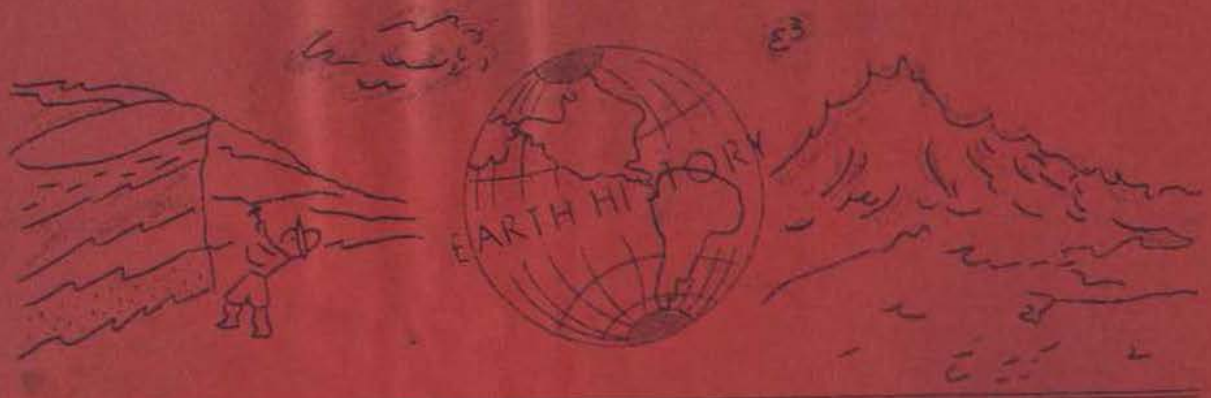

THE MINNESOTA GEOLOGIST

OFFICIAL BULLETIN
OF
THE GEOLOGICAL SOCIETY OF MINNESOTA

VOL 11 OCTOBER 1945 NO 7

Contents

GEOLOGICAL SOCIETY OF MINNESOTA

831 SECOND AVENUE SO.
MINNEAPOLIS 2, MINN.

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

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MEETINGS: OCTOBER to MAY inclusive 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.

JUNE until SEPTEMBER, inclusive, we have a program of field trips. Visitors are very welcome, always.

ANNUAL DUES: Residents of Hennepin and Ramsey Counties $3.00 plus $1.00 additional for your wife, husband, or dependent family members; for those residing elsewhere and students, $1.00.

EDITORIALS: ARS

CHARLES P. BERKEY, Ph. D. For two years now, your editor has been trying to locate a copy of Dr. Berkey's thesis on the St. Croix Dalles. So far as we know, this is the only treatis on the geology of this very interesting locality. It is of special interest to our Society which, for some years now, has been making a biennial pilgrimage to the Dalles. This little book is an absolute "Must" to any leader of a trip to this place. We know of only two copies of this book, one in the library of the Geology Department of the University, and we believe Miss Hinchley has one. We have canvassed practically every second hand dealer in geology books and scientific papers in the country, and in our desparation to obtain a copy, we finally wrote to Dr. Berkey, himself. Dr. Berkey replied that if he could find a copy that was not appropriated to a definite use, he would mail it to us and shortly thereafter, we received one inscribed "To the Geological Society of Minnesota with Compliments of Charles P. Berkey." We will have this copy bound and it will be the property of the Society. We are greatly indebted to Dr. Berkey for this gift and we want him to know that we appreciate his kindess and courtesy tremendously. Dr. Berkey is an honorary member of our Society, Professor of Geology in Columbia University, New York City, and Past President of the Geological Society of America.

FIELD TRIPS. The field trip season just closed, has been an especially interesting one and has been unusually well attended. The average attendence was 37. The leaders have been unusually proficient and those of you who have not attended have missed part of your geology education. Our sincere thanks to the committee and the leaders. With the return of tires and gasoline, however, we will be able, next year, to have a somewhat more extensive program reaching out to places we have been unable to attend because of the shortage of these essentials. This will entail greater responsibility on the field trip committee, whoever they may be. We have thought that there is a great opportunity here for someone with the necessary back ground, time, inclination, and organizing ability to take over the whole matter of field trips. It would take someone who could take considerable time away from his business or work. We will miss Mr. Burch greatly in this respect. It is necessary for the leader to scout the trip and to organize it, get out a data sheet, possibly an itinerary, as was done on the Mankato trip, and to see that the trip is made interesting to the members --not only one trip, but all trips. This would be a real service to the Society. If the spirit moves anyone so qualified, and so disposed, would you please communicate with the President or any member of the Board of Directors.

STRUCTURAL GEOLOGY. The Society offers, beginning October 15, a series of 15 lectures on the subject of "Structural Geology" by Dr. George M. Schwartz, Professor of Geology at the University of Minnesota. This is a subject that every member should know something about. We should be able to recognize a fault, for instance, or an unconformity, a syncline, a dike, or jointing and other features of the Earth's structure which are readily observed as we journey about. We have had a full course on the processes of Geology. We know how nature carves landscape. This new course will help us to interpret some of its observed phenomena. Don't miss a single lecture and be sure to interest a friend or two if you possibly can. This will be a very interesting series of lectures. Dr. Schwartz is an excellent lecturer, a fine, patient and friendly gentleman whose acquaintanceship you will enjoy.

G-E-O-L-O-G-I-C-A-L S-O-C-I-E-T-Y O-F M-I-N-N-E-S-O-T-A

L E C T U R E C O U R S E

1945-6

October 8, 1945
Dr. Wm. J. Luyten, Head
Department of Astronomy, University of Minnesota

MATTER AND ATOMIC ACTION

October, 1945 to February, 1946
Dr. George M. Schwartz
Professor of Geology, University of Minnesota

October 15, 1945	ROCKS OF THE EARTH; Physical Character and Properties
October 22, 1945	ORIGINAL ROCK STRUCTURES, of Sedimentary and Igneous Rocks
October 29, 1945	ROCK FOLDS I; Description and Importance
November 5, 1945	ROCK FOLDS II; Modes of Origin
November 12, 1945	ROCK FRACTURES OR JOINTS; Origin, Description, and Importance
November 19, 1945	FAULTS I; Description and Classification
November 26, 1945	FAULTS II; Origin and Practical Importance
December 3, 1945	ROCK CLEAVAGE; Origin and Significance
December 10, 1945	STRUCTURES, in Unconsolidated or Loose Rock Formations, Landslides, etc.
December 17, 1945	UNCONFORMITIES; Origin, Description, and Significance
January 14, 1946	MOUNTAINS; Origin and Types
January 21, 1946	THE CONTINENTS, OCEAN BASINS AND DEEPS; History and Characteristics
January 28, 1946	INTERIOR OF THE EARTH; What We Know and Infer About it
February 4, 1946	EARTHQUAKES; What They are and Relation to Structures
February 11, 1946	MOVEMENTS OF THE EARTH'S CRUST; Major Causes and Results

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.

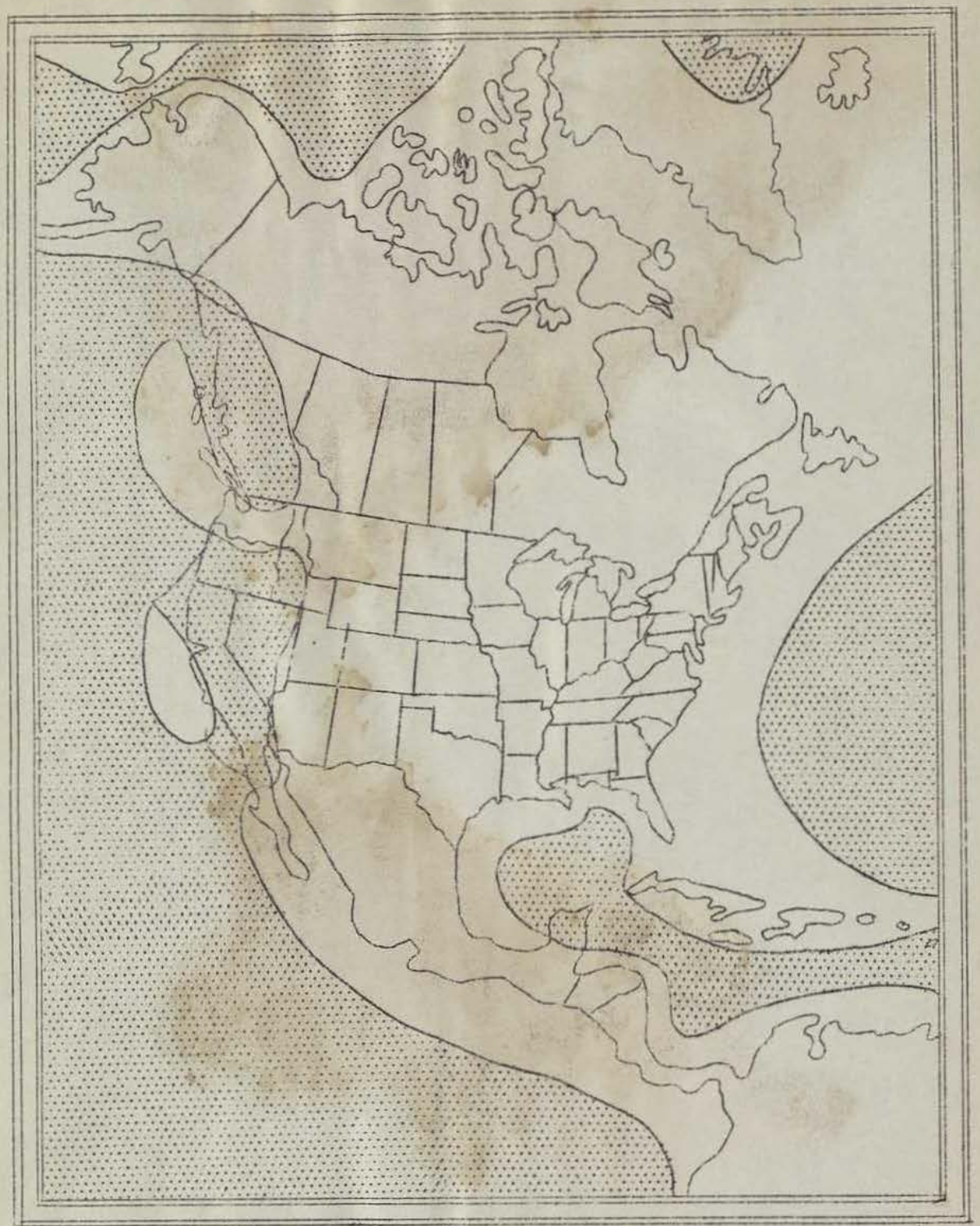
THE TRIASSIC PERIOD

The Triassic period is the beginning of the Mesozoic era. During this period there was little flooding of the continent, practically none on the Atlantic Coast, some on the Gulf and Pacific Coasts. Essentially it was a period of erosion. The significant feature in the Eastern half of the continent was the very considerable terrestrial deposits extending from Virginia to Nova Scotia. These consist of great thickness, up to 20,000 feet of sandstones and shales, usually red, or red to gray in color. There was some extrusive lava sheets interbedded, the Palisades being the most notable one. In the West, also large areas, from Canada to Texas, were covered with terrestrial deposits. Coral reefs abound on the West Coast from California to Alaska. Because of the extensiveness of the gypsum and salt deposits, it is thought that the climate was more or less arid in the western part of America. Too much is not known of the climate, but it is thought to have been arid throughout many parts of the world. The Triassic rocks of France and Germany are important sources of salt.

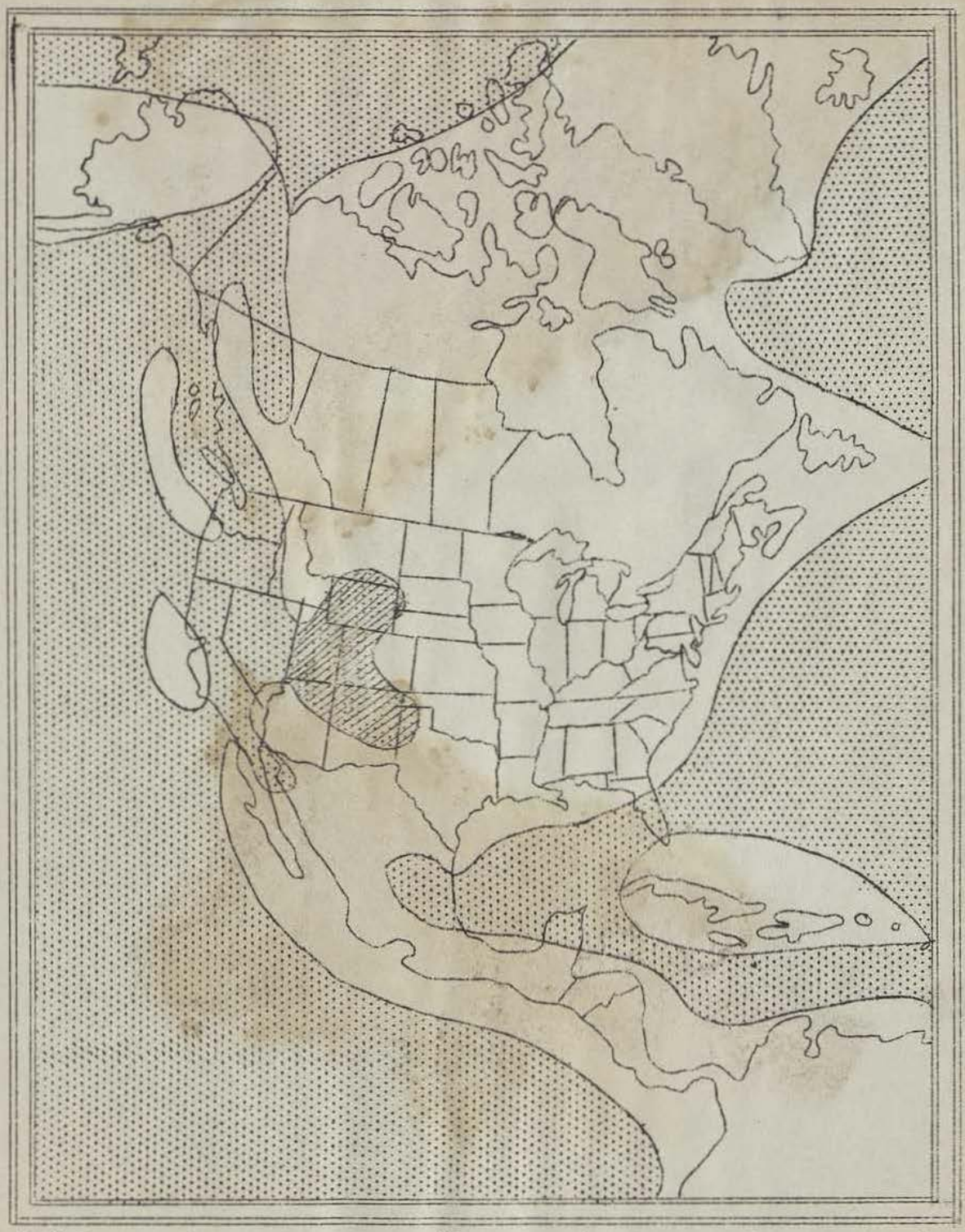
The flora underwent considerable evolution as plants changed from the spore bearing kind of the Paleogoic to the seed bearing kind, which later, in the lower Cretaceous, gave rise to great flowering plants, and with them, modern insects.

There was wide distribution of the amphibians and reptiles. During this period, the reptiles freed themselves from the amphibians by the development of an egg laid upon the land, and also by learning to breath by means of lungs throughout their life, so that the reptiles became, generally, land animals. This lead to the development of the dinosaurs which seem to have covered the entire continent, some herbiferous, some aquatic in their habits. Of the invertebrates, the ammonites were the dominant group which enjoyed a wonderful revolution in the Triassic. All in all, it was quite a significant period.

(29) TRIASSIC, EARLY (SCHUCHERT, MODIFIED; STIPPLED AREA IS SEA)



(30) TRIASSIC, MIDDLE (SCHUCHERT, MODIFIED; STIPPLED AREA IS SEA)



(31) TRIASSIC, LATE; (SCHUCHERT, MODIFIED; STIPPLED AREA IS SEA)
(RULED AREA PARTLY MARINE AND PARTLY CONTINENTAL)

(32) European - Triassic (F.X. Schaffer, by Miller)

"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 currency for $1.00.

"OUT-OF-TOWN" MEMBERSHIP APPLICATION
G E O L O G I C A L S O C I E T Y O F M I N N E S O T A
831 Second Ave. South,
Minneapolis 2, Minnesota

I enclose herewith $1.00 and apply for membership in your Society;

Name _____ Residence _____ Phone _____
(Print) (Print)

Business _____ Business Address _____ Phone _____

_____ _____
Signature Address

NEW MEXICO'S CRATER LAKE By E. R. Harrington

Reprinted and condensed from "Compressed Air Magazine"

There are several crater lakes in America, the most famous one of course being that in Oregon's Crater Lake National Park. New Mexico also has a crater lake. While it is not so large as its northwestern brother it is unique in being the only crater lake in the United States filled with salt water. It is in the west-central part of the state some 50 miles south of the Indian capital of Gallup. There, surrounded by civilizations which were ancient when Columbus discovered America, lies Indian "salt lick."

You catch the first glimpse of the lake from its northern shore--a shallow, greenish-gray body of water in a steep-sided bowl something over a mile across and about 300 feet deep. The bowl's rim is an almost unbroken band of black lava. In the southern part of the lake are two cinder cones that rise to a maximum elevation of perhaps 200 feet, the higher one being completely surrounded by water and the other one being tied to the southwest rim by a black cinder slope. Half a million pounds of salt is taken from the shallow waters every year.

The two cones are perhaps the most interesting features of the lake. The higher one is solid, its throat being completely choked by cinders; the other, which covers a larger area, has a crater in which is a pool of clear salt water of an amazing greenish color presenting a beautiful sight in the steep-walled funnel of red and black cinders. The pool is some 200 feet in diameter, and as its bed is invisible it is reputed to be bottomless, as such bodies of water frequently are said to be. A reported depth of 500 feet was found to be not more than 23. The level of the pool is a foot or more above that of the lake that has formed in the great flat basin surrounding the cone.

The water inside the crater is nearly completely saturated with salt. The brine wells up in the nature of a spring, and as the level of the pool is above that of the lake, the brine percolates through the porous cinder walls and finds its way into the larger body of water. The latter has a maximum depth of less than 10 feet, most of it being shallow enough for wading. Because of its shallowness it is subject to a tremendous amount of evaporation in the drier seasons of the year, in fact, the evaporation far exceeds the inflow of brine from the crater spring. The water in the lake therefore becomes supersaturated, salt crystals forming on the bottom and interlacing to make an incrustation several inches thick.

One is immediately struck by an oddity such as a brine spring in a volcanic crater. The great flat basin is surrounded by Cretaceous sediments, and these are underlain in New Mexico by the Permian "red beds." The latter were laid down in a broad shallow sea, connected to the ocean by a narrow strait, far back in geological time before the dinosaur arrived on the scene. By progressive fillings, settlings, and dessications, this vast inland sea became a succession of beds of salt, gypsum, and sandstone, including the lesser deposits of potash salts that are found many miles away in southeastern New Mexico. In some places the red beds contain layers of salt that are as much as 2000 feet in thickness.

For our purpose it is sufficient to picture the scene presented by the red beds and older rocks surmounted by Cretaceous and younger sediments. Soon after being uplifted from the sea, great volcanic activity set in. In the region

of the present salt lake a volcanic cone showered the surrounding plain with stones and ashes that were eventually built up to a height of perhaps 3000 feet. In a last tremendous explosion the whole upper part of the cone was blown away, creating a basin or caldera ringed by the fragments of its former glory. In its last dying gasps two smaller cones were formed within the basin, one filling its vent with cinders and lava and the other remaining explosive to the last, leaving a steep crater that was eventually to become the brine spring that is a source of salt today.

As the volcanic fury died away, the fissure connecting the lower volcanic magma with the active spatter cone became the conduit through which water rose to the surface. Like that in most springs, it is surface water--water coming from higher levels but taking a roundabout course which leads it far underground during its travels. Before rising through the vent it passes through the salt-bearing red beds and, accordingly, becomes nearly saturated with salt. This brine flows out through the porous cinder crater and becomes supersaturated in the shallow water outside.

In early spring the harvest commences. The workers wade in alongside, finding few places where the water comes above their knees. By skilful use of large, flat, many-tined forks they scoop the salt incrustation from the floor, free from the mud upon which it has rested.

To date most of the salt has been shipped out in crystal form. It is used chiefly for livestock and is delivered by truck to many ranches in Arizona, New Mexico, Texas, and Mexico. Actually the salt is quite clean and rather free from magnesium compounds as well. Very little if any refining would be needed to prepare the product for human consumption.

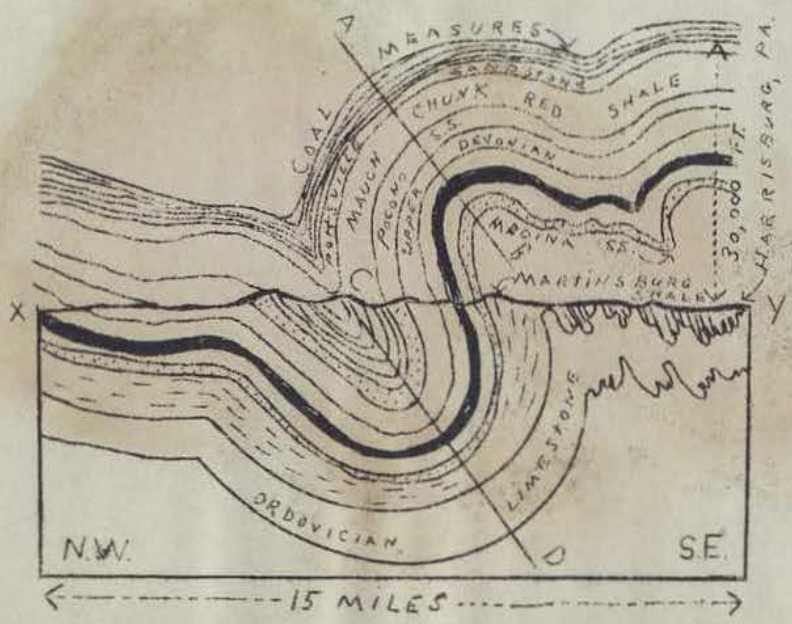
The Indians from Zuni Pueblo some 40 miles to the north have used this lake as a source of salt from time immemorial. When the Spanish explorer Coronado entered Zuni in 1540 that village had already built up a thriving salt trade with tribes far down in Mexico. Certain other warlike tribes made forays into Zuni territory for salt, but, even so, the lake was always associated with the Zuni Pueblo in ancient times. They made quite a ritual of their salt gathering. For that matter they do so today. The modern workers remove almost all the salt crust from the lake floor every year, and yet twelve months later another half million pounds lies there for the taking.

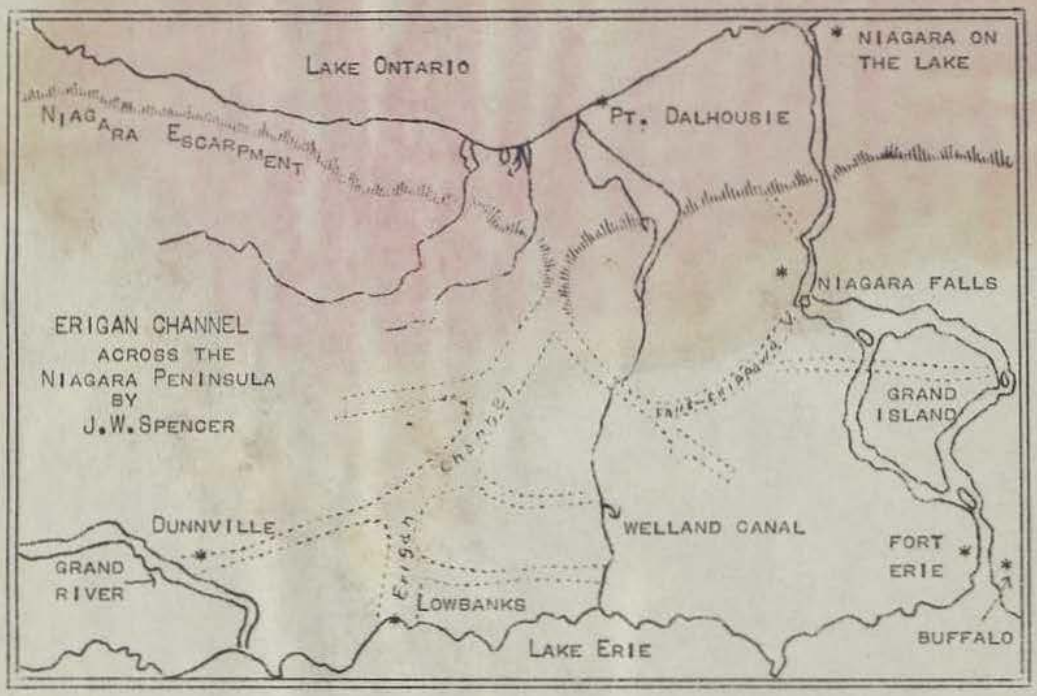
THE JORDAN-ONEOTA CONTACT

Our members who studied the Jordan-Oneota Contact at Mankato and elsewhere will be interested in the following explanation of the solution cavities at the base of the Oneota dolomite, by Prof. W. A. P. Graham of Ohio State University.

"In the neighborhood of Mankato the Oneota dolomite is well jointed wherever exposed and shows evidence of solution along these joints near and at the contact with the Jordan. The effect of solution along the joints is shown by the smooth, rounded, and somewhat undulatory joint surfaces. On reaching the sandstone the waters spread laterally, developing small solution cavities at the base of the dolomite, over rather extended areas. This phenomenon would be especially developed at times when the water table closely approached the contact plane between the two formations. The top of the Jordan (in places) is a fine-grained, water-bearing sandstone, the fineness of the texture causing the water to be held for some time after the coarser underlying layers are dry. Water passing downward along the joints in the Oneota is slowed up in its downward motion on reaching the fine sandstone, resulting in lateral spreading and giving rise to the conditions necessary for the accomplishment of the observed solution effects."

The following diagram represents a reconstruction of the eroded Appalachian folds near Harrisburg, Pennsylvania, showing the tremendous size of the original folds. It represents a section about fifteen miles long. The vertical scale is not exaggerated. The line AB is the axis of an overturned anticline and the line CD is the axis of an overturned syncline. The line XY represents the present eroded surface. Note that since the folding took place, over 30,000 vertical feet of sediments have been eroded. The size of these folds, their height and length, illustrates the grand scale upon which nature performs her work. Sometimes one has to give his imagination full play in order to interpret correctly the effects of great geologic processes. However, as rapid erosion took place as the folds were evolved, the rocks did not at any time attain their full height. Folding occurred during the Permian Period. This diagram was adopted from the Topographic and Geologic Survey of the State of Pennsylvania.





Perhaps very few of the general public know of the existance of an ancient, or preglacial river which flowed from Lake Erie to Lake Ontario, just west of the present Niagara River, yet the proof that such a stream existed is indisputable. The channel of this ancient stream, which is now known as "Erigan", is proved by the logs of a great number of wells drilled in the territory once traversed by this river.

We might say, the river began at "Lowbanks" on the north shore of Lake Erie, about 40 miles west of Buffalo, New York, although it has been traced for 30 miles into but under Lake Erie. It flowed north by east into Lake Ontario, as shown by the above sketch. The valley of this river was on the average, more than two miles wide, and the river bottom was 180 feet below the present level of Lake Erie. There is a large embayment in the rocks at Lowbanks on Lake Erie, and also at the Niagara Escarpment on Lake Ontario indicating both ends of this river,

It is not known whether this river drained an ancient Lake Erie, or whether it was part of a very much greater river system whose drainage basin occupied the area covered by the beds of all the Great Lakes, except Superior. The latter seems the more likely.

The position of this interesting relic of geologic time is just west of the Welland Canal, and no doubt might well have served the same purpose for some "Ancient Mariner."

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