of the salary of a curator and for the acquisition of new specimens. This collection, so liberally provided for, includes many noble examples of rare minerals.

"The University of Pennsylvania possesses also a mineral cabinet which is administered by Dr. Genth, whose private collection is probably in some respects unique, especially as regards pseudomorphs and minerals which have been derived from others by alteration. Here it may be mentioned that in Philadelphia there are several important private collections of minerals which have been acquired at great expense by their owners—among them those of Dr. Lea and Mr. Bemment are especially noteworthy. However scientific institutions may have progressed in other parts of the United States of late years, Americans cannot but admit the debt which their country owes to the Academy of Natural Sciences for the leading part which it has taken for so many years in the advancement of knowledge of the natural sciences."

Mr. Ball gives a somewhat detailed account of the American Museum of Natural History, New York, which, however, we need not quote, as we recently referred to it in some detail.

The well-known Massachusetts Institute of Technology, Boston, was founded by charter in 1841, its objects, as sketched out by its first President, Prof. Rogers, being threefold, namely, the establishment of a Society of Arts, a Museum of Arts, and a School of Industrial Science. The Society of Arts was the first part of the scheme to be organised. It holds fortnightly meetings, from October to May, the objects of which are to "awaken and maintain an active interest in the practical sciences, and to aid generally in their advancement and development in connection with arts, agriculture, manufactures, and commerce." Discoveries and inventions are described and discussed at these meetings. Judging from the titles and characters of the subjects which have been communicated, the results of these meetings are often doubtless of such a character as to confer great benefit on the community at large. Abstracts of the proceedings are published in the annual reports.

In the new building a spacious and suitable hall has been provided for an Industrial Museum; but, although varied and valuable collections have been made of material suitable for such a Museum, it has been necessary to make use of them in the different departments of the school, where they are placed so as to be easy of access to teachers and students, which would not be the case were they centralised in the main building. The most important branch of the institution, Mr. Ball states, which has excited the admiration of so many visitors, is the School of Industrial Science.

This school was founded in 1865, and two subsidiary schools have since been organised under the control of the Corporation of the Institute. These are, respectively, the Lowell School of Practical Design and the School of Mechanic Arts. The studies in the school "are so arranged as to offer a practical and liberal education in preparation for active pursuits, as well as a thorough training for most of the active professions."

The regular courses, each of four years' duration, are as follows:—

I. Civil and topographical engineering.
II. Mechanical engineering.
III. A. Mining engineering.
III. B. Geology and mining.
IV. Architecture.
V. A.B.C. Chemistry.
VI. Metallurgy.
VII. A. Natural history.
VII. B. Preparatory to the professional study of medicine.
VIII. A. Physics.
VIII. B. Electrical engineering.
IX. A.B.C. General courses.

For proficiency in any one of these courses the degree of Bachelor in Science (S.B.), in the course pursued, is conferred.

The first six of these courses and VIII. B. are distinctly professional. The general courses IX. A.B.C. are for students who, though not desiring to enter a distinctly scientific profession, desire an education of a pre-eminently scientific character. Advanced courses of study may be pursued with or without reference to the higher degree of Doctor of Science. Women who are properly qualified are admitted to any of the courses of the school, and special laboratories in the different branches of study have been provided for their use. Schedules of prescribed studies in the various courses indicate very clearly the weight which is given to the modern languages and other branches of a liberal but strictly non-classical education.

The staff of professors and assistants is a large and highly competent one, and the practical part of the instruction appears to be carried on in a very earnest and sound manner. The fee for regular students is 400 dollars per annum, to which in estimating the total cost must be added board and lodging in the town, books, instruments, and personal expenditure. There are at present about 440 students on the roll. From the records of the School it would appear that numbers of its graduates occupy important positions all over the country, for which their special training has qualified them.

The School of Mechanic Arts is for the benefit of those who, from want of time or means, are unable to go through one of the regular courses of the School of Industrial Science. "The object is to develope the bodily and mental powers in harmony with each other." Its exact and systematic method affords the direct advantage of training the hand and the eye for accurate and efficient service with the greatest economy of time. The instruction in the mechanic arts given to each regular student at present embraces:—I. Carpentry and joinery; II. Wood turning; III. Pattern making; IV. Foundry work; V. Iron forging; VI. Vice work; VII. Machine tool work. The regular course includes two years of study in English, French, and elementary mathematics and physics. The general plan of the School is founded upon the systems followed in the Imperial Technical School of Moscow, the Royal Mechanical Art School of Komotau in Bohemia, the École Municipale d'Apprentis of Paris, and the Ambachts Schoole of the principal cities of Holland, modified, however, to suit local conditions. Applicants for entrance must be at least fifteen years old, and must pass an examination in arithmetic, geography, and composition. Fifty-six students have been on the roll during the current year.

The Lowell School of Practical Design was established by the trustees of the Lowell Institute for the purpose of promoting industrial art in the United States, but it is under the administration of the Corporation of the Institute of Technology. Tuition is free to all pupils. A considerable degree of skill in freehand drawing from nature and in the use of the brush is positively required for entrance to the school, which does not undertake to teach drawing.

"*Course of Study.*—Students are taught the art of making patterns for prints, ginghams, delaines, silks, laces, paperhangings, carpets, oil-cloths, &c. The course is of three years' duration, and embraces (1) technical manipulations; (2) copying and variations of designs; (3) original designs or composition of patterns; (4) the making of working drawings and finishing of designs."

The school is provided with looms for different fabrics, and the pupils have the opportunity of working their designs in various materials. A constant supply of samples of novelties in textile fabrics of all kinds is received from Paris. Those students who, at the close of the half-year, do not show evidence of progress are permitted to withdraw. Some sixty students have received certificates from this school, and the majority of them have found employment in various factories and other places of business.

Among other institutions referred to in this Report are the Harvard Museum of Comparative Zoology, the Meteorological Museum, Harvard, the Peabody Museum, Connecticut, the Peter Redpath Museum, Montreal, and the Geological Museum, Ottawa. The Report is illustrated by numerous views and plans.

SCIENTIFIC SERIALS

Königliche Gesellschaft der Wissenschaften, Göttingen, January to March, 1885.—Memoir on Jacob Grimm, by F. Frensdorff.—On the optical properties of very thin metal plates, by W. Voigt.—Seventh annual report on the treatment of ear complaints in University Hospital, Göttingen, by Dr. K. Bürkner.—A contribution to the history of the Papacy during the tenth century, by Ludwig Weiland.—On the electric conductivity of liquid solutions in a state of extreme dilution, by Friedrich Kohlrausch.—On the Eris of Greek mythology, her outward appearance and representation in plastic art and literature, by Friedrich Wieseler.—On the theory of complex magnitudes formed of n units, by R. Dedekind.—The organic Aryan inflection of the locative case singular of the u declension, by A. Bezzenberger.—On Euler's integral in connection with Cauchy's "Mémoire sur les Intégrales définies," by A. Enneper.—A demonstration of the multiplication theorem for the determinants, by M. Falk.—A

contribution to the study of the sympathetic nerves in the higher mammals, by Fr. Huth.—On some definite integrals by A. Enneper.—On the maximum of a four-sided figure of given dimensions, by A. Enneper.

Rendiconti del Reale Istituto Lombardo, July 9.—Principles of criminal law; preventive measures and police offences, concluded, by Dr. Raffaele Nulli.—The conflict between Julius Cæsar and the Senate, continued, by Prof. J. Gentile.—Direct oxidation of the iodides and of ammoniacal and organic nitrogen, especially by means of the bioxides of lead and manganese, by Prof. E. Pollacci.—Effects of the phosphates and other fertilisers on the wheat crops, by Prof. Gaetano Cantoni.—An exposition of Riemann's memoir on the theory of the Abelian functions, by Prof. Giulio Assoli.

SOCIETIES AND ACADEMIES

EDINBURGH

Royal Society, July 20.—Mr. David Milne-Home, LL.D., Vice-President, in the chair.—Dr. Harvey Gibson read the second part of his paper on *Patella*.—Prof. Tait read a paper by the Rev. T. P. Kirkman on the unifilar knots with ten crossings; and also a paper of his own on the census of ten-fold knottiness. There are 364 different forms of ten-fold knottiness, when the crossings are alternately over and under, included in 124 types, 50 of which are unique, while 74 have multiple forms.—Prof. Tait also communicated a paper by Messrs. Crocket and Creelman on the thermal effects produced in solids and in liquids by sudden large changes of pressure, and a paper by Mr. W. Peddie on a method of determining the resistance of electrolytes without endeavouring to prevent polarisation.—Prof. MacFadyean and Dr. G. S. Woodhead submitted an account of the construction of the auricles of the pig's heart. Beating of the heart and the superior *vena cava* may continue under proper stimulation for a few hours after death.—Mr. A. P. Laurie communicated a note of the heat of solution of zinc iodide. The heat of solution was determined by observations of the electromotive force of a voltaic cell invented by himself for the purpose.—Dr. J. McFarlane read a second paper on pitchered insectivorous plants.—Mr. H. R. Mill, of the Scottish Marine Station, read a paper on the salinity of the Tay estuary and of St. Andrew's Bay.—The meeting, which was the last for the session, was concluded by an address from the chairman.

PARIS

Academy of Sciences, August 10.—M. Bouley, President, in the chair.—Note on the chief momenta of terrestrial inertia, by M. F. Tisserand.—Remarks on the third part of the Map of Tunis, published by the French War Office, and presented to the Academy by Col. Perrier. The map is to the scale of 1 : 200,000, and the present sheets comprise the districts of Gafsa, Maharès, Kebili, Gabès (Cabes), and Zarzis. Three sheets only remain to complete the whole work, and for these the surveys have already been made.—The sixth part of the General Map of Africa, executed for the War Office to the scale of 1 : 2,000,000 by Capt. de Launoy. This part contains eight sheets comprising the districts of Tabora, Zanzibar, Livingstonia, Vicloux, Mossamedes, Linyanti, Tete, Quilimané.—Note on a registrar of the calorific intensity of solar radiation (one illustration), by M. A. Crova. The apparatus here described is intended faithfully to record the readings of an actinometer giving the calorific intensity of solar radiation to which it is *directly* exposed, while protected from the disturbing action of the winds.—On the treatment of mildew (*Peronospora vitis*) by means of sulphurous acid, by M. Emile Vidal.—A certificate, prepared by Dr. Ferran and signed by several physicians, respecting the results of anti-choleraic inoculations at Benifayo, accompanied by a diagram showing the progress of the epidemic before and after these inoculations, was presented to the Academy, by M. F. Angla. Similar documents are promised for other districts. A telegram was also received from M. Paul Gibier regarding the experiments made by him with hypodermic inoculations of the cholera bacillus.—Observation on Tuttle's comet, the return of which was noticed on August 8 and 9 by M. Perrotin at the Observatory of Nice.—Remarks on a demonstration of the law of reciprocity in mathematical analysis, by M. A. Genocchi.—On the temperatures and critical point of pressure for the chloride of ethyl, and another series of homologous bodies comprising ammonia, gas, and the three methylamines, by MM. C. Vincent and J. Chappuis.—On aqueous evaporation in a disturbed state of the atmosphere, by M. Houdaille.—On a method of obtaining a true standard volt; cause of previous errors, by M. A. Gaiffe.—Products of the oxidation of carbon by the electrolysis of an ammoniacal solution, by M. A. Millot.—On certain alloys of cobalt and copper, by M. G. Guillemin. The alloy with 5 per cent. of cobalt is described as specially interesting, being capable of resisting oxidation, malleable as ordinary copper, tenacious and ductile as iron. It might be largely used in the manufacture of rivets, tubes, and a great variety of copper-ware articles in daily use.—On the thermic phenomena attending the transformation of the protochloride of chromium into a sesqui-chloride, by M. Recoura.—On the crystallographic characters of the substituted derivatives of camphor, by MM. P. Cazeneuve and J. Morel.—On a new species of land turtle (*Testudo yniphora*) brought by M. Humblot from the Comoro Islands, and presented by him to the Natural History Museum of Paris, by M. Léon Vaillant.—On the Brisingidæ fished up from great depths by the *Talisman* Expedition, by M. Edmond Perrier.—Position of the embryo and formation of the cocoon in *Periplaneta orientalis*. The author describes the results of his observations, continued throughout the whole formation and evolution of the egg of this insect for the purpose of determining the exact relations existing between the organic axis of the egg, the principal axis of the embryo, and that of the maternal organism.—On the local treatment of fibrinous pneumonia by means of intra-parenchymatose injections, by M. R. Lépine.—On the cystitis and nephritis produced in the healthy animal organism by the introduction of the micrococcus ureæ (Cohn) into the urethra, by MM. R. Lépine and Gabriel Roux.—Note on the microbe of typhoid fever in man, its cultivation and inoculation, by M. Tayon.—Transmission of pathogenetic microbes from mother to fœtus, by M. Koubassoff.—An explanation of the abnormal development of the grape occasionally occurring in the vineyards of the Vaudois district, by M. J. B. Schnetzler.—On a specimen of pine found embedded in the upper Tschingel glacier at an altitude of 2475 metres, far above the present zone of the pine in this region, by M. Paul Charpentier.—Note on the employment of atmospheric heat for the purpose of obtaining a motor power capable of raising water to a certain height, by M. Ch. Tellier.

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