan area are of Cambrian and Ordovician age, but pre-Cambrian rocks have been reached in deep wells and are exposed within fifty miles of the Twin Cities.

The deepest well in Minneapolis was drilled at Lakewood Cemetery south of the downtown district about 1886. This well reached a total depth of 2,150 feet and is reported to have penetrated granite for 15 feet. The granite surface thus lies at about 1,350 feet below sea level. A deeper well was drilled at about the same time at Stillwater on the St. Croix River, ten miles northeast of St. Paul. This well reached a total depth of 3,500 feet and penetrated Keweenawan basalt flows for 325 feet. The igneous rock surface there is about 2,413 feet below sea level.

Above the granite in the Minneapolis well are 1,012 feet of red sandy shales which have been referred to as the Red Clastic series. In the Stillwater well the thickness of these Keweenawan red sediments is 2,458 feet. The Red Clastic series grades upwards usually without sharp contacts to a buff to red sandstone which Winchell correlated with the Hinckley sandstone (Keweenawan) of Pine County, one hundred miles to the north. Recent correlation by study of heavy residuals and light fractions of Twin Cities well cuttings indicate that the lower part of this sandstone is correctly correlated with the Hinckley and the upper portion with the Dresbach, (Mt. Simon, basal Cambrian of Wisconsin). Unfortunately there is no known exposure of the contact between these formations.

ROCK FORMATIONS OF THE MINNEAPOLIS-ST. PAUL AREA

Period	Formation	Average Thickness in Feet
Pleistocene	Recent deposits	0 to 100
	Wisconsin drift	0 to 400
	Keewatin drift	
	Patrician drift	
	Iowan drift	
	Illinoian drift	
	Kansan drift	
	Nebraskan drift	
Ordovician	Galena	0 to 20
	Decorah shale	75
	Platteville limestone	30
	Glenwood beds	15
	St. Peter sandstone	150
	Shakopee dolomite	45
	New Richmond sandstone	11
	Oneota dolomite	80
Cambrian	Jordan sandstone	90
	St. Lawrence formation	50
	Franconia formation	145(?)
	Dresbach formation	345
Keweenawan	Hinckley sandstone	60
	Red Clastic series	1,000
Pre-Cambrian granite		Unknown

STRUCTURE

The general structure of the rocks of the Minneapolis-St. Paul area is that of a very shallow basin. The basin is slightly elongated in a northeast-southwest direction with the lowest point just south of the University of Minnesota campus on the Mississippi River. The dip of the beds on the sides averages about 20 feet per mile though it departs from this considerably at places. The bottom of the basin is decidely flat. The spacing of the lower contours between the 450- and 550-foot contours is nearly twice as great as between the 550- and 800-foot contours.

The rocks exposed in this basin-shaped structure are of Cambrian and Ordovician age, but the structure as outlined above coincides approximately with a great depression in the pre-Cambrian rocks. Only two wells within the area reach igneous rocks, but basalt flows are exposed at Taylors Falls, on the St. Croix River, thirty five miles northeat of St. Paul. Metamorphic rocks

are exposed in a creek near Princeton, thirty miles north-northwest of Minneapolis. At Becker, thirty-five miles northwest of Minneapolis, granite is found in wells at an elevation of 976 feet above sea level. Near St. Cloud, fifteen miles further northwest, granite is quarried extensively. The Sioux quartzite is exposed in the Minnesota River Valley at New Ulm, sixty miles southwest of Minneapolis, and granite is found beneath the drift nearer to Minneapolis at Gibbon and Winthrop. To the southeast of St. Paul the granite surface rises as shown by the fact that wells commonly strike granite at an elevation of 160 feet above sea level at Winona.

The basin-shaped structure is of great practical importance since it forms a local artesian basin which supplies hundreds of artesian wells in Minneapolis, St. Paul, and adjacent regions. The greater number of wells tap the Jordan sandstone at depths varying from 350 to 450 feet beneath Minneapolis. Many wells of larger capacity have an open hole from the Shakopee dolomite into the Dresbach.

A few deeper wells tap the so-called Hinckley sandstone, which probably includes both the Hinckley and basal (Mt. Simon) sandstones.

By casing off the hole to the base of the Dresbach (Eau Claire) shales a much softer water is obtained. This is used to a considerable extent by laundries and hotels and requires a well about 1,000 feet deep. The hardness of Jordan sandstone water averages about 19 grains per gallon (324 parts per million)whereas the water from the lower horizon (Mt. Simon-Hinckley) averages only 8.3 grains per gallon (142 parts per million).

Although the structure over most of the Metropolitan area is very uniform and the disturbance gentle, there are localized areas of deformation such as the faulting at Hastings on the Mississippi River southeast of St. Paul.

Southwest of the village of Afton on the St. Croix River is a well developed anticline where it is possible to pass from outcrops of Platteville limestone to exposures of Franconia at essentially the same elevation and within a distance of two miles.

At Hastings, fifteen miles southeast of St. Paul on the Mississippi River, a fault brings Oneota dolomite and Jordan sandstone into vertical contact. The throw is estimated at about 100 feet. Between this exposure of the fault on the north side of the river and the city of Hastings on the south bank another fault must exist beneath the alluvial fill of the valley. Well records and outcrops show that this fault has a vertical displacement of approximately 200 feet.

An area of complex block faulting has been mapped in the St. Croix Valley about forty-five miles above its junction with the Mississippi.

GLACIAL DEPOSITS

Pleistocene glacial drift nearly everywhere mantles the upland surface of the Minneapolis-St.Paul Metropolitan area. The entire region, at one time or another, has been covered by continental ice but subsequent stream action has removed or modified the deposits along the major valleys.

From the general distribution of the deposits and the direction of striae elsewhere, it is known that both the Nebraskan and Kansan ice which reached the Twin Cities area came, in general, from the northwest radiating from the Keewatin center. The limestone pebbles were derived originally from the early Paleozoic formation beds of western Minnesota and the adjacent portions of North Dakota and Manitoba.

The southern section of Minneapolis is located on an extensive outwash plain as is part of St. Paul. Well-developed drumlins, kames, and eskers are rare in the Metropolitan area.

THE AMERICAN FEDERATION OF MINERALOGICAL SOCIETIES

by Mr. Hazen T. Perry.

What is the American Federation of Mineralogical Societies and what are its objectives? This question can best be answered by examining its "purposes and objectives" as set forth in its constitution. It was formed in 1947 "To promote popular interest and education in the various Earth Sciences and in particular in the subjects of Geology, Mineralogy, Paleontology, Lapidary, and other related subjects, and to sponsor and provide means of coordinating the work and efforts of all persons and groups interested therein, to sponsor and encourage the formation and international development of Societies and Regional federations, and by and through such means to strive toward greater international goodwill and fellowship".

At the present time, The American Federation is composed of six regional Federations as follows: The California Federation of about 148 Societies, The Northwest Federation of 136 Societies, The Rocky Mountain Federation of 78 Societies, The Midwest Federation of 80 Societies, The Eastern Federation of 61 Societies, and the Texas Federation of 25 Societies.

Let us examine how the American Federation and the Regional Federations such as the Midwest Federation of Mineralogical and Geological Societies (of which the Geological Society of Minnesota is a member) functions. The President and Vice-President of each individual Society are members of the governing body of the Midwest Federation. They meet once each year to consider and pass on proposals of benefit to all of the membership and to encourage the growth and formation of new clubs and to hold a Regional Convention and Exhibition. Officers are elected each year. These officers function as an Executive Committee and meet at intervals during the year.

The Board of Directors of the American Federation consists of the President and Vice-President of each of the six Regional Federations. Meetings are held once a year in conjunction with the Annual National Convention. To finance the cost of operations, your Society pays out of your dues 15¢ per member yearly to the Midwest Federation. They in turn pay 2 ¢ out of this amount to the American Federation and retain the balance for their expenses.

Neither the Regional nor the American Federations have authority to dictate policies to the individual clubs or in any way interfere with their operation. They function only as coordinating agencies on a Regional and National level. This then is the framework of the Federations. A great deal of the organizational work was done by Mr. Alger R. Syme of the Geological Society of Minnesota. He later served as President of the Midwest Federation in 1945. Mr. Charles Preston of our Society also served as President in 1949. If they were with us today they would be more than pleased to see the results of their efforts for there are now some 550 active and growing Societies providing education, information, and pleasure for some 35,000 members of all walks of life. Some of the Societies specialize in Geology, others in Mineralogy, Paleontology, or Lapidary work. The great majority have a combined interest in all of the subjects as they are all interdependent on each other.

Through the six Regional Federations the Societies are banded together in a spirit of mutual cooperation and helpfullness. Our Society can point with pride to the fact that they were one of the early leaders in laying the framework for these organizations.

EDITORS NOTE - Mr. Perry is a member of our Society and a former director. He is also a past-President of The Midwest Federation and past-President of the American Federation.

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