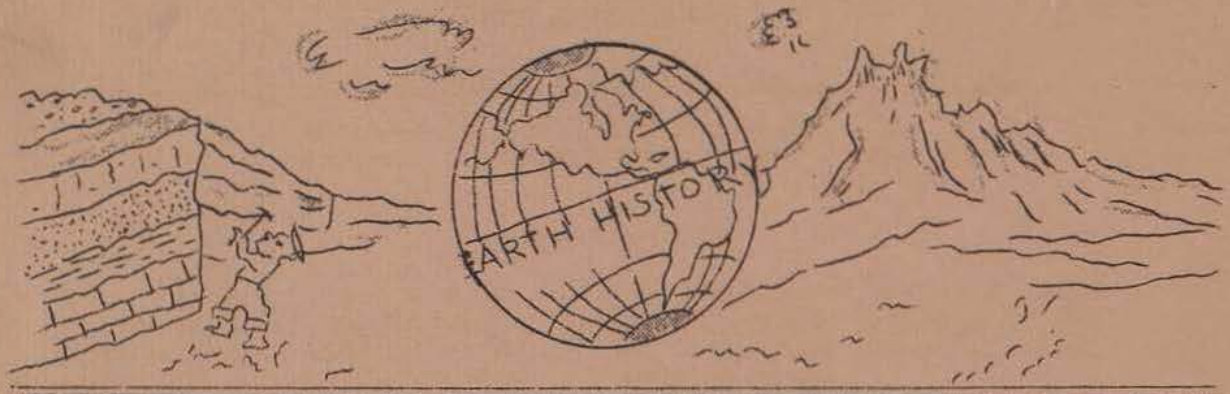

THE MINNESOTA GEOLOGIST

OFFICAL BULLETIN
OF
THE GEOLOGICAL SOCIETY OF MINNESOTA

VOL. 11. MARCH 1945 No.3.

contents

GEOLOGICAL SOCIETY OF MINNESOTA

831 SECOND AVENUE SO.
MINNEAPOLIS 2, MINN.

THE GEOLOGICAL SOCIETY OF MINNESOTA is devoted to the study of GEOLOGY and MINERALOGY for their cultural value.

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Alger R. Syme, Director & Editor
Edward P. Burch, Director & Counselor

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Junior F. Hayden
Alger R. Syme
Charles H. Preston

Meetings: Our Society meets every MONDAY evening, not a holiday, in the large auditorium on the 4th floor of the Public Library at Hennepin Avenue and 10th Street, Minneapolis, Minnesota, at 7:30 o'clock P.M., from October to May, inclusive. From June until September, inclusive, we have a program of field trips. Visitors are very welcome, always.

Dues: For those residing in Hennepin and Ramsey Counties are $3.00 annually, plus $1.00 additional for your wife, husband, or dependent family members; for those residing elsewhere, dues are $1.00 per person.

EDITORIAL

APPRECIATION: DR. THIEL HAS JUST FINISHED HIS THIRD COURSE OF LECTURES TO OUR SOCIETY. THE FIRST WAS ON DYNAMIC OR ELEMENTARY GEOLOGY; THE SECOND ON HISTORICAL GEOLOGY, AND THIRD AND LAST, ON THE GEOLOGY OF MINNESOTA. WE CANNOT HELP BUT ATTRIBUTE MUCH OF THE GROWTH AND STABILITY OF OUR SOCIETY TO DR. THIEL, AND THESE LECTURE COURSES. THIS IS EVIDENCED BY THE FACT THAT OUR ATTENDANCE DURING THE LAST COURSE HAS AVERAGED ALMOST 90. WE HAVE MORE MEMBERS, NO DEBTS AND A COMFORTABLE BALANCE IN THE TREASURY. IT IS UNUSUAL, TOO, THAT IN GIVING SO MANY LECTURES, WE HAVE STILL TO HEAR A SINGLE WORD OF CRITICISM FROM A SINGLE PERSON, AND ON THE OTHER HAND, PRAISE AND HIGH COMPLIMENT ARE TOO ABUNDANT TO MENTION. WE HAVE REJOICED ALSO, IN DR. THIEL'S ELEVATION TO HEAD OF THE DEPARTMENT OF GEOLOGY AT THE UNIVERSITY OF MINNESOTA, AND, PERHAPS SELFISHLY, LOOK FORWARD TO HIS GIVING US A COURSE ON SOMETHING, OR, IN FACT, ANYTHING, NEXT YEAR. IT IS IN ORDER FOR SOME OF US TO TAKE A MINUTE OR TWO AND WRITE JUST A SHORT NOTE TO DR. THIEL, TO EXPRESS OUR APPRECIATION. WE TAKE THIS OPPORTUNITY OF COLLECTIVELY COMMUNICATING TO HIM OUR SINCERE APPRECIATION OF HIS GREAT ABILITY AND HIS GRACIOUSNESS IN BEING SO GENEROUS OF HIS TIME AND PATIENCE.

PLANS: WHILE WE HAVE RECEIVED MORE FAVORABLE COMMENT ON THE LAST ISSUE OF "THE MINNESOTA GEOLOGIST" THAN ON ANY PREVIOUS NUMBER, WE HAVE ALSO RECEIVED A SUGGESTION THAT WE HAVE MORE ARTICLES. WE ARE WONDERING HOW OTHERS MAY FEEL ABOUT IT. THE SERIES OF SKETCHES ON THE HISTORY OF THE GREAT LAKES WILL CONCLUDE WITH THE SECOND NUMBER FOLLOWING THIS ISSUE. WOULD YOU LIKE US TO BEGIN ANOTHER SERIES, OR WOULD YOU PREFER TO HAVE AN ARTICLE ON SOME SUBJECT OF GEOLOGY OR MINERALOGY? ALSO, WE HAVE ANOTHER ORIGINAL GEOLOGICAL CROSSWORD PUZZLE, WHICH WE HOPE TO RUN SHORTLY. WE WILL TRY TO MEET YOUR DESIRES, IF YOU WILL TELL US WHAT YOU WOULD LIKE MOST.

WEEKLY PROGRAM: WHILE WE WILL MISS THE REGULARITY OF DR. THIEL'S LECTURES, THE DIRECTORS HAVE, WE THINK, PROVIDED AN EXCEPTIONALLY ATTRACTIVE PROGRAM FOR THE REMAINDER OF THE SEASON. DR. SCHWARTZ GAVE US AN EXCEPTIONALLY INTERESTING LECTURE ON THE GEOLOGY OF ARIZONA, AND DR. E. F. BEAN, STATE GEOLOGIST OF WISCONSIN, ON THE GEOLOGY OF WISCONSIN. LECTURES BY DR. GRUNER ON THE BLACK HILLS, AND BY DR. GOULD ON GLACIATION, NEED NO COMMENT, AND PROVIDE A RARE OPPORTUNITY TO ANYONE INTERESTED IN THE SUBJECT OF GEOLOGY. WHY NOT USE THESE LECTURES AS AN OPPORTUNITY TO INTEREST ONE OR MORE OF YOUR FRIENDS IN OUR WORK AND PROGRAM? BRING A GUEST.

PAST PRESIDENT, CHARLES H. PRESTON WAS HOST TO DR. BEAN, THE BOARD OF DIRECTORS OF OUR SOCIETY, AND THE FACULTY OF THE DEPARTMENT OF GEOLOGY OF THE UNIVERSITY, AT A LUNCHEON AT THE MINNEAPOLIS CLUB, MONDAY, MARCH 5TH, 1945.

DR. L. M. GOULD'S LECTURE DATE HAS BEEN CHANGED FROM APRIL 2ND TO APRIL 16TH. PLEASE NOTE AND TELL YOUR FRIENDS. DR. GOULD WAS SECOND IN COMMAND OF BYRD'S FIRST ANTARCTIC EXPEDITION, AND LEADER OF THE SLEDGE PARTY TRAVELING 1,200 MILES OVER THE ANTARCTIC CONTINENT, AND IS WORTHY OF A "PACKED HOUSE".

WE CAN DREAM, CAN'T WE?: SEVERAL YEARS AGO, WHILE PRESIDENT, YOUR EDITOR RECOMMENDED MAKING THE GEOLOGICAL SOCIETY STATEWIDE IN ACTIVITY, AS WELL AS IN NAME. PERHAPS, WE CAN'T DO MUCH UNTIL AFTER THE WAR, EXCEPT TO KEEP THE IDEA ALIVE. WE COULD HAVE A NUMBER OF SUBSIDIARY SOCIETIES, IN PLACES OF GEOLOGIC INTEREST, SUCH AS THE IRON RANGE, ST. CLOUD, MANKATO, DULUTH, SUPERIOR. HEREIN LIES A REAL OPPORTUNITY FOR THE RIGHT PERSON WITH SUFFICIENT TIME AND ORGANIZING ABILITY.

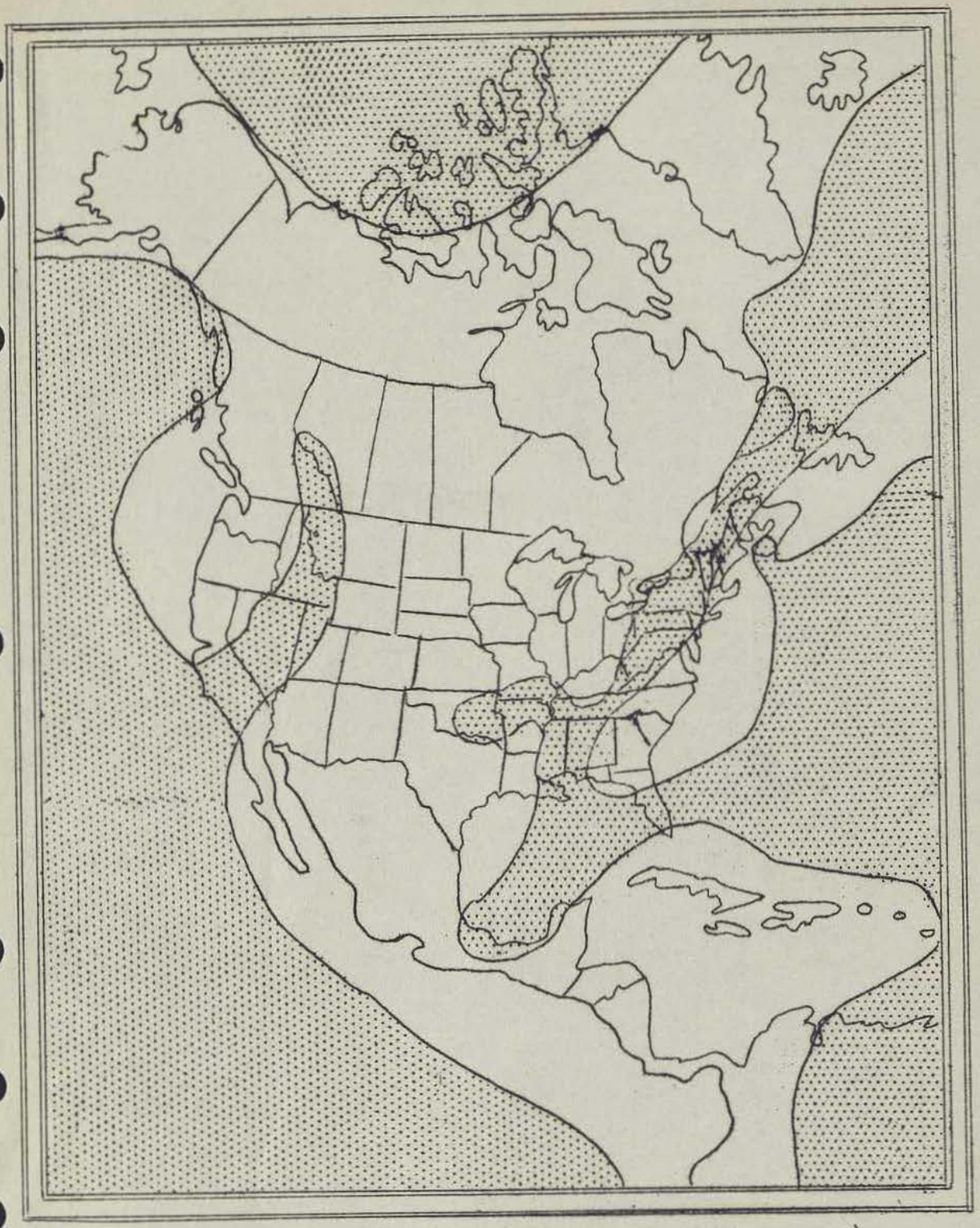
THE FOLLOWING PARAGRAPH WILL BE REPEATED WITH EACH SET OF PALEOGEOGRAPHIC MAPS. THESE MAPS, EXCEPT THOSE OF EUROPE, WERE COPIED FROM SCHUCHERT, AS MODIFIED BY MILLER AND OTHER AUTHORS, AND ILLUSTRATE VARIOUS INVASIONS OF THE SEA UPON THE CONTINENT. IN PAST AGES, RESPONSIVE TO GREAT FORCES, THE SURFACE OF THE CONTINENTS ROSE, AND FELL AGAIN, MANY TIMES. WHEN THE SURFACE SANK BELOW SEA LEVEL, THE SEA COVERED GREAT AREAS OF THE LAND. THE PROCESSES OF EROSION CONTINUED TO WEAR DOWN THE LAND REMAINING ABOVE SEA LEVEL, AND THE RESULTING MATERIAL WAS DEPOSITED IN THE SEA, TO BECOME SEDIMENTARY ROCK. THUS, LARGE AREAS OF THE CONTINENT HAVE COME, IN TIME, TO BE COVERED WITH GREAT LAYERS OF LIMESTONE, SHALE AND SANDSTONE. BY A STUDY OF THE AREA COVERED BY THESE ROCKS, GEOLOGISTS HAVE BEEN ABLE TO OUTLINE, IN A GENERAL WAY, THE LIMITS OF THE VARIOUS INVASIONS BY THE SEA. THESE SEAS ARE KNOWN AS "EPEIRIC" AND "EPI-CONTINENTAL" SEAS, THAT IS, THEY WERE SEAS UPON THE CONTINENT, AS DISTINGUISHED FROM THE ABYSMAL DEPTHS OF THE OCEAN. THEY WERE NEVER VERY DEEP, PROBABLY NOT MUCH OVER 600 FEET, YET MANY THOUSANDS OF VERTICAL FEET OF MATERIAL WAS COLLECTED IN MANY PLACES IN THESE SEAS, BECAUSE THE WEIGHT OF THE ACCUMULATED MATERIAL CAUSED THE FLOOR OF THE SEA TO GRADUALLY SINK, AS NEW MATERIAL WAS ADDED. FORTY TO FIFTY THOUSAND FEET OF MATERIAL WAS NOT UNCOMMON, IN THE GREAT SEA TROUGHS.

THE DEVONIAN PERIOD

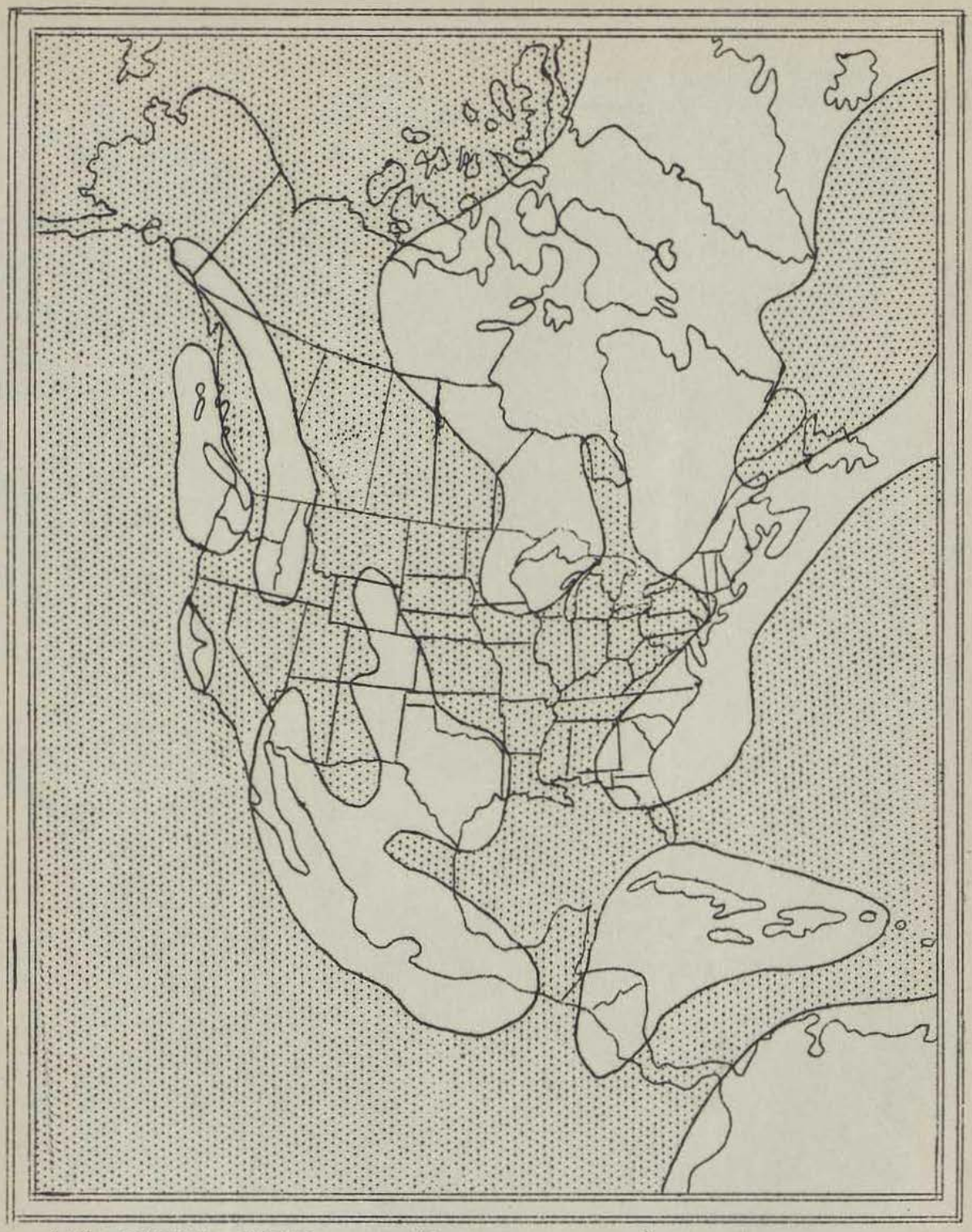
PALEOGEOGRAPHIC MAP NO. 13 SHOWS THE MAXIMUM INVASION OF THE SEA DURING EARLY DEVONIAN TIME, MAP NO. 14, THE MIDDLE DEVONIAN, AND MAP NO. 15, LATE DEVONIAN. MAP NO. 16 SHOWS EUROPE DURING MIDDLE DEVONIAN TIME. PROBABLY DURATION OF THE ENTIRE PERIOD WAS 60,000,000 YEARS, AND THE END OF THE PERIOD, ABOUT 350,000,000 YEARS AGO. THE INVASIONS OF THE SEA COVERED A TOTAL OF 40% OF THE CONTINENT, NOT AS GREAT AS SOME PERIODS, BUT MUCH GREATER THAN MOST. THERE WERE SOME OROGENIC, OR MOUNTAIN-MAKING DISTURBANCES, IN ACADIA, AND ALONG THE NORTH ATLANTIC COASTS, BUT LITTLE ELSEWHERE. THE CLIMATE WAS UNIFORM OVER THE EARTH, AND MILD, AS SHOWN BY REEF-BUILDING CORALS FOUND IN THE ARCTIC, AS WELL AS TEMPERATE ZONES. IT IS SUPPOSED THAT DURING THIS PERIOD, NORTH AMERICA AND EUROPE WERE CONNECTED BY A GREAT LAND BRIDGE, CALLED "ERIA".

THIS IS THE FIRST PERIOD DURING WHICH LAND PLANTS WERE COMMON, AND THE FIRST DURING WHICH THEY FIRMLY ESTABLISHED THEMSELVES ON THE LAND. THIS WAS OF IMMENSE IMPORTANCE, FOR WITHOUT PLANT FOOD ON THE LAND, THE LAND ANIMAL KINGDOM COULD NOT HAVE DEVELOPED. FORESTS GREW IN MOIST PLACES, AND FOR THE FIRST TIME, THE LAND HAD BEAUTY OF APPEARANCE.

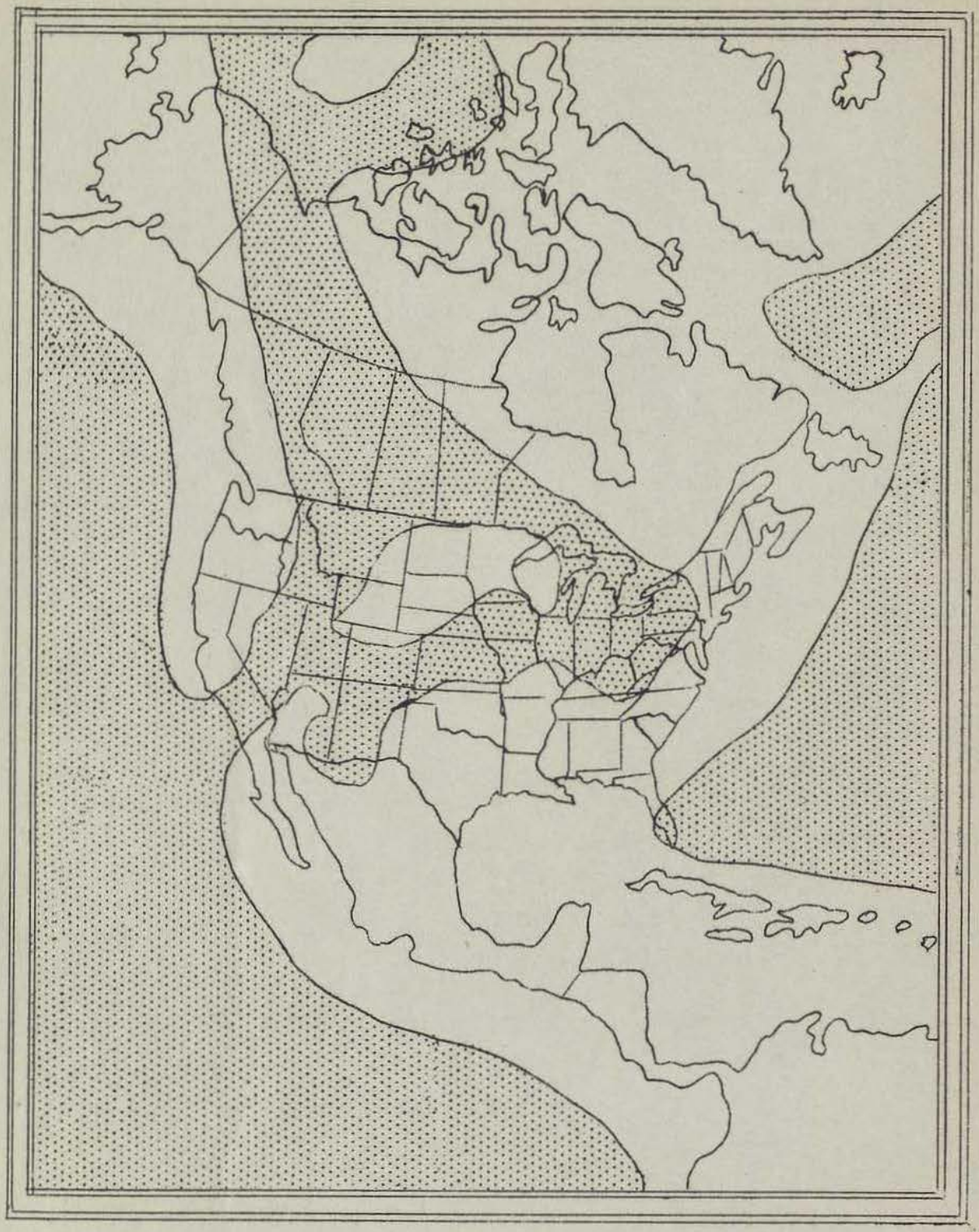
INVERTEBRATES WERE ABUNDANT, AND MANY VARIETIES OF FOSSILS HAVE BEEN FOUND. SILICEOUS, OR "GLASS" SPONGES, DEVELOPED IN GREAT NUMBERS. THE CORALS REACHED THEIR GREATEST DEVELOPMENT, BUT THE TRILOBITES SHOWED A MARKED DECLINE. PRIMITIVE INSECTS, WITHOUT WINGS, APPEARED. THE FISHES, HOWEVER, HAD THE GREATEST DEVELOPMENT, AND THE DEVONIAN IS SOMETIMES REFERRED TO AS THE "AGE OF FISHES". THE GREATEST DEVELOPMENT IN THE FAUNA WORLD WAS THE GROWTH OF A SAC-LIKE EXPANSION OF THE ALIMENTARY CANAL IN THE CHEST REGION OF THE FISH. FROM THIS, GREW THE LUNGS OF ALL VERTEBRATES, WITH THE ABILITY TO TAKE OXYGEN FROM THE AIR, AND THUS TO LIVE ON THE LAND. THE SECOND GREAT DEVELOPMENT WAS THE EVOLUTION OF THE PAIRED FINS, PRIMITIVE FORERUNNERS OF THE LEGS AND ARMS OF THE VERTEBRATES. THE AMPHIBIANS HAD NOT YET MADE THEIR APPEARANCE, ALTHOUGH THERE IS ONE SMALL, DUBIOUS FOSSIL FOOTPRINT. IT IS INTERESTING TO NOTE, ALSO, THAT LAND PLANTS WERE DEVELOPING RAPIDLY, AND AHEAD OF THE LAND FAUNA. THIS, OF COURSE, WAS A NECESSARY SEQUENCE, AS OTHERWISE, THE LAND FAUNA WOULD HAVE HAD NO SOURCE OF FOOD.



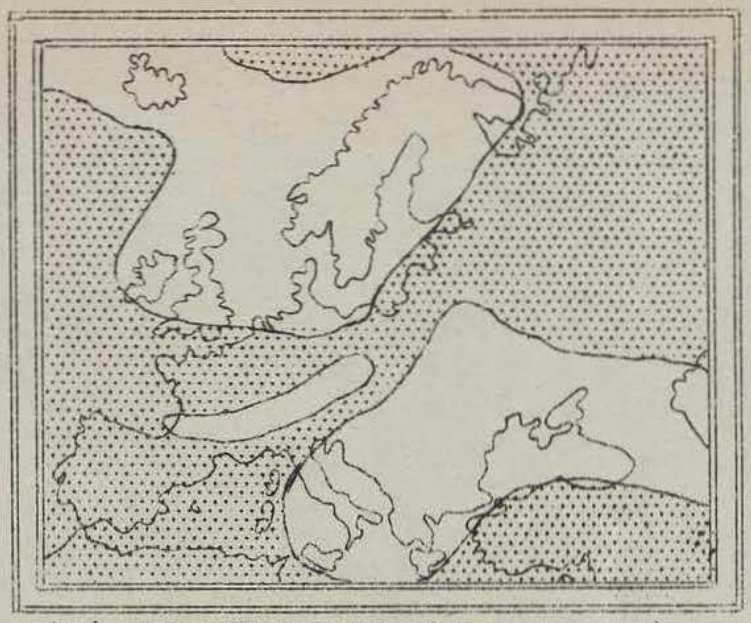
(13) DEVONIAN- EARLY (SCHUCHERT- MODIFIED; STIPPLED AREA IS SEA)



(14) DEVONIAN- MIDDLE (SCHUCHERT- MODIFIED) STIPPLED AREA IS SEA.



(15) DEVONIAN- LATE (SCHUCHERT- MODIFIED; STIPPLED AREA IS SEA)



(16) EUROPEAN-DEVONIAN (MILLER-SCHAFFER)

BULLETIN BOARD

MARCH 19: SPEAKER, GRACE L. NUTE; SUBJECT, "THE HISTORY OF LAKE SUPERIOR";

MARCH 26: SPEAKER, EDWARD W. HAWLEY; SUBJECT, "THE GEOLOGY OF SOUTH DAKOTA";

APRIL 2: SPEAKER, JUNIOR HAYDEN; SUBJECT, "YELLOWSTONE PARK";

APRIL 9: TO BE ANNOUNCED;

APRIL 16: SPEAKER, DR. LAWRENCE M. GOULD; SUBJECT, "GLACIATION".

THIS AND THAT

VOLCANIC DUST on Iwo Jima was so thick and light that the Marines frequently sank to their knees in it. The fine dust penetrated the mechanism of their guns and rifles and greatly interferred with their fire power. This is interesting, geologically, but it was tough on the Marines.

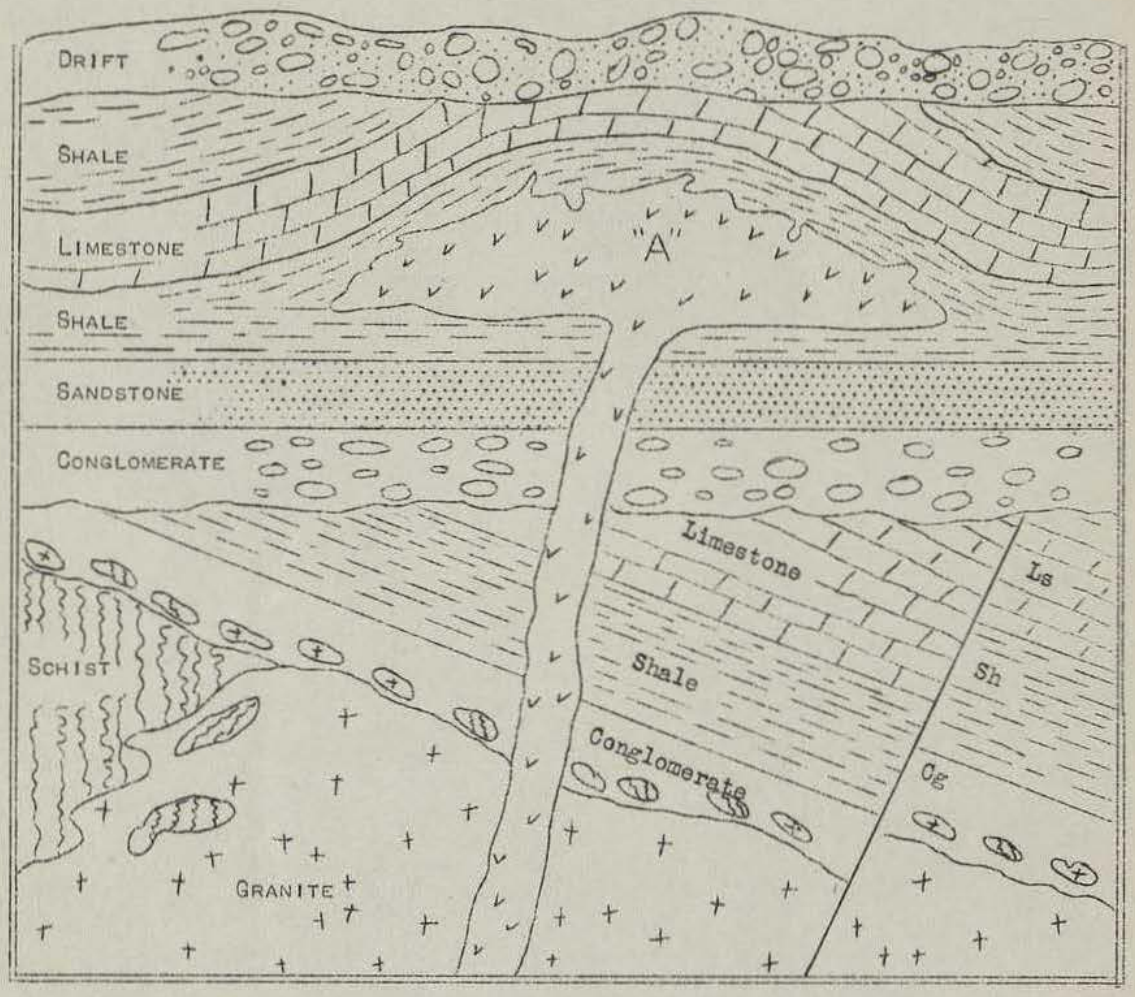
DEFINITION OF A "PEBBLE PUP": He doesn't think of rocks all the time, but when he thinks, he thinks of rocks.

FROM OUR MAIL BAG

OTTO W. HUBIN, Rochester, Minnesota: "I am happy to know of the existence of such a Bulletin. Everyone interested in Earth Science, or just plain Minnesota rocks and minerals, should get your publication."

SILICON is the most common element of Earth, next to Oxygen. Combined with glass and other finely divided inorganic materials, it is used to make various plastics. It is the basis of "bouncing putty", and many amazing products.

OUR GEOLOGY LESSON



HOW MANY UNCONFORMITIES ARE INDICATED? _____ GIVE THE EVIDENCE FOR EACH.

HOW MANY IGNEOUS INTRUSIONS ARE THERE? _____

WAS THE SCHIST FORMED BEFORE OR AFTER FAULTING? _____ GIVE THE EVIDENCE.

INDICATE THE INTRUSIONS IN THE GRANITE. ARE THEY OLDER OR YOUNGER THAN THE IGNEOUS ROCK? _____

GIVE THE NAME OF THE GEOLOGIC FORMATION INDICATED BY "A". _____

The maps in our last issue showed how the ice had retreated north of Lake Erie and Lake St. Clair, but still covered Lake Ontario, part of Lake Huron, most of Lake Michigan, and all of Lake Superior. At this time, however, water from the melting ice had forced an outlet through the Susquehanna River.

In the above sketch, you will note that the ice has now retreated from more than half of Lake Superior, practically all of Lake Michigan and Lake Huron, considerably north of Lake Erie, and is beginning to retreat from Lake Ontario. The Susquehanna outlet, however, is closed, and the outlet across Lower Michigan is almost closed.

In the next sketch, No. 7, note that the outlet from Lake Huron to Lake Michigan, across Lower Michigan, is now closed. Lake Michigan is entirely exposed, Lake Huron is almost entirely exposed, Lake St. Clair and Lake Erie are entirely exposed. The ice has just started to expose Lake Ontario. The water has forced an outlet along the edge of the ice to the east, down the Mohawk Valley, into the Hudson River.

Also, by this time, Lake Duluth has ceased to drain into the St. Croix and Mississippi, and Lake Michigan has ceased to drain through the Wisconsin and Rock Rivers, although it still drains through the Illinois. The drainage of Lake Huron, Lake St. Clair, Lake Erie, and Lake Ontario is now through the Hudson River,

In our next issue, we will show how the retreating ice is revealing the valley of the St. Lawrence, and the beginning of normal drainage in that direction,

"OUT-OF-TOWN" MEMBERSHIP

IF YOU RESIDE OUTSIDE OF RAMSEY AND HENNEPIN COUNTIES, MINNESOTA, YOU MAY BECOME A MEMBER OF OUR SOCIETY BY PAYMENT OF THE ANNUAL MEMBERSHIP FEE OF $1.00.

YOU WILL RECEIVE A MEMBERSHIP CARD, ALL NOTICES OF OUR ACTIVITIES, INCLUDING MEETINGS, LECTURES, FIELD TRIPS, ETC., AND THE BULLETIN OF OUR SOCIETY, "THE MINNESOTA GEOLOGIST", WHICH IS PUBLISHED EIGHT TIMES DURING THE YEAR.

MAIL THE FOLLOWING APPLICATION TO THE SOCIETY'S OFFICE WITH CHECK OR MONEY ORDER (OR CURRENCY) FOR $1.00.

"OUT-OF-TOWN" MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF MINNESOTA
831 SECOND AVENUE SOUTH
MINNEAPOLIS 2, MINNESOTA

I ENCLOSE $1.00 AND APPLY FOR MEMBERSHIP IN YOUR SOCIETY:

NAME _____ RESIDENCE _____ PHONE _____
(PRINT) (PRINT)

BUSINESS _____ BUSINESS ADDRESS _____ PHONE _____

_____ _____
SIGNATURE ADDRESS

ALMA BORCHARD
2105 BRYANT AVE. SO.
MINNEAPOLIS, MINN.5