degree rather than character. A paper of very general interest is that on the 'Action of the Larynx in Relation to the Pitch of the Voice' by Thomas Fillebrowne showing that the larynx should *not* rise with the pitch if one wishes to retain the vocal powers. There are a series of abstracts of papers presented at the Indianapolis meeting of the Public Health Association as follows: 'Observations on Methods for the Detection of *B. coli communis* in Water' by E. E. Irons, 'Variation of the Properties of the Colon Bacillus, Isolated from Man' by W. W. Ford, 'Thermal Death Point of the Tubercle Bacillus and its Relation to the Pasteurization of Milk,' by H. L. Russel and E. G. Hastings, 'A Note on the Disinfectant and Deodorant Properties of Ammonium Persulphide,' by M. P. Ravenel and S. H. Gilliland, and 'An Inquiry into the Rôle of the Domestic Animals in the Causation of Typhoid Fever,' by W. R. Stokes and John S. Fulton.

In *The Popular Science Monthly* for March Simon Newcomb continues his 'Chapters on the Stars' this instalment being devoted to statistical studies of proper motions, concluding that, so far as we can judge, our own system is near the center of the stellar universe. R. H. Thurston considers 'The Law of Substance,' substance being what we are familiar with as 'matter.' Dudley Allen Sargent discusses 'The Height and Weight of the Cuban Teachers' who were in Cambridge last summer, showing that in these points they fall below the average of our own teachers. The reasons for this and the remedy are suggested. Hudson Maxim treats of 'Throwing a High Explosive from Powder Guns' considering that this problem and that of firing high explosives through armor plate have been successfully solved. Harold W. Fairbanks describes 'Pyramid Lake, Nevada' and its curious tufaceous formations, and William H. Hobbs deals with 'The Geologist Awheel' believing that topographical work may be greatly expedited by the use of the bicycle. 'The Formation of Habits in the Turtle' by Robert Mearns Yerkes, describes a series of experiments showing how a turtle learned, or acquired, the shortest route around a number of obstacles to its nest. In 'The Science of Distances,' being the address of the President of the Geographical Section of the British Association, George S. Robertson shows how steam and electricity have shortened the time between distant places and hints at what may be hoped for in the future. Finally Havelock Ellis continues 'A Study of British Genius,' this instalment being devoted to a consideration of the influence of birth and race. Perhaps the most interesting of the brief articles are those discussing the relations between the Government and science.

SOCIETIES AND ACADEMIES.

GEOLOGICAL SOCIETY OF WASHINGTON.

The 110th meeting was held at the Cosmos Club, February 13, 1901. The following papers were presented:

Age of the Coals at Tipton, Blair County, Pennsylvania: Mr. David White.

It was shown that the coals occur in a down-faulted block of coal measure beds surrounded by Pocous strata.

Production of the B. & M. Plant at Great Falls, Montana: Mr. R. H. Chapman.

A view of the reduction works was shown and specimens of the copper products exhibited.

Notes on Two Desert Mines in Southern Nevada and Utah: Mr. S. F. Emmons.

The Delamar mine is situated on the western slopes of the Meadow Valley Range in southeastern Nevada. Its ore-body occurs in a heavy series of quartzite beds of Cambrian age, that strike in a northwesterly direction and dip 23° southeast. The so-called vein is a fracture plane whose strike varies but slightly from that of the enclosing quartzite, but its dip is 70° to 80° to the northwest, or nearly at right angles to the strata. It neither has vein-filling, nor is it mineralized to any considerable extent, but has zones or chimneys of crushed quartzite along it that have been mineralized and carry the ore values. Two granite-porphyry dikes about 30 to 40 feet in width run nearly at right angles to the main fracture, and are crossed by a narrow dike 6 to 10 feet wide of basic lamprophyric rock, so decomposed that its mineral composi-

tion is difficult to recognize. It is sometimes called 'gouge' by the miners. The main fracture plane follows this dike, generally within its walls. The principal ore-chimney is a zone of crushed quartzite around the intersection of this dike and fracture plane with the first granite porphyry dike, where it approaches most closely to the second. All the dikes show evidences of deformation since their intrusion. Smaller ore bodies are found in the hanging wall of the dike to the northward and generally only a few feet in width, while the greater ore chimney, which is divided into four parts by the intersecting and practically barren dikes, has an area of about 200 feet square in horizontal section. The ore is an intensely crushed quartzite, recemented and largely replaced by silica, so that often nothing of the original granular structure of the quartzite is distinguishable. The unoxidized ore shows, besides quartz, only a little finely divided pyrite, very little microscopic chalcopyrite and some telluride in spots. The interesting feature of the mine is the variation in the tenor of its ore, whose values are mainly in gold, the bullion being only 300 fine. In a broad general way it may be said that the values increased downwards to the 700-foot level from $20 to $40 and often to $70, to the ton, small lots running very much higher. From there downwards the values have decreased to about $6 or $8 at the tenth level, and to only $1 to $3 dollars at the fifteenth and sixteenth levels. It is evidently a case of enrichment by gradual leaching down of the precious metals, but as the country is so dry that there is never any moisture in the mine, it must be assumed that this leaching took place in an earlier geologic period, when there was greater precipitation; presumably during the Bonneville period.

The Horn silver mine, in southwest Utah, occurs in a region of very much more complicated geological structure. The Grampian Hills at the south end of the San Francisco Mountains consist of more or less crystalline Paleozoic limestone into which a monzonite mass (locally called syenite) has been intruded in stock-like form. A broad contact zone between limestone and monzonite (locally called andesite) is made up of a dark brown rock, consisting mainly of garnet with many other contact minerals, notably, a white, fibrous tremolite (locally called needle spar).

Opposite the mining hamlet of Frisco, an east and west fault has cut through limestone and monzonite, raising the latter so that it abuts against the former. Along the east base of the hills is a later fault plane, running magnetic north and south, along which more recent andesitic breccias form the hanging-wall, and limestone or monzonite, as the case may be, the foot-wall, the fault plane having a steep dip to the eastward. It is this fault plane that constitutes the Hornsilver vein. The fault fissure or zone varies in width from a maximum of 90 feet down to one or two feet, and has been opened to a depth of 1,600 feet. It is by no means all ore, but consists in great measure of crushed wall-rock, limestone or andesite, as the case may be, but so much altered that its original character is difficult to determine. The ore bodies which have been of great size were largely replacements of this material. It is well known that in its early history, about 1880 to 1885, the mine produced enormous masses of rich silver-lead ores and paid some four millions in dividends in spite of high costs of production, due to its situation in the midst of the desert.

The interesting feature to which the speaker called attention is that whereas neither copper nor zinc was recognized as a constituent of the ore in the upper levels, the main values of late years have been found in a very rich body of copper ore, largely copper glance, extending from 650 down to 750 feet. Moreover, at 500 feet, zinc minerals began to show in small amount, and now in the lower levels the largest ore masses carry 40 to 50 per cent. of zinc, with 6 or 8 per cent. of silver, it being estimated that they have 300,000 tons of this ore in sight. In the deeper part of the mine, while the fault zone holds its width in the main chimney, the ore values have shrunk below the workable point. This is evidently another instance of the leaching down and concentration into the middle levels of the mine of the more soluble salts of copper and zinc, and their reprecipitation in more or less segregated bodies.

The Asphalt and Bituminous Rock Deposits of the United States: Geo. H. Eldridge.

The asphalts, by this meaning the several varieties of purer hydrocarbon compounds, such as uintaite, grahamite, etc., occur in vein form in rocks of Ordovician, Carboniferous and Tertiary ages. They are found in West Virginia, Indian Territory, Colorado, Utah and California. The most remarkable veins are in Utah near the Colorado line, where a maximum width of 18 feet and an uninterrupted length of 10 miles for a single vein have been observed. In California they occur in proximity to the developed oil fields, and the material is here of softer nature than that found in the veins of Utah and elsewhere. Where the veins occur in shales they are irregular and interrupted.

The bituminous rocks embrace both sandstones and limestones. The limestones as yet known are confined to Indian Territory, Texas and Utah; in Texas, in the upper part of the Ordovician, and in Utah, in the Green River Tertiary formation. Those of Indian Territory are conspicuous for their thickness and extent. At one point a bed of 350 feet, impregnated from bottom to top, was observed, having a lineal extent of something over two miles, with considerable variation in the thickness of the bed. Bituminous sandstones are the most generally distributed in the United States, occurring of especial richness in Kentucky, Indian Territory, and in the Coast ranges of southern California. The percentage of bitumen contained in these rocks varies up to a maximum of 14 in the limestones and 20 in the sandstones.

F. L. Ransome,
David White,
Secretaries.

BIOLOGICAL SOCIETY OF WASHINGTON.

The 335th meeting was held on Saturday evening, February 23rd.

Under the head of notes, B. W. Evermann spoke of the aquatic vegetation observed during the winter at Lake Maxinkuckee, Ill., saying that it remained green and flourishing at a late date. The manner in which the reproductive buds were formed on the species of *Potamogeton* and *Valisneria* was described, and it was stated that it was these buds of the wild celery that were sought after by the coots and ducks.

W. H. Ashmead stated that the examination of the Hymenoptera collected by Trevor Kincaid of the Harriman Alaskan Expedition had raised the number of species known to occur in Alaska from 28 to 318, 195 of which were new. Four European species were noted for the first time as occurring in Alaska, while 30 of the genera had never before been reported in North America.

E. L. Morris exhibited photographs of four new species of *Plantago* stating that these pictures, which were remarkable for their distinctness of outline and detail, were for the purpose of supplying the U. S. National Museum with accurate figures of types which belong to other collections.

F. A. Lucas described 'A Fossil, Flightless Auk' obtained at Los Angeles, Cal., from beds stated by Mr. Dall to be of Upper Miocene, or Lower Pliocene age. The bird was represented by only the proximal part of the humerus, but this showed it to have been somewhat less in size than the Great Auk and more highly specialized, the humerus being shorter, more flattened and more curved, with sharper muscular ridges than the corresponding bone in that species. The name *Mancalla californiensis* was proposed for the fossil auk, and its nearest living relative stated to be the California Murre. The specimen will be described in detail in the Proceedings of the U. S. National Museum.

W. P. Hay presented a paper 'On the Distribution and Classification of the North American Crayfishes' giving first a brief review of the classification of the Astacoidea in which four families were recognized—Eryonidæ, Homaridæ, Parastacidæ and Astacidæ. In the Astacidæ the three genera *Astacus*, *Cambaroides* and *Cambarus* were described and their distribution commented on.

The American species of *Astacus* and *Cambarus* were then taken up and a few points on the life history of these animals were given. It was stated that the five groups of Faxon are natural and well marked and are worthy of subgeneric rank at least. Contrary to Dr.

Faxon's belief, the author contended that the fifth group of crayfish, including southern United States and Mexican species, is the most generalized and resembles Cambaroides most closely. This would seem to indicate that the theories of Huxley and Faxon to explain the distribution of the Astacidæ will not hold good and that the original home of the Astacine progenitors was in southern seas and invaded the continents from that direction. It was further stated that the specialization of *Cambarus* is probably much more ancient than the specialization of *Cambaroides*, and that the resemblance between *Cambaroides* and *Cambarus* is accidental and does not indicate a close relationship.

M. B. Waite spoke of the 'Influence of Vegetation on the Sand Formations of the Michigan Lake Shores,' his remarks being illustrated by lantern slides. He showed how dunes may originate by the sand being at first held in check by grass, which grows upward and outward as the sand accumulates, and illustrated the gradual progress inland of dunes and the manner in which the sand moved slowly forward in great waves to overwhelm the adjacent country.

F. A. LUCAS.

PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 530th meeting of the Society was held February 16, 1901. Mr. R. H. Strother called attention to the fact there are now three processes of making phonographic records that promise to be permanent, so that the early idea of making records of speech for posterity now seems feasible.

Mr. R. A. Harris read a paper entitled, 'A Few Questions in Hydrodynamics.' This re viewed briefly the kinds of problems in liquid wave motion which have been considered in articles and treatises on hydrodynamics. But its chief object was to point out the lack of attention given to oscillations in bodies of water having incomplete boundaries, although a somewhat analogous subject, viz., that of the open organ pipe, had received much attention. The behavior of water in straits is also a neglected subject. The case treated by Airy really applies only to motions in straits not extremely short, and where the bodies connected are comparatively deep. These and other hydrodynamical questions, it was contended, must be investigated before satisfactory progress can be made in the theory of tides.

Mr. J. F. Hayford presented the 'Recent Progress in Geodesy,' referring to the triangulation in progress on the 98th meridian; the connection of the principal United States and European stations by pendulum observations; the connection recently made between several independent systems of precise levels, so that the elevations of some 4,000 places have now been published; and the results of the calculations of the axes of the terrestrial spheroid based on the United States observations. [This paper appeared in SCIENCE for March 8th.] A spirited discussion followed regarding the accuracy of the new and rapid base-line measurements, and the leveling between the Gulf of Mexico and the Atlantic Ocean.

CHARLES K. WEAD,
Secretary.

AMERICAN MATHEMATICAL SOCIETY.

A REGULAR meeting of the American Mathematical Society was held at Columbia University, New York City, on Saturday, February 23, 1901. About thirty persons attended the two sessions. The President of the Society, Professor Eliakim Hastings Moore, occupied the chair. The following persons were elected to membership: Professor John F. Downey, University of Minnesota; Professor F. C. Ferry, Williams College; Mr. H. T. Gerrans, M.A., Oxford University; Mr. Edwin Haviland, Jr., New York City; Professor A. E. H. Love, Oxford University; Mr. V. R. Thyagarajaiyar, Bangalore, India. Two applications for membership were received.

The following papers were presented at this meeting:

(1) Dr. H. E. HAWKES: 'Note on Hamilton's determination of irrational numbers.'

(2) Professor E. B. VAN VLECK: 'On the convergence of continued fractions with complex elements.'

(3) Dr. M. B. PORTER: 'On linear homogeneous finite difference equations, with applications to certain theorems of Sturm.'

(4) Professor L. E. Dickson: 'Concerning real and complex continuous groups.'

(5) Professor E. O. Lovett: 'An application of continuous groups to non-euclidean geometry.'

(6) Professor E. O. Lovett: 'Contact transformations which change asymptotic lines into lines of curvature.'

(7) Professor H. B. Newson: 'Indirect circular transformations and mixed groups.'

(8) Mr. W. B. Fite: 'On metabelian groups that cannot be groups of cogredient isomorphisms' (preliminary communication).

(9) Dr. Edward Kasner: 'On algebraic potential curves.'

(10) Professor Maxime Bôcher: 'Green's functions in space of one dimension.'

(11) Dr. H. E. Hawkes: 'Estimate of Benjamin Peirce's linear associative algebra.'

(12) Dr. G. A. Miller: 'On holomorphisms and primitive roots.'

(13) Dr. Edward Kasner: 'Theorems on collinear lines in space.'

(14) Mr. C. W. M. Black: 'Decomposition of a form in n variables in an arbitrary domain with respect to a prime ideal modulus.'

(15) Professor Maxime Bôcher: 'An elementary proof of a theorem of Sturm.'

(16) Dr. L. P. Eisenhart: 'Surfaces whose first and second fundamental forms are the second and first respectively of another surface.'

(17) Dr. L. P. Eisenhart: 'Possible triply asymptotic systems of surfaces.'

(18) Dr. H. F. Stecker: 'On the determination of surfaces capable of conformal representation upon the plane in such a manner that geodetic lines are represented by algebraic curves.'

(19) Professor Maxime Bôcher: 'Non-oscillatory linear differential equations of the second order.'

The next regular meeting of the Society will be held on Saturday, April 27th. The Chicago section will meet at the University of Chicago, on Saturday, April 6th.

F. N. Cole,
Secretary.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

At the meeting of the Academy of Science of February 18th, 1901, 23 persons present, Professor J. L. VanOrnum read an address of general interest, summarizing the progress made in engineering during the nineteenth century.

A paper entitled 'Florida lichens,' by Professor P. H. Rolfs, was presented by title.

Professor F. E. Nipher showed two photographic negatives, developed by an ordinary pyro developer. One plate had been exposed in a printing frame for 1,000 seconds at a distance of a meter from a 300-candle lamp. It was then treated for ten minutes in a chromic acid bath having ten drops of an eight-per-cent. solution of chromic acid to three ounces of water. This treatment was in the dark-room. The plate was then developed in the dark-room.

The exposure of the other plate had been equivalent to a tenth of a second at the same distance from the lamp, and was exposed under the same plate. This plate developed normally in a pyro developer, having six drops of bromide and six drops of potassium ferro cyanide, both in ten-per-cent. solutions. The over-exposed plate showed more of detail, but the contrasts were less strong than in the plate with normal exposure. It looked like a slightly under-exposed plate.

When a plate with this exposure is treated with the chromic acid bath while in the light, and is then developed in the light, a positive picture results. The chromic acid bath may be replaced by ten drops of saturated potassium bichromate solution, and four drops of common C. P. nitric acid, to three ounces (90 cc.) of water. There is reason to believe that any camera exposure which was intended to be correct may be developed as a positive in the light by such methods. It is certain that it may be handled as a negative in the dark-room.

Professor Nipher stated that if either a negative or a positive had been started and had resulted in a failure, due to improper treatment, the picture with the fog on the plate might be chemically destroyed by chromic acid, and the picture might be redeveloped in either case either as a negative in the dark-room or as a positive in the light.

It was also stated that one plate had been developed as a superb negative at a distance of a meter from a 300-candle lamp. This case was

very remarkable, because, on account of an accident in the treatment, a failure or a poor positive had been expected. Several repetitions of this treatment had failed to yield this result again.

It is frequently observed that with a strong pyrocatechin developer the picture will start as a negative in the light, and will reach a fair degree of excellence, and then reverse. This is in the nature of an oscillation such as is known in electric discharges. The phenomenon is not observed in a weaker or in a more slowly acting bath. The anomalous case before referred to could hardly be accounted for in this way, because the picture developed very slowly in a normal hydrochinon bath, and grew steadily better until it was sharply defined on the back of the film. This case is still being examined.

A short biographic sketch of the late Charles Pierre Chouteau, a charter member of the Academy, who in its early years, as the western representative of the American Fur Company, contributed many important collections to its Museum, was presented by a committee appointed for that purpose.

Two persons were elected to active membership.

WILLIAM TRELEASE,
Recording Secretary.

DISCUSSION AND CORRESPONDENCE.

A FIELD FOR MOSQUITO THEORISTS.

CLIMATIC CONDITIONS ON THE UPPER CONGO.

TO THE EDITOR OF SCIENCE:—The following extracts from letters of Father Grison, a Missionary at Stanley Falls, and Mg'r Roelens, Vicaire Apostolique of the Upper Congo, addressed to the Société Antiesclavagiste of Belgium, may be of interest. G. R. S.

WASHINGTON, D. C.,
February 12th.

At Stanley Falls the climate is very agreeable, but is formidable, as the victims of fever are too numerous. Europeans have very inaccurate ideas of tropical temperatures. I have passed eight years at the equator on the Pacific Coast, and have never seen the mercury above 29° C.

Here the maximum is 32° C. and the nights are deliciously cool. This is our climate all the year.

There is, however, a reverse to this picture. We have frequent tempests of indescribable violence; I have counted in one minute during a diluvial rain and continuous thunder, sixty-six flashes of lightning; and have seen in two hours within a radius of a few hundred meters, ten *coup de foudres*.

Mg'r Roelens at M. Pala, writes:

The work of the Mission allows me little leisure for anything else than an occasional attack of fever.

The fever, however, does not ask if you have the leisure, but imposes it at will, and unhappily, a little too frequently.

Dame fever reigns as mistress of the country.

In the rainy season, from November to May, her tyranny is most severely felt; no one escapes attack; the newly-arrived are most susceptible, but the old residents are not completely immune.

Those who have been resident more than a year are the chosen victims of the terrible hæmaturic fever (Malarial hæmaturic, or 'Swamp fever.') In five years' residence I have had the fever fourteen times! For the last two years, fortunately, it has left me in peace.

Brother Stanislas, who has resided here since 1893, is now sick with it for the twenty-fifth time.

It is an old saying here that the third attack is always mortal.

We, however, have passed the period when our lives are despaired of; this result is due to the treatment we have followed here.

Since 1892 the missionaries of the Upper Congo have applied this treatment to seventy-five cases of this fever, of which five only have been fatal.

Beside this there are no other grave climatic dangers for Europeans. The dysentery, which elsewhere is a serious menace, does not occur here.

I suspect that the English at the south of us find this malady more frequently in their boxes of conserves, and in *la dive bouteille*.

At this moment an epidemic of smallpox is invading the country. It is said here that this recurs every seven years, and attacks all who escaped the previous invasion.

We cannot depend upon the vaccine of Europe, because of the long voyage and the great heat.

I have given it many trials without result.

SHORTER ARTICLES.

ARE THE AUSTRALIAN MARSUPIALIA OF OPOSSUM DERIVATION.

AT the last meeting of the American Association for the Advancement of Science, in June, 1900, the writer presented some reasons in