These two maps are mainly compiled from Dr. Naumann's reconnaissance surveys.

(3) Magnetic map by S. Sekino, representing the isogonic, isoclinic, and isodynamic lines of Japan, constructed from about 200 magnetic observations made at as many different stations.

(4) Map of the great historical earthquakes, volcanoes, solfataras, and hot springs of Japan, by Dr. Naumann and two of his assistants. The relative frequency of earthquakes in different parts of the country is indicated by different shades of brown. The limits of the areas of disturbance of some of the most remarkable earthquakes are likewise given.

B. *Maps Printed and Published.*

(5) Reconnaissance map, Division I., containing the northern part of the main island, from the original survey of Dr. Naumann and his assistants (Tokio, 1884). As already mentioned, this map is on the scale of 1 : 400,000. The mountains are represented by curves of equal height, 40 metres apart. The map is printed in three colours—the mountains brown, the water blue, while the skeleton and writing are black. The surface shape is clearly shown, and the system of representing the mountains is peculiar, and novel at least in a map of such small scale. The curves of equal height are directly used for the production of shades, which latter indicate the amount of slope. Great difficulty was encountered in reproducing this map. There can be no doubt that 40-metre curves applied to a 400,000 scale map represent the utmost limit attainable at present. In the case of an inclination of 45°, which occurs here and there, though rarely, the curves approach each other so closely that a zone of 1 mm. in breadth contains no less than ten lines! There are two different editions of the reconnaissance map—one with Roman, the other with Japanese, lettering. On other grounds all these maps are of interest, for they are the first artistic reproduction of the results of a regular topographical Survey in the far east of Asia.

(6) The three first sheets of the special Survey, showing the topography of the section Yokohama, Idsu, and Kadzusa. Here also there are two editions. Scale 1 : 200,000, and the mountains are shown by curves of equal height 40 metres apart.

(7) Index-sheet, containing the divisions of the whole country into five sections for purposes of the publication of the reconnaissance map, and into ninety sections for the special map. A short statement gives the progress of the Survey up to 1884, while the various signs employed in the maps are explained.

Besides the maps here specified, numerous designs, geological sections, landscape representations, tables, &c., have been made. A large number of practical reports were made for the Government, some of which have been published, but only in Japanese, and they are therefore inaccessible to the rest of the world. Among the papers thus furnished by the Director himself were reports on the waste of ores in Japan, on slate deposits and their utilisation, on Japanese building-stones, on the moving sand-dunes on the coast of Satsuma and how to fix them, on Japanese mineral springs, on the occurrence of gold and copper in various localities, and others.

As to the scientific results obtained by the Survey, they are of much general interest, but it is impossible in the space at our disposal to do more than refer to them cursorily. Those specially interested in the geological work may consult Dr. Naumann's book on the subject, "Bau und Entstehung der japanischen Inseln" (Berlin, Friedländer Sohn, 1885). Almost all systems have a part in building up the colossal mountain-range forming the Japanese islands. The occurrence of Devonian, Carboniferous, Triassic, Jurassic, Cretaceous, and Tertiary, was established by well-characterised fossils. A remarkable discovery of Upper Cretaceous Ammonites was made in the Island of Yezo, which Dr. Naumann proves are identical with Indian species of corresponding age. The considerable collection of Tertiary plants is now being studied by Prof. Nathorst, and his researches promise some interesting results, as appears from some preliminary notes already published by him. A monograph on Jurassic plants by Mr. Yokoyama, one of Dr. Naumann's assistants, will shortly appear. In early Tertiary times the Japanese islands contained numbers of elephants, identical with the celebrated species belonging to the old Indian Siwalik fauna (Dr. Naumann, "On Japanese Fossil Elephants," "Paläontographica," xxviii. 1). Triassic strata have yielded important fossils corresponding to the well-known *Monotis salinaria* of the Alps. Another important result of the Survey is the discovery of Radiolarian slates in almost every part of the archipelago. These are of great age, being probably older than the Carboniferous limestone, and they are nothing else than hardened mud of the deepest parts of the ocean bottom. Radiolarian mud occurs at present in depths of from 4200 to 8400 metres in the western and central parts of the Pacific Ocean, as ascertained by the *Challenger* Expedition. The mud, as well as the slates, is in great part made up of the microscopical skeletons of Radiolarians, and we learn that at remote periods the conditions at the greatest depths of the ocean have been nearly the same as at present, and that in Palæozoic times a great part at least of the Japanese chain was deeply submerged beneath the sea. Great scientific value must also be attributed to the results respecting tectonic geology, which are perhaps the most prominent of all. The Japanese island chain is one of the finest examples of a mountain-range of unilateral structure; and there cannot be the slightest doubt that it has been shifted by forces acting from the side of the Japan Sea towards the side of the free ocean. Almost all the eruptive and volcanic rocks are confined to a zone facing the Sea of Japan, while the outer zone is for the greater part made up of folded larger masses of Palæozoic and pre-Palæozoic times. Very striking, too, is the great transverse depression, introduced by Dr. Naumann into scientific nomenclature by the name of Fossa Magna, which crosses the main island not far from the capital. It appears that this depression is a kind of fissure or cleft produced by another chain of mountains running from Vries Island to the Bonin Islands. The movements going on in this latter chain may have entered the Japanese chain so as to split it. Some of the largest volcanoes of the country—as for instance the celebrated Fujinoyama—issued from that fissure. An inspection of the geological map shows clearly how the advancing folds were stopped by the Fossa Magna, so that they curve back and go around it. Last, but not least, the results concerning the magnetism of the earth may be mentioned. As shown in the magnetic map mentioned above, the magnetic curves are curiously irregular, and these irregularities have an evident connection with those of the geological structure. The Fossa Magna causes the isogonic lines to describe a large irregular curve, like the folds of the geological strata. Dr. Naumann, we believe, is preparing a paper on this subject for the Royal Society, where a fuller treatment of this phenomenon than he has hitherto given may be anticipated.

It is to be regretted that the Japanese Government does not appear sufficiently aware of the importance of a work such as that carried out by its Geological Survey. Its economical value is probably that which would appeal most strongly to a Government, and of its utility from this point of view there can be no doubt. The fundamental ideas with which the undertaking started should be revived: the various sections of the Survey must advance with even step, otherwise the work cannot fail to be irregular and dislocated. It may be hoped, too, that the Japanese will know how to utilise the invaluable experience laboriously collected by the Survey during the past five years.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—An Examination for Minor Scholarships at Downing College will be held early in June. These Scholarships will be awarded for Law, or certain branches of Natural Science. Persons who have not entered at any College in the University are eligible to these Scholarships, which will be of the value of 50*l.*, and tenable until their holders are of standing to compete for a Foundation Scholarship. Further information will be given by the Tutors of the College.

SCIENTIFIC SERIALS

Archives Italiennes de Biologie, tome vii., fasc. 1, Rome, February 1886, contains:—Studies on the drainage of the Roman Campagna, part 5, by C. Tommasi-Crudeli, concludes with the expression of his opinion, based on very numerous facts—(1) that the proposed artificial draining of the Ostian and Maccaresan marshes, and their reclamation, will augment in a great degree the malaria exhalations from these basins; and (2) that the hygrometric condition in which the subsoil of the reclaimed district would exist would render it very probable that such malaria exhalations would be persistent. He believes that malaria is produced on the earth, and not on the water, and when an area is covered with a sheet of water, and while it

is covered, it is free from malaria.—On the minute anatomy of the central nervous organs, by Prof. C. Golgi.—On periodic and superfluous respirations, by Prof. A. Mosso (eight plates).—The respiratory movements in health are not always uniform in sleep and during moments of deep repose; the respiratory effort decreases and augments. This peculiar form the author calls "periodic respiration," and any excess of respiration beyond the actual needs of the tissues and blood he calls "superfluous respiration." Many phenomena of interest are described in this memoir.—Contribution to a knowledge of the physiological effects of cocaine, by Dr. C. Sighicelli.—On the physiological action of thalline, by Dr. G. Pisenti.

Schriften der Naturforschenden Gesellschaft in Danzig, Band vi. Heft 3 (1886).—We note here a copiously-illustrated account by Drs. Lissauer and Conwentz of the various antiquities which have been found in the Vistula-Nogat delta, ranging from the Neolithic period to Roman times; also a curious collection, by Herr Triechel, of sayings of the country folk in West Prussia, about plants.—Herr Helm and Herr Brischke report on insects found in amber.—The remaining matter largely relates to local botany.

Bulletin de l'Académie Royale de Belgique, February.—Application of the telephone to the discovery of faults in electric lines, by Eric Gerard. A new and ingenious method is described for determining by means of the telephone the spot where an underground telegraph line presents any accidental solution of continuity without the necessity of opening the ground and exposing the section of the wire where the break is suspected to exist. Owing to its extreme sensitiveness, the telephone communicates all signals transmitted by the underground conductor during the examination; but when the fault is reached, it remains silent, thus indicating the spot where search should be made for the defect. The method may be made applicable to submarine cables.—Earth microbes and their action in stimulating the growth of the higher vegetable species, by E. Laurent. In order to ascertain how far these micro-organisms are necessary to the life of the plant, the author has recently made some experiments: (1) in natural soil; (2) in soil first sterilised and then inoculated with microbes taken from the natural soil; (3) with soil rendered absolutely sterile; (4) with sterilised soil to which mineral manures were afterwards added. These experiments clearly showed the importance of the microbes, whose functions would seem to be identical with those of nitrification. They seem to prepare the needed inorganic food of the plant by decomposing the organic matter present in the ground.—On the influence of lunar attraction on the mercurial barometer, by J. Liagre. This was in reply to some remarks of M. Folie, who questioned the author's statement that atmospheric tides cannot be determined by the mercurial barometer. He repeats that lunar attraction cannot be appealed to in order to explain M. Folie's law that atmospheric pressure is lowest when the oceanic tides are highest.—A simple and practical method of determining the magnetic declination of any place whose meridian is unknown, by F. Folie. It is shown that the difficult and troublesome process of fixing the meridian may be dispensed with by employing a method based on the simple fact that, when the height of a star is equal to its declination, taken with its sign or opposite sign according as it is in the northern or southern hemisphere, its azimuth is the supplement of its horary angle, or else is equal to this angle itself.—Notice of some geological specimens from the islands of Cebu and Melanipa (Philippines), by A. F. Renard. A study of these specimens, collected by Mr. Buchanan in 1874, seems to show that to Cebu and Melanipa may also be extended the interpretation already admitted for the larger islands of the archipelago regarding the schisto-crystalline character of the underlying rocks, and the presence of eruptive rocks of the archæan type.—The same author contributed two other valuable papers on the geological constitution of the Ternate volcano and of Mount Gûnong-Api, in the Banda Archipelago.

Rendiconti del Reale Istituto Lombardo, March 4-18.—Positivism and evolution, by Prof. A. Buccellati. It is argued that Comte's theological, metaphysical, and positive cycle may perhaps represent the general sequence of mental evolution, but cannot be accepted in a strictly chronological sense. It confines the human mind in too narrow limits, and it must be obvious that all three phases of thought have been simultaneously at work in varying degrees of intensity at all times. Such an exclusive succession is illogical, and opposed alike to history and to the very constitution of the mind, which passes readily and unconsciously from analytic observation to synthesis, and from the inductive to the deductive method.—On the systems of surfaces and their rectangular trajectories, by G. Morera.—Meteorological observations made at the Brera Observatory, Milan, during the month of February.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 25.—"On the Minute Anatomy of the Brachial Plexus." By W. P. Herringham.

Dr. Herringham had traced by dissection the fibres of the several nerve roots from the spinal cord through the net of the plexus into the various nerves given off from this, and down these nerves to their final destination, whether motor or sensory. He found—

(1) That any given fibre may alter its position relative to the vertebral column, but will maintain its position relative to other fibres.

(2) That, in the motor nerves, (*a*) of two muscles, or of two parts of a muscle, that which is nearer the head end of the body tends to be supplied by the higher, that which is nearer the tail end by the lower nerve; (*b*) of two muscles that which is nearer the long axis of the body tends to be supplied by the higher, that which is nearer the periphery by the lower nerve; (*c*) of two muscles that which is nearer the surface tends to be supplied by the higher, that which is further from it by the lower nerve.

(3) That, in the sensory system, (*a*) of two spots on the skin that which is nearer the pre-axial border tends to be supplied by the higher nerve; (*b*) of two spots in the pre-axial area the lower tends to be supplied by the lower nerve, and of two spots in the post-axial area the lower tends to be supplied by the higher nerve.

A table was also given of the muscles classified according to the spinal root which supplied them. The paper was based on fifty-five dissections.

Physical Society, April 10.—Prof. Balfour Stewart, President, in the chair.—The following communications were read:—On the cause of the solar diurnal variations of terrestrial magnetism, by Prof. Balfour Stewart, LL.D., F.R.S. The author commenced by reviewing various theories that have been advanced to account for the solar diurnal inequalities of terrestrial magnetism. That they can be due to the direct magnetic action of the sun is highly improbable, since terrestrial analogies would lead us to infer that matter at the temperature of the sun is quite incapable of possessing magnetic properties, and also from the fact that changes in the range of the daily variation lag behind corresponding solar changes in point of time. The hypothesis of Faraday, that the observed variations are the result of the displacement of the magnetic lines of force due to the varying temperature, and consequently varying magnetic permeability, of the atmospheric oxygen, is disproved by the fact that there is no agreement between the chief magnetic variations and those of the temperature of the great mass of the atmosphere, though it is certain that there must be some effect due to this. The earth-current hypothesis is quite unable to explain one of the chief characteristics of these variations, that they are half as great again at periods of maximum as at those of minimum sun-spot frequency. Sir George Airy has, moreover, been unable to detect any resemblance in form between the regular diurnal progress of the magnet and that of earth-currents. We seem, therefore, compelled to seek for the cause of the variations in the upper atmospheric regions, and we cannot imagine such a cause to exist in any other form than that of a system of electrical currents. That curents may, and actually do, exist at great heights is shown by the aurora, which is unquestionably an electric current, and manifests a close connection with the phenomena of terrestrial magnetism. The great increase of magnetic variation at epochs of maximum sunspot frequency can also be accounted for on this supposition: Prof. Stokes has remarked that an increase in the radiating power of the sun would probably imply not only an increase in general radiation, but a special and predominant increase in such actinic rays as are probably absorbed in the upper regions of the earth's atmosphere. These regions will, therefore, greedily absorb the new rays, their temperature will rise, and, as is known to be the case for gases, the electrical conductivity will be increased.