

River" is by some map-makers already erroneously applied to the whole of the Hsi-chiang river. It would be as correct to call the River Ganges the "Hoogli."

### THE ST. PETERSBURG ACADEMY OF SCIENCE.

WE have before us the yearly Report of the St. Petersburg Academy of Science, drawn up by its new secretary, Prof. A. A. Strauch; it is full of interest, as it gives a careful analysis of the scientific work done by the Academy. After having mentioned the losses sustained by the Academy, and the new members elected, Prof. Strauch passes in review the scientific institutions connected with the Academy. The Pulkova Observatory is now under the directorship of the Moscow Professor, Th. Bredichin, well-known for his researches into the structure of comets; the Physical Observatory, under H. Wilde, has added to its former weather warnings a system of warnings of snowstorms, which are sent to the Russian railways. A new laboratory for researches into the physiology and anatomy of plants has been opened; while the remarkable ethnographical and anthropological collections of the Academy (which contain the collections brought in by Krusenstern, Lütke, Junker, Miklukho-Maclay, Polyakoff, and so on), have been lodged in a separate museum, now opened to the public. Rich collections, especially zoological, from Caucasia, Turkestan, and Mongolia, were received during the past year. Among the recent acquisitions of the library, Mr. Friedland's collection of Hebrew printed works, old and new, some of which are very rare, is especially valuable.

As to the scientific work done during the last year, the following are especially worthy of notice.

In mathematics, Prof. Ishmenetsky, continuing his researches into the functions of Bernoulli, has shown the use which may be made of them to explain the geometrical meaning of Euler's formula for the approximate calculation of surfaces limited by curves; Prof. Markoff's work on the transformations of slowly convergent series into rapidly converging ones, and M. Bortkevitch's researches into the average duration of life in Russia, are also valuable contributions.

In astronomy, Prof. Backlund, besides geodetical work in the north of Russia, continued his calculations of the ephemerides of Encke's comet, which will reappear this year.

In physics, O. D. Chwolson's work upon the conductivity of metals at various temperatures is mentioned.

In meteorology, we find, besides a review of the already known publications of the Central Physical Observatory, special reference to H. Wilde's memoirs on a new (very practical) instrument of his own invention for measuring magnetical inclination, as also on his anemograph, registering pluviometer, and atmograph.

In chemistry, Prof. N. Beketoff continued his work upon the physical and chemical properties of cesium and its oxides.

In geology, Dr. Rogon published an interesting work upon the Ganoid fishes of the Upper Silurian deposits of Oesel, as also on the Jurassic fishes of Ust-Balei in East Siberia. The six species discovered in these last deposits are intermediate forms between the Mesozoic Ganoids and the *Teleostei*. M. Tschersky's work is especially interesting: taking advantage of more than 2500 specimens (70 species) of fossil Mammalia discovered in Northern Siberia, he prepared a most elaborate monograph on Post-Pliocene Mammalia, which contains, first, a full account of what is already known about the Quaternary mammals in Siberia, a description of the Post Pliocene formations of Siberia generally, and their mammalian fauna, with incidental remarks upon the fauna of the caves, and, finally, a very good systematic description of 25 Post-Pliocene mammals.

In botany, the work of Prof. Maximowicz on the flora of Tibet is prominent. This flora is of high antiquity, and consists, besides its own endogenous species, of immigrants from both the Himalayas and the mountains of Mongolia. Many of those immigrants have already evolved into distinct species. Later immigrants came from China, and, later on, the Tibet flora was completed by our familiar northern plants. The orographical division of Tibet into a plateau in the west, and Alpine tracts in the East holds good for the flora as well. As to the flora of Mongolia, it is an impoverished continuation of the flora of South Siberia. Prof. Famintsyn continued his researches into the symbiosis of Algae with Infusoria. The green grains often seen in several Infusoria proved to be Algae having a nucleus, chromatophores, and covered with a jelly-like

envelope; their structure is identical with that of monocellular Algae, and they multiply within Infusoria by partition. But they are incapable of an independent life, and die out soon after the death of the Infusorium they have lived in. Further research is now being carried on to ascertain in what conditions they might live independently.

In zoology, the chief work of the Academy consisted in the publication of the zoological results of Prjevalsky's expeditions. Two fascicules have now been issued containing the description of the Rodents, by E. A. Bichner, and the description of the families of *Silviidae*, *Timeliidae*, and *Accentoridae*, by Th. Pleske. The chief interest of the latter fascicule is in the new genus of birds, *Lophobasilus*, which appears to be a connecting-link between the *Sylvia* and the *Regulus*. S. M. Hertenstein described some new fishes from the Russian Pacific coast, and E. A. Bichner made a preliminary review of a small but very interesting zoological collection brought in by MM. Potanin and Berezovsky from the Chinese province of Kansu, and now lodged at Irkutsk. Th. Pleske issued the fourth fascicule of his "Ornithographia Rossica," which contains the description of ten Russian species of *Acrocephalus*.

In anatomy and physiology, Prof. Owsianikow continued his researches into the striation of some nerves, and Dr. Tarenetski described forty-four Aino skulls from the island of Saghalien. The author is inclined to admit that they belong to a race quite different from the Mongolian.

In ethnography the Report mentions the following works:—Dr. Bilenstein has terminated an important work upon the geographical distribution of the Letts, now and in the thirteenth century, in Courland and Livonia. In view of the capital interest of this work, it will be published by the Academy separately, with an atlas of maps. Prof. W. Radloff has published a *facsimile* of a most important document, the "Kudatku-bilik," which is the oldest representative of the Uigur language, and has, for Turkish dialects, almost the same importance as Ostromir's Gospel has for the Slavonian languages. To complete the historical and linguistic materials which will be associated with this publication, M. Radloff consulted the Eastern manuscripts of the British Museum, and is now preparing a general work upon the subject. In connection with the above, Prof. Eitling, of Strasburg, prepared for the Academy a table of Uigur, Mongol, and Mantschu alphabets, which shows that they originated from the Syrian alphabet. The likeness between Syrian and Uigur letters also permits us to guess the sounds which separate letters had in the Uigur language. Prof. Wasilief's notes on his journey to West Siberia are also worthy of note. The learned Professor is now preparing a work on the geography of Tibet, as well as the second volume of his great work on Buddhism. Finally, M. Katanoff (of Sagai origin) visited, last year, Northern China and Turkestan, and collected a good many interesting materials relative to the Tartars, and especially the now rapidly disappearing Soyotes. His collection of tales, songs, Shaman prayers, &c., is remarkably interesting, the more so, as all has been written down in the Soyote language (with Radloff's Turkish alphabet), and transcribed for print, on the spot, among the Sagais, who speak the Soyote language correctly. P. K.

### A METHOD OF DETERMINING SPECIFIC GRAVITY.

THE specific gravity of a single Foraminifer, such as a Globigerina, of the scales from a butterfly's wing, or of a drop of its blood, might seem a difficult task to ascertain, as indeed by the ordinary gravimetical methods it would be plainly impossible. Yet nothing can be easier, given the following method. And to conduce to brevity we shall describe its application in a particular case, say to the spicules of the common shore sponge (*Halichondria panicea*). A quantity of one of the well-known heavy fluids, such as cadmium-boro-tungstate, or potassium-mercury-iodide solution, or methylene iodide, is diluted down to a density of about 2.25 (which is known to be above that of the spicules), and introduced into a small glass tube, about one-quarter of an inch in diameter, and with two opposite flattened faces. This is cemented by one of its flat faces to an ordinary microscope slide, the axis of the tube being set at right angles to the length of the slide.<sup>1</sup> The tube being about half-filled with heavy fluid, water (or in the case of methylene iodide,

<sup>1</sup> See Proc. Roy. Dublin Soc., vol. iv. p. 374, 1885, and Journ. R. Micr. Soc., vol. v. p. 579.

benzole) is poured in, and this not too carefully, since partial admixture will serve to expedite the process. The vessel is now left to stand for a few hours or over-night. In the morning the change in the specific gravity of the column of fluid will be found to increase *uniformly* on passing from the top downwards. To make certain of this three small indexes of different specific gravities, say 2.15, 2.03, and 1.98, are thrown in: naturally they sink till they each reach that level in the column where the specific gravity is identical with their own—"their own level," as we may briefly term it. The distances between them may be determined by bringing them successively into the focus of the microscope, and then reading off the position of the edge of the microscope slide by means of two parallel scales attached to the stage of the instrument.

If it be found that these distances are exactly proportional to the known differences of specific gravity, then the increase in density of the column must be uniform. It will save arithmetic if the distances and densities be referred to two rectangular axes, and a curve constructed; evidently when the change in density is uniform, the curve will be a straight line.

The sponge spicules are next introduced (in practice they are added at the same time as the indexes), and, like the indexes, sink to their own level. The position of this is read off as in the case of the indexes, and being referred to the axis of distances in the diagram, the specific gravity will be found on the corresponding axis of density. In this way it is easy to determine the specific gravity of individual spicules, and with a certainty that does not always attach to specific gravity determinations on large bodies by ordinary methods. The specific gravity of the spicules as a result of actual experiment is found to be 2.036, the great bulk of them floating at a level indicating this, but individual examples may sink to 2.09, while others do not fall below the level of 2.02.

It is only rarely that one needs to employ a microscope in this method; usually a test tube serves admirably to hold the heavy fluid, and a graduated glass mirror affords the speediest means of reading off the distances of the levels. So easy, accurate, and sure, has experience shown this method to be, that I now use it whenever practicable in preference to any other: unfortunately its range is limited to specific gravities below 3.45.

The indexes may be small fragments of minerals, or chemically pure substances of known density, such, for example, as yellow phosphorus (1.85), sulphur crystallized from carbon disulphide (2.07), and the like; or little floats may be made by manipulating short lengths of capillary glass tube. The ends of the bit of tube are successively sealed, the last to be fused generally blowing out into a little bubble during the process, and thus giving a form to the float which causes it to assume the vertical position when suspended in the heavy fluid. The quantity of solid glass in the float as compared with hollow, is determined chiefly during the sealing of the first end, since this merely fuses together without blowing out. Having constructed a good supply, some dozens, of these floats, they are thrown into a diffusion column along with three mineral indexes of carefully determined density: by reference to these, the specific gravity of each float can be found, and it can then be fished out from the fluid with a dipping tube, and preserved in a labelled box for future use.

The density of fluids can be ascertained in the same way as that of solids; but if the fluid be watery, an oily fluid such as methylene iodide, with benzole to dilute it, must be used for the diffusion column; while if it be oily, the diffusion column must be an aqueous solution, it may be of cadmium-boro-tungstate, or some other heavy salt.

There is, finally, one other case in which density can be determined by this method, while all others fail: given a gelatinous precipitate, like some of the silica hydrates, in which one has a sponge of loosely combined hydrate with additional water mechanically present filling the meshes, to find the specific gravity of the hydrate. This is not possible by ordinary methods, for one cannot be sure that no combined water is lost in the process of drying, which must precede the application of gravimetric processes. But if a small clot of the gelatinous substance be introduced into a diffusion column, the mechanically mixed water will slowly diffuse out, and its place be taken by heavy fluid till the hydrate has reached its own level, where it will rest, its meshes then being filled, no longer simply by water, but by solution of the same specific gravity as its own. I am at present investigating the composition of the silica hydrates by a process based on this method. W. J. SOLLAS.

## UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The General Board of Studies propose to appoint Mr. J. J. Lister, M.A., of St. John's College, Assistant to the Superintendent of the Museum of Zoology and Comparative Anatomy (Mr. J. W. Clark) for a period of three years. He will give special attention to the preparation of a new Catalogue of the Museum.

The Mechanical Workshops Inquiry Syndicate make proposals which virtually amount to the establishing of an Engineering School and Laboratory under Prof. Ewing, by recommending an annual expenditure of some £700 for demonstrations and apparatus. Another Syndicate report in favour of reserving a considerable area of ground between the Chemical and the Physical Laboratories for buildings in which the Engineering School may be accommodated. But the erection of these buildings and their equipment with suitable plant depend on a handsome response being made to the appeal for funds from outside the University which Prof. Ewing has in contemplation. It is to be hoped that his energy and fervour in the cause of engineering education in Cambridge may be adequately rewarded by generous benefactions to the Engineering School.

The Sites Syndicate propose that the remainder of the ground available in the New Museums area should be assigned (1) to the necessary extension of the Cavendish Physical Laboratory; (2) to the Botanical Department for new class-rooms, &c.; (3) to the Departments of Medicine, Surgery, &c.; (4) to the Sedgwick Memorial Museum of Geology; and (5) to the temporary accommodation of the Classical and Modern Language Lecturers. The Syndicate have been unable to assign special rooms to the Lecturer in Geography.

## SCIENTIFIC SERIALS.

*American Journal of Science*, February.—A solution of the aurora problem, by Prof. Frank H. Bigelow. The question considered is the location in space of the visible aurora arch and streamers, referred to the surface of the earth, as seen by an observer. The observations required to test the theory which is developed consist in measuring the angle of inclination of a streamer to the vertical plane passing through the station, together with the azimuth of the ray. A simple piece of apparatus, suitable for such measurements, is described. The problem is of importance, because it bears upon the physical connection between the sun and the earth, as communicated through the medium of the ether.—Columbite and tantalite from the Black Hills of South Dakota, by W. F. Headden. A full description is given of the constitution of these minerals.—Note on the geology of the Florida phosphate deposits, by N. H. Darton.—Record of a deep well at Lake Worth, Southern Florida, by the same author. The well penetrated the great sand mantle at Lake Worth, and extended down into the Vicksburg limestone to a depth of 1212 feet. The section obtained from the borings is an important one, inasmuch as it throws some light on the general stratigraphy of a portion of Florida of which little was hitherto known.—On the chemical composition of aurichalcite, by S. L. Penfield.—The compressibility of hot water and its solvent action on glass, by Carl Barus. As a general deduction from the experiments, the author infers that in many instances a definite dissociation temperature of the solid must first be surpassed before solution will set in.—An attempt to harmonize some apparently conflicting views of Lake Superior stratigraphy, by S. R. Van Hise.—Powellite calcium molybdate, a new mineral species, by W. H. Melville.—Brückner's "Klimaschwankungen," by Frank Waldo. This is an extended review of Dr. Edward Brückner's important work on oscillations of climate, published last year.—The gigantic Ceratopsidae, or horned Dinosaurs of North America, by O. C. Marsh (with ten plates); read at the Leeds meeting of the British Association for the Advancement of Science, 1890.

*Bulletin de l'Académie Impériale des Sciences de St. Pétersbourg*, new series, vol. i. No. 4.—On the products of condensation of benzaldehyde and the phenols, by A. Rusanoff (in German).—List of the (thirteen) *Scotylus* species in the Museum of the Academy, by P. Shevyreff. Two species (*S. ventrosus* and *S. unispinosus*) are new.—On some observations made by Winnecke at Pulkova with the meridian circle in 1861–63, by O. Backlund (in German).—