posed to deny that this may have happened. But I consider it much more probable—as does Mr. Gordon apparently—that most, if not all, of our otters (at least those found in eastern Massachusetts) are descended from primitive native stock. For it is evident that the species has never been completely extirpated in Massachusetts, even in the neighborhood of such large cities as Boston and Springfield, while any assumption that there have been immigrations from farther north is unsupported by known evidence and also unsatisfactory because of the fact (to which I could bear strong testimony if it were necessary) that in most parts of northern New England otters are, and have been for twenty years or more, far from common. Hence it is difficult to believe that many of them have come to us from that direction, although a very few may stray southward, at infrequent intervals, along the Connecticut and Merrimac rivers. However this may be, I am decidedly of the opinion that if, within recent times, there has been anything in the nature of an overflow of otters from localities which they have somewhat over-populated, its source is most likely to have been Cape Cod. For there, as I have said, the otter has been more numerously represented, over wide areas, during the past quarter of a century, than anywhere else in New England.

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SOCIETIES AND ACADEMIES

THE GEOLOGICAL SOCIETY OF WASHINGTON

AT the 212th meeting of the society, held on Wednesday, January 13, Mr. G. K. Gilbert presented the following paper: "Earthquake Forecasts," a paper read before the Association of American Geographers at Baltimore, on Friday, January 1. This paper was published in SCIENCE and hence no abstract is furnished herewith.

AT the 213th meeting of the society, held on Wednesday, January 27, the following papers were presented:

Regular Program

Some Observations on Rocky Mountain Faults: CHESTER W. WASHBURNE.

The faults observed may be referred to three genetic types.

Type I. Normal dip faults crossing the axes of anticlines.—The examples considered displace strata just above the Colorado shale, and do not penetrate the latter over 300 feet. None reach the Carboniferous. The maximum vertical displacement, 50 to 300 feet, is on the anticlinal axes and decreases down the limbs until the faults become small monoclinal flexures and finally disappear. The motion along each fault plane had two essential components: (1) vertical, either (*a*) upward movement of the foot-wall, or (*b*) downward movement of the hanging wall; and (2) horizontal, either (*a*) inward movement of the foot-wall toward the anticlinal axis, or (*b*) outward movement of the hanging wall away from the axis. Field observations show that these movements have been combined in one of two ways. A: (1 *a*) with (2 *a*); or B: (1 *b*) with (2 *b*). Combination A would be produced during folding by compression resulting in axial thickening of the underlying shale and upward creep on the limbs, the movement being greater on the up-thrown or foot-wall side of each fault. Combination B would be produced by creep down the limbs of anticlines and axial thinning of the Colorado shale, the movement being greater on the down-thrown side. This might be caused during the folding, by the tension of stretching over the underlying Paleozoic limestones, or subsequently by gravitative creep down the limbs, under the pressure of about 3,000 feet of overlying rock. Combination A is the most probable. The breaks were probably initiated as lines of scission or *blätter* between blocks that were shoved unequally.

Type II. may, for convenience, be called *faults of vertical thrust*, because the vertical component is large. The type is characteristic of the margins of broad, domical, flat-topped uplifts such as the Marysville batholith and the Bighorn Mountains. The faults are usually intimately associated with flexures. The faults that are of the same kind, orographically, as the flexures, *i. e.*, the faults that add to the height of the uplift and to the depth of the adjacent depression, are named *additive*. These are due to the same forces that elevated the mountain mass. The additive group includes both "thrust" and "normal" faults of the current nomenclature. The complementary group of faults subtracts from the height of the uplift and is therefore designated *subtractive*. They are due to forces opposite in kind to those that made the uplift, probably to gravitative subsidence. All subtractive faults are "normal."

Type III. Tilted fault blocks.—Many great series of step faults are hard to explain by the idea of collapse of an uplift. In some cases the inclination of the strata require that the uplift have a height far exceeding any known elevation on the earth, yet there is no physiographic evidence that such elevations existed. It is more probable that the tilting and faulting of the blocks were concomitant. The hypothesis of continental creep can not explain some of the phenomena.

A suggestion is furnished by a faulted pebble in schist, collected by J. S. Diller. (See U. S. Geological Survey Bulletin 353, fig. 4, p. 22, and *American Journal of Science*, Vol. XXIV., fig. 5, p. 12, July, 1907.) According to Becker the schistose structure is in the final direction of maximum slide, and the oblique faults are in another final direction of maximum slide subordinate to the first. Both were initiated by the same rotational shear or scission, which tilted the oblique faults forward, and which produced practically no change in the direction of the schistose structure.

A cross-section of the mountains of Colorado bears a strong resemblance to this pebble. The schistose structure or direction of greater motion corresponds with the thrust faults and hypothetical buried sheer zones of the mountains. The cross-breaks correspond with the step faults of South Park and the Leadville District. The initial formation of the breaks on the principles of cleavage laid down by Becker, and the subsequent forward rotation of the fault blocks by the same shearing thrust, would explain all the phenomena. In this way both the thrust faults and the normal step faults could be produced at the same time by the same forces.

Quartz as a Geologic Thermometer: Fred. Eugene Wright and Esper S. Larsen.

On any temperature scale certain temperatures, as the boiling and freezing points of water, are arbitrarily chosen as fixed and standard points of reference. For the geologic temperature scale, similar points must be selected and for this purpose melting points of minerals and mineral aggregates (eutectics), and especially inversion temperatures of enantiotropic forms of the same compound, may serve. Quartz is well adapted to furnish one and possibly two such points, since it has two inversion temperatures, the one at about 560°, where α-quartz inverts to β-quartz, and the second at about 800°, where β-quartz changes under certain conditions to tridymite. Mügge[1] has recently shown that at 560° quartz changes to a second form called β-quartz, which is also hexagonal and trapezohedral in its symmetry but in all probability hemihedral instead of tetartohedral. This change in symmetry class involves certain changes, as crystal habit, character of twinning and intergrowth of right- and left-handed quartz, and fracturing of crystals, which in turn can be used directly to distinguish quartz formed above 560° from that which has never reached that inversion temperature. These criteria were applied to quartz from 43 different localities, 17 of vein quartz, 13 of pegmatite and 13 of granite and granite porphyry quartz. Nearly 500 plates of quartz in all after the basal pinacoid were cut, polished, etched and tested from these view-points —the net result of the investigation being that the vein quartzes were formed below 560°; also the quartz of certain pegmatites, while all granite, granite porphyry and graphic pegmatite quartzes were probably formed above 560°. By thus fixing temperature limits of formation of quartz, it is possible in many instances to determine limits for other minerals associated with quartz.

The Stream Robbery on which the Belle Fourche Reclamation Project is Based: N. H. Darton, U. S. Geological Survey.

The Belle Fourche project provides for the irrigation of 85,000 acres of the Great Plains lying north of the Black Hills in western South Dakota. The water is to be taken from Belle Fourche River just below the town of Belle Fourche, carried down the north bank a short distance, and then by a deep cut through a narrow divide to a large reservoir sustained by a long dirt dam. From the reservoir it will be carried by ditches into a large, low-lying basin, where it will be utilized. As in most reclamation projects, the topography presents certain favorable peculiarities. In this case it is that the river near Belle Fourche is considerably higher than the wide basin of tributaries on the opposite side of a narrow divide. This basin was excavated in soft shale by creeks of moderate size. Originally the present river was a very small branch creek, but having greater declivity, it finally cut back through a narrow divide and tapped the headwaters of the Little Missouri River. The river has not yet greatly deepened its valley near Belle Fourche, so that now the water can easily be carried by a short canal system into the large, low lying basin to the north.

[1] "Neues Jahrbuch," Fest band, 181–196, 1907.

The locality at which the Little Missouri was tapped, is in the big bend thirty miles northwest of Bele Fourche. Its features are well shown on the Aladdin quadrangle of the U. S. Geological Survey. The former channel is now a flat-bottomed gap through the divide about two miles long and known as Stoneville Flat. To the north it coalesces with the present Little Missouri Valley, while to the south it ends in a cliff of shale eighty feet high descending to the present Belle Fourche River.

AT the 214th meeting of the society, held on Wednesday, February 10, under informal communications, Dr. J. W. Spencer presented briefly some "Notes on Borings in the Vicinity of Whirlpool Rapids."

Regular Program

The Pleistocene Phenomena of Southeastern Wisconsin: WM. C. ALDEN.

This paper is based upon detailed surveys of an area of about 8,600 square miles south of latitude 44° N., made under the direction of Dr. T. C. Chamberlin. Outside the terminal moraines of the Wisconsin ice sheet is a deposit of drift regarded as of Illinoian age. The composition of the drift and trend of striæ show that the direction of ice movement was, in general, westerly to the limit of the drift. The average estimated thickness over 470 square miles of this area is 45 feet. Very compact reddish till and contorted laminated clays exposed at intervals on the shore of Lake Michigan at the base of the bluff are correlated with this stage of glaciation.

Some, at least, of the vegetal deposits penetrated by wells at many places throughout the area of Wisconsin drift probably represent the Peorian interval of glaciation. To this horizon also may belong the logs and stumps observed by Dr. J. W. Goldthwait near Manitowoc and Two Rivers, Wis. One stump was found still rooted in dense reddish clay provisionally classed with the Illinoian deposits.

The Green Bay, Lake Michigan and Delavan lobes of the Late Wisconsin ice sheet are shown to have been contemporaneous in their maximum extension. Estimated average thickness of drift in the terminal moraine of the Green Bay Glacier at the south end of the lobe is 119 feet (this includes older drift). Along the west side, where no earlier drift is known, the thickness is 61 to 77 feet. The estimated average thickness over 1,611 square miles of the ground moraine, including recessional moraines, is 71.4 feet. Seventeen hundred and fifty drumlins of good form occur in the area examined. Evidence is found that some were formed when the ice reached only to one of the inner moraines. Eskers were formed at or near the base of the ice and the esker-forming streams were controlled by the configuration of the drift surface. Direction of movement in the adjacent parts of the two glaciers was almost opposite. The interlobate moraine is 100 to 300 feet high, the relief generally being entirely of drift. Drift of the Lake Michigan glacier estimated as 100 to 150 feet thick at the south, 160 feet at the north and 45 feet midway between. Recessional moraines are well marked.

A readvance of the Lake Michigan glacier covered the moraines east of the Milwaukee River with a deposit of red till southward to Milwaukee. Between Sheboygan and Plymouth this extended 14 miles west of the lake shore. The estimated average thickness of this deposit is 34 feet. In Sheboygan and Manitowoc counties there is a well-marked terminal moraine of red till overlapping the earlier recessional and interlobate moraines. A similar deposit of red till bordering Lake Winnebago indicates a readvance of the Green Bay glacier to the south line of Fond du Lac Township. This readvance is believed to have occurred at the Glenwood stage of Lake Chicago. There is a faint development of the Glenwood beach on the red clay formed when the ice again retreated. This is traceable north through Sheboygan County. In southern Sheboygan County slight traces of a beach occur at the Calumet level. Traces of the Toleston beach occur in Kenosha County, but this was mostly obliterated during the formation of the Nipissing shore, which is strongly marked by cliffs and terraces about 14 feet above Lake Michigan. The Algonquin beach is not distinguishable, possibly it is identical with the Toleston shore. As shown by Goldthwait, there has been little or no deformation of the old shore lines in this area. Filling in the lower part of Milwaukee River valley, consisting of marsh deposits and alluvium extending 50 feet below the level of the lake, indicate that at some time following the Glenwood stage and deposition of the red till the lake waters stood considerably below their present elevation.

Clinton Iron Ores in the Birmingham District, Alabama: ERNEST F. BURCHARD.

The Clinton formation lies on the flanks of a non-symmetrical anticlinal valley, extending northeast and southwest for about fifty miles, with the city of Birmingham near the middle. Only on

the east limb of the anticline in Red Mountain near Birmingham is the ore of commercial value at present. Northwest of this valley lies the Warrior Field, containing coking coals, while to the southeast lies the Cahaba Field, containing high-grade steam and domestic coal. Cambro-Ordovician dolomite within the valley and Mississippian limestone between the ore outcrop and the coal fields both afford stone for fluxing. The topography is of the ridge and valley type, very favorable for transportation lines to reach the outcrops of ore, stone and coal. The ore is of sedimentary origin. It contains approximately 36 per cent. of iron, 12 to 25 per cent. silica, 8 to 20 per cent. lime and .33 per cent. phosphorus. It occurs in beds like coal, but, unlike coal, the beds are subject to residual enrichment on the outcrop, due to solution of soluble constituents; also they are not so broadly extensive as coal beds. Studies of the strike sections of the ore on the outcrop and of sections at right angles to the outcrop by means of mine openings and drill records show that the beds are long, narrow, lens-like bodies. The quality of the unweathered ore is fairly constant in the direction of the dip. All the facts obtained during recent geological surveys of this field indicate that the ore is the result of original deposition of ferruginous sediments and that, so far as the material continues of workable thickness, it will mostly be found of workable quality.

The Earthquake Rift in Eastern San Luis Obispo County, California: Ralph Arnold and H. R. Johnson.

This paper embraced a description of some of the topographic features along the earthquake rift and was illustrated by lantern views showing the terraced aspect of the country adjacent to and the offsetting of streams by the rift. An instance of offsetting was described in detail where a stream flowing southwestward from the Temblor Range strikes the rift at right angles, is directed to a northwesterly course along the rift for 400 feet, and finally leaves the rift at right angles and flows off on the plain. The scarp along the rift at this point is on the northeast side, and there is apparently a small alluvial fan developed where the stream leaves the rift on the southwest, so that any hypothesis other than one in which a horizontal movement of 400 feet is assumed does not seem to explain the conditions found here.

Philip S. Smith,
Secretary

The Philosophical Society of Washington

The 659th meeting was held on January 30, 1909, Vice-president Wead presiding.

The following papers were read:

A Proposed Method for Determining the Solar Parallax: Dr. C. G. Abbot.

The author cited the recently published values of the solar parallax obtained by observations of the minor planets, and especially of Eros. These generally agree very closely and yield a value 8″.80 or a trifle higher. The recent long-continued and careful work of Doolittle, on the other hand, has given the value of the aberration constant as probably 20″.51, corresponding with a parallax 8″.783. Küstner and Halm have employed the Döppler principle to determine the velocity of the earth in its orbit, by observing the displacements of lines in the spectra of certain stars at intervals of six months. Küstner obtained thereby 8″.84 for the solar parallax.

The author proposed to use two cœlostats and reflect simultaneously on a powerful spectroscope the light of Venus and Mars. A differential velocity of these objects as great as 28 km. per second is available. Adams has in similar fashion determined the velocity of rotation of the sun with a probable error for a single photographic plate of 0.004 km. per second. An experimental photograph of Venus's spectrum has been made with the tower apparatus at Mt. Wilson, on the same scale employed by Adams for the sun, in two hours' exposure. It is thought that a scale of spectrum one fifth as great can be used in practise for a simultaneous exposure on Mars and Venus. By alternating the two cœlostats on successive nights, and by carefully reducing the light of Venus to equal that of Mars, and by using a long focus telescope to form the images, so that only the central part of the disks of the planets would be used, the author hoped the method would be capable of yielding in ten nights a value of the parallax accurate to one part in 2,000.

The Magnetic Properties of Iron: Their Application and Measurement: Mr. C. W. Burrows.

The 660th meeting was held on February 13, 1909, Vice-president Wead presiding. The following papers were read:

A New Method for Determination of Focal Length: Mr. I. J. Priest.

This method, based on the Fabry and Perot interferometer, gives the focal length directly and accurately; it is adapted to lenses of all focal lengths; it can be used for the determination of achromatism; and finally it is unique in that

linear measurement only is involved—a length taken with a micrometer. The use of a costly and cumbersome optical bench is not required. Briefly, the method is rapid, precise and convenient. The speaker gave a general account of the theory of fringe formation in the Fabry and Perot interferometer. The several sources of error were considered and all shown to be of the order of one part in one thousand, and hence the error in the determination of focal length f not greater than $f/1{,}000$.

The Coefficient of Reflection of Electric Waves at a Transition Point: Dr. LOUIS COHEN.

The paper discussed mathematically an important practical question, applicable to many present-day engineering problems, especially to the transmission of power by means of high potential electric currents. It was pointed out that in passing from an air circuit to an underground cable the potential might easily be almost doubled at the point of transition, due mainly to the difference in the capacities of the two parts of the circuit. In the cases of circuits having large localized inductances the potential may at places become nearly double the ordinary line potential. The discussion was in reference to alternating currents.

R. L. FARIS,
Secretary

THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE

THE thirty-second meeting of the society was held at the New York University and Bellevue Hospital Medical College, February 17, 1909, with President Lee in the chair.

Members present: Alsberg, Atkinson, Auer, Banzhaf, Beebe, Berg, Burton-Opitz, Ewing, Famulener, Foster, Gay, Gies, Henderson, Jacobs, Joseph, Kast, Lee, Levene, Levin, Lewis, Lusk, Mandel, Meltzer, Meyer, Murlin, Noguchi, Opie, Pearce, Storey, Terry, Wallace, Weil.

Members elected: John F. Anderson, T. G. Brodie, L. J. Cole, Martin H. Fischer, Richard V. Lamar, Max Morse, Hanz Zinsser.

Officers elected: President, Frederic S. Lee; *Vice-president,* William J. Gies; *Secretary,* Eugene L. Opie; *Treasurer,* Graham Lusk.

Resolution adopted: Resolved, That, on the retirement of Professor William J. Gies from the secretaryship of this society, after a service of six years, the society expresses to him its appreciation of, and its cordial thanks for, his most efficient labors. To Professor Gies's devoted work is due, in great part, the honorable position which the society has already attained among the scientific societies of this country.

Scientific Program[1]

Yandell Henderson: A method for the direct observation of normal peristalsis in the stomach and intestines.

A. I. Ringer (by invitation): Studies on the effects of carbon monoxid poisoning.

George B. Wallace and Hugo Salomon: Intestinal excretion during diarrhea.

R. Burton-Opitz and Daniel R. Lucas: The vascularity of the kidney as influenced by sensory impulses.

Paul A. Lewis: The influence of temperature on hemolysis in hypotonic solutions.

Frederick P. Gay: A carcinoma of the rat (Flexner-Jobling) considered from the standpoint of immunity.

A. O. Shaklee: Influence of temperature upon pepsin.

Nellis B. Foster and James C. Greenway: Synthesis of uric acid.

Hideyo Noguchi: Some critical considerations on the serum diagnosis of syphilis.

D. Manson, L. Kristeller and P. A. Levene: On nitrogenous metabolism in chronic nephritis.

Carl L. Alsberg: The formation of gluconic acid by the olive-tubercle organism and the function of oxidation in some microorganisms.

Jacques Loeb: On the fertilizing and cytolytic effect of soap.

T. Brailsford Robertson and Theodore C. Burnett: On the depression of the freezing point of water due to dissolved caseinates.

W. J. MacNeal, Lenore L. Latzer and Josephine E. Kerr: The daily excretion of bacteria in the feces of healthy men.

Walter A. Jacobs and P. A. Levene: Further studies on the constitution of inosinic acid.

John F. Anderson and M. J. Rosenau: The effect of heat on the anaphylactic properties of proteins.

Charles A. Elsberg: A skin reaction in carcinoma from the subcutaneous injection of human red blood cells.

EUGENE L. OPIE,
Secretary

[1] Authors' abstracts of the papers read before the Society for Experimental Biology and Medicine are published in the *Proceedings of the Society for Experimental Biology and Medicine.* A number is issued shortly after each meeting, and costs twenty cents a copy. Copies may be obtained from the managing editor, Eugene L. Opie, Rockefeller Institute for Medical Research, 66th Street and Avenue A, New York.

THE AMERICAN CHEMICAL SOCIETY
NEW YORK SECTION

THE sixth regular meeting of the session of 1908–9 was held at the Chemists' Club, March 5.

The following papers were presented:

New Aromatic Amino Acids: A. H. KROPFF.

The paper described the method of formation of a certain new diamino isophthalic acid and a diamino toluic acid and of various derivatives of these acids; also some new derivatives of a nitro-amino isophthalic acid and a diamino benzoic acid.

Some New Quinazolines: R. A. GORTNER.

A brief statement was given of further work in the quinazoline field, including some new anthranils and the preparation of some amino and carboxylated quinazolines.

The Determination of Niobium in the Presence of Tantalum.

The process given consists in the reduction of niobium by means of zinc and acid and the subsequent titration with permanganate.

On Tetrachlorether and Dichlorvinylether: WILLIAM FOSTER.

The paper dealt with an improved method for the preparation of tetrachlorether and a new method for the preparation of dichlorvinylether together with the physical properties of these compounds; also with the preparation of ethoxychloracetylchloride by the action of oxygen on dichlorvinylether with a study of the mechanism of the oxidation.

The Industrial Manufacture of Anhydrous Chlorine and the Phenomena Connected with Chlorine Detinning: ELMER A. SPERRY.

The chlorine process of detinning tin plate scrap was described and illustrated by lantern slides and samples. The more important conditions which have made the process commercially successful were set forth. These included the preparation of liquid anhydrous chlorine, the use of a special form of apparatus for regulating the temperature of the reaction, and an electrolytic method for rendering detinned steel free from iron oxide and tin alloy. The tin tetrachloride resulting from the process was shown and its properties, which required special methods of handling, were considered.

The following officers were elected for the session of 1909–10:

Chairman—Morris Loeb.

Vice-chairman—Charles Baskerville.

Secretary-Treasurer—C. M. Joyce.

Executive Committee—W. D. Horne, A. G. Stillwell, C. B. Zabriskie and David Wesson.

C. M. JOYCE,
Secretary

THE AMERICAN MATHEMATICAL SOCIETY

THE one hundred and forty-second regular meeting of the society was held at Columbia University on Saturday, February 27, 1909. The brief program required only a single session. Twenty-four members were in attendance. President Maxime Bôcher occupied the chair. The council announced the election of the following persons to membership in the society: Mr. W. T. Campbell, Boston Latin School; Professor W. A. Garrison, Union College; Mr. D. D. Leib, Johns Hopkins University; Professor William Marshall, Purdue University; Mr. J. B. Smith, Richmond, Va., High School; Mr. C. M. Sparrow, Johns Hopkins University. Ten applications for membership were received.

Professor Bôcher tendered his resignation as member of the editorial committee of the *Transactions,* to take effect August 15, it being his intention to spend the coming academic year abroad. Professor Osgood was appointed to fill the unexpired term.

The following papers were read at this meeting:

Edward Kasner: "Brachistochrones and tautochrones."

D. C. Gillespie: "On extremal curves which are invariant under a continuous group."

Virgil Snyder: "Infinite discontinuous groups of birational transformations which leave certain surfaces invariant."

Professor Bôcher presented certain results in extension of his paper "On systems of linear differential equations of the first order," read February 22, 1902, and to be published in an early number of the *Transactions.*

The San Francisco section of the society also met on February 27, at Stanford University. The Chicago Section meets at the University of Chicago, April 9–10. The next meeting of the society will be held at Columbia University on April 24.

F. N. COLE,
Secretary