'On the Relation between Oxygen in Water and the Longevity of the Typhoid Bacillus.'

George A. Johnson, William R. Copeland and A. Elliott Kimberly: 'The Relative Applicability of Current Methods for the Determination of Putrescibility in Sewage Effluents.'

George A. Johnson and A. Elliott Kimberly: 'A Comparative Review of Current Methods for the Determination of Organic Matter in Sewage.'

A. Elliott Kimberly and M. G. Roberts: 'A Method for the Direct Determination of Organic Nitrogen by the Kjeldahl Process.'

A. Elliott Kimberly and Harry B. Hommon: 'The Practical Advantages of the Gooch Crucible in the Determination of the Total and Volatile Suspended Matter in Sewage.'

H. W. Clark: 'The Resistance to Decomposition of Certain Organic Matters in Sewage.'

Stephen DeM. Gage and George O. Adams: 'The Collection and Preservation of Samples of Sewage for Analysis.'

Ernest C. Levy: 'A Ready Method for Preparing a Silica Turbidity Standard.'

George C. Whipple and Andrew Mayer, Jr.: 'The Solubility of Calcium Carbonate and Magnesium Hydroxide and the Precipitation of These Salts with Lime Water.'

George C. Whipple and Francis F. Longley: 'Experience with the Use of a Nonbasic Alum in Connection with Mechanical Filtration.'

H. W. Clark and S. DeM. Gage: 'The Use of Copper Sulphate in Water Filtration.'

H. W. Clark and Stephen DeM. Gage: 'On the Bactericidal Action of Copper.'

Fred B. Forbes and Gilbert H. Pratt: 'Notes in Regard to the Determination of Copper in Water.'

Hibbert Winslow Hill: 'A Notable Source of Error in Testing Gaseous Disinfectants.'

Francis H. Slack: 'Methods of Bacteriological Examination of Milk.'

Hibbert Winslow Hill: 'Suggestions for Change in the Schedules for Making Broth, Gelatin and Agar, Recommended in the Last Report of the Committee on Standard Methods of Water Analysis.'

Hibbert Winslow Hill: 'A Device for Filtering Toxins, etc., by the Use of Water Pressure.'

SOCIETIES AND ACADEMIES.

THE AMERICAN MATHEMATICAL SOCIETY.

The one hundred and twenty-seventh regular meeting of the American Mathematical Society was held at Columbia University, on Saturday, February 24, 1906. Professor W. F. Osgood, the president of the society, occupied the chair. Thirty members attended the meeting. The council announced the election of the following nineteen persons to membership in the society: Mr. M. J. Babb, University of Pennsylvania; Mr. William Betz, East High School, Rochester, N. Y.; Mr. G. D. Birkhoff, University of Chicago; Mr. W. D. Breuke, Harvard University; Mr. B. E. Carter, Massachusetts Institute of Technology; Dr. H. L. Coar, University of Illinois; Miss Anna Johnson, Harvard University; Mr. W. D. Lambert, U. S. Coast Survey; Mr. W. A. Luby, Central High School, Kansas City, Mo.; President W. J. Milne, New York State Normal College; Professor Richard Morris, Rutgers College; Mr. W. J. Newlin, Harvard University; Miss R. A. Pesta, Wendell Phillips High School, Chicago, Ill.; Dr. H. B. Phillips, University of Cincinnati; Mr. A. R. Schweitzer, University of Chicago; Mr. C. G. Simpson, Michigan College of Mines; Mr. A. W. Stamper, Columbia University; Mr. F. C. Touton, Central High School, Kansas City, Mo.; Mr. M. O. Tripp, College of the City of New York. Ten applications for membership were received.

The following papers were read at the meeting:

W. H. Bussey: 'On the tactical problem of Steiner.'

Ida M. Schottenfels: 'On linear fractional transformations of functions of the complex variable $u + \epsilon v$, when $\epsilon^2 = 0$' (preliminary communication).

C. J. Keyser: 'On the linear complex of circle ranges in a plane.'

E. B. Wilson: 'Note on integrating factors.'

Miss R. L. Carstens: 'A set of independent postulates for quaternions.'

W. B. Ford: 'On the analytic extension of functions defined by double power series.'

Oswald Veblen: 'Remark on a measure of categoricalness.'

Virgil Snyder: 'Surfaces generated by conics cutting a twisted quartic curve and a line in the plane of the conic.'

Clara E. Smith: 'Development of a function in terms of Bessel's functions (second paper).'

L. P. Eisenhart: 'Surfaces with the same

spherical representation of their lines of curvature as spherical surfaces.'

PAUL STÄCKEL: 'Die kinematische Erzeugung von Minimal-flächen (erste Abhandlung).'

OSKAR BOLZA: 'A fifth necessary condition for a strong extremum of the integral $\int_{x_0}^{x_1} F(x, y, y')\ dx$.'

A regular meeting of the San Francisco Section of the society was also held on February 24, at Stanford University. The next meeting of the society will occur on Saturday, April 28. The Chicago Section will hold its nineteenth regular meeting on Saturday, April 14, at the Northwestern University Building, Chicago. The date of the next annual meeting of the society has been fixed as Friday and Saturday, December 28–29. The summer meeting and colloquium will be held at Yale University during the week September 3–8. A preliminary announcement of the colloquium lectures will be issued in May.

W. H. BUSSEY,
Assistant Secretary.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 612th meeting was held on January 27, 1906.

Mr. Briggs concluded his communication on 'Centrifugal Methods of Soil Investigation,' pointing out as a third use, to extract the liquid contents of a sample of soil, and fourth, to determine capillary flow of water through soils.

Mr. W. W. Coblentz, of the Bureau of Standards, then presented by invitation a paper on 'The Infra-red Radiation of Gases.' This part of the spectrum has been investigated by photography to 1.2 μ and by phosphorescent plates to 1.7 μ; beyond this point the thermopile, bolometer and radiometer have been used up to 15 μ. The speaker had used an unusually sensitive form of the last-named instrument. He exhibited in ten charts the distribution of radiation from various bodies; as a 'black body,' burning gases, a Welsbach mantle, metals in the carbon arc and gases in a vacuum tube.

Previous investigations on emission lines had extended to 2 μ. He had noticed that this was the limit of the lines predicted by our spectral series formulæ, hence the object of his investigations was to determine whether emission lines could be found beyond this region.

The main points shown were that inert gases like helium and nitrogen have strong lines just beyond the red, while CO and CO_2 have a strong emission band at 4.75 μ. He showed that for gases in a vacuum tube all lines increase in intensity with increase in current, keeping the pressure constant. On the other hand, for constant current and variable pressure the emission lines at 1 μ have a maximum intensity at about 1.5 mm. pressure, while the intensity of the 4.75 μ band does not pass through a maximum. From this he concludes that the lines at 1 μ belong to those in the visible spectrum, while the 4.75 μ band is not thus related, but seems to be of a thermal instead of an electrical origin. For the arc between metal electrodes and for the salts of the metals in the carbon arc he found no lines beyond 2 μ. Another interesting point was that the violet vapor of the carbon arc has no infra-red emission lines except possibly at 1 μ.

Mr. J. F. Hayford then exhibited the new Swiss 'Millionaire' multiplying machine and discussed the speed and limits of accuracy in practical computing of approximate written multiplication, the slide-rule, logarithms, Crelle's table and machines. The new machine, unlike the familiar Thomas-Burkhardt type, requires both multiplicand and multiplier to be set up; but then a single turn of the crank is enough for each figure of the multiplier even though the figure be 9. In practise only about half as many manual operations are required as on the older machine.

Each of the papers gave rise to considerable discussion.

THE 613th meeting was held on February 10, 1906.

President Abbe brought forward informally the problem 'How is the peculiar noise associated with a meteor passing through the upper air produced and communicated to us?' No adequate solution has yet been given.

Mr. F. B. Littell described in detail 'The New Transit Circle of Kiel Observatory' of

eight and one half inches aperture, made by Repsold, and having many novel features. It is mounted in a double-walled semi-cylindrical dome with shutter ten feet wide; the masonry piers have means for observing their stability. The tube is of steel and is shielded. There are three objective screens to reduce all stars to the same magnitudes; a reversion prism and the new transit micrometer are provided. Novel provision is made for determining the errors in collimation, azimuth and level, from flexure and irregularity of pivots, and in graduation of the circle. Mr. Updegraff spoke of the history of such instruments and stated that the first steel-tube transit was made under direction of Professor Harkness in 1889. Messrs. Hayford and Abbe defended the accuracy of the spirit-level when properly used.

Mr. L. W. Austin then spoke on 'The Emission of Negative Particles Produced by the Impact of Canal Rays on Metals.'

In the work described an attempt was made to find whether the positively charged canal rays which pass backward through a perforated cathode in a vacuum tube give rise to reflected rays when they come in contact with a metal plate connected to earth. No reflection of the canal rays was discovered, but it was found that the impact gave rise to an emission of negative corpuscles. Like the well-known negative emission produced by cathode rays this emission increases with the angle of incidence of the canal rays, being about two and one half times as great at 70° as at perpendicular incidence. The negative corpuscles appear to have some considerable velocity, but how great this velocity is has not been determined.

Charles K. Wead,
Secretary.

THE ONONDAGA ACADEMY OF SCIENCES.

The academy held its regular monthly meeting in Syracuse on February 16.

Miss M. L. Overacker spoke of 'A Few Devonshire Ferns,' and exhibited material collected in England during the past summer. Among other ferns, particular interest was expressed in the abundance of *Asplenium Rutamuraria* L. and in the abundance and variability of *Phyllitis Scolopendrium* (L.) Newman.

Mr. George T. Hargitt also presented a paper on 'Regeneration and Growth,' an abstract of which follows.

A preliminary report of a series of experiments which was started at Woods Hole during the past summer, to determine the conditions necessary for regeneration and growth. The animals so far studied include several species of hydroids and the medusa *Gonionemus*. The results obtained show the effect upon regeneration of acid and alkali, and also of various salts, especially those found in the sea water. These solutions and salts were added to normal sea water and also to a synthetic sea water.

The general results suggested were as follows: Acids have a tendency to retard or inhibit regeneration, while alkalies have a tendency to accelerate regeneration. Both acids and alkalies may sometimes act as disturbing rather than as definitely accelerating or retarding stimuli. The effect of these and other chemical stimuli is largely dependent upon the state of vitality and sexual maturity of the animals. Calcium and potassium seem to be necessary for regeneration and growth, but may be present in variable quantities, especially the calcium.

The experiments will be continued during the present year.

J. E. Kirkwood,
Corresponding Secretary.

THE CALIFORNIA BRANCH OF THE AMERICAN FOLK-LORE SOCIETY.

The sixth meeting of the California Branch of the American Folk-Lore Society was held in the Unitarian Church, Berkeley, on Tuesday, February 13, 1906, at 8 P.M. Mr. Charles Keeler presided.

The minutes of the last meeting were read and approved.

The following persons approved by the council were elected to membership in the society, the secretary being instructed to cast the vote of the society for them: Mr. F. Rossi, San Francisco; Professor O. M. Johnston, Stanford University.

Dr. William Popper delivered a lecture on 'Superstitions of the Arabs,' based on his researches and personal experiences among the Arabic-speaking peoples of the Orient.

One hundred and thirty-five persons attended the meeting.

A. L. KROEBER,
Secretary.

THE BERKELEY FOLK-LORE CLUB.

THE third regular meeting of the Berkeley Folk-Lore Club during 1905–6 was held in the Faculty Club of the University of California on Wednesday evening, January 31. President A. F. Lange presided, Professor W. F. Bade acting as secretary *pro tem.* Dr. W. Popper and Dr. A. W. Ryder were proposed for membership in the club and unanimously elected. Professor G. R. Noyes presented the paper of the evening on 'Servian Heroic Ballads.' Mr. Nikolitzsch, who was present as the guest of the club, read one of the ballads in the original. The paper was discussed at length by the members.

A. L. KROEBER,
Secretary.

DISCUSSION AND CORRESPONDENCE.

ISOLATION AND THE EVOLUTION OF SPECIES.

I HAVE read with the greatest interest the discussion on isolation and its relation to evolution, commencing with President Jordan's article in SCIENCE for November 3, 1905.

There are many reasons for believing that in the earlier stages of the segregation that produces two or more species from one, geographical isolation, or at least some degree of local isolation, has had in many cases an influential part. It is, however, important to observe that, when the local variety multiplies and passes over into areas occupied by the original stock, its continued separate evolution must depend on some other form of isolation.

One form of isolation that may prevent the variety from being swamped by free crossing is seasonal isolation due to its having gained a separate season for propagating. This form of isolation is mentioned in one of the quotations given in President Jordan's article.[1]

[1] See page 552.

Another form of isolation is what Romanes has called physiological isolation, which he defines as the prevention of free crossing due to physiological incompatibility between the reproductive cells of different groups of creatures.[2]

But this extended use of the word isolation is not found in the works of Darwin, and even at the present time many writers follow his usage by treating the term as meaning the prevention of free crossing due to geographical separation. This limited meaning of the word, as used by Darwin and the writers of his time, led me for many years to seek other terms when discussing the broad problem of the prevention of free crossing. Separation and segregation are the terms I have chiefly used.[3]

I observe that E. A. Ortmann in his discussion entitled, 'Isolation as One of the Factors of Evolution,' appearing in SCIENCE for January 12, 1906, also uses 'separation' as an equivalent for isolation when meaning the prevention of free crossing. In some of the previous discussions on the subject it has been pointed out that sometimes the nearest allies of a species are found in the same district. In such cases the point of chief interest is that some other form of separation will be found to prevent free crossing between the different races and species. Closely allied plants may bloom at separate seasons and so occupy the same district without crossing. In other cases the pollen of each variety may be prepotent on the stigmas of the same variety. Varieties of birds and mammals differing chiefly in color may be held apart by sexual or social instincts. These and many other forms of isolation have been pointed out in my work on 'Evolution, Racial and Habitudinal,' published by the Carnegie Institution.

I have also brought together many reasons for believing that without isolation one species can not be transformed into two or more

[2] See 'Darwin and After Darwin,' Part III., entitled 'Isolation,' pp. 43–47.

[3] See my three papers published in the *Linnean Society's Journal*, between 1872 and 1889, also three articles published in the *Amer. Jour. of Science* for 1890.