animals before reached Europe. Scarce four months had elapsed when there arrived a second consignment, still more extensive than the first, and the result of collections made during a voyage from Montevideo to Cape Horn, around the islands of the Patagonian archipelago (a course which the obliging commander of the corvette, Capt. Palumbo, had followed at my especial desire).

This collection, too, contained most interesting specimens, among which are especially worthy of mention a vast number of tubes filled with the produce of deep-sea fishing (pelagic products). In the same way there have come to hand two other consignments from the Peruvian coast, from the Galapagos Isles, from the coast of Panama; and also some most interesting animals found in small pools and rivers in Peru. Among these, of special importance are two complete series of embryonic forms—first, of a Peruvian ray, and secondly of a toad, which Lieut. Chierchia, at my desire, and to aid my studies in the history of the origin of vertebrate animals, reared with great care, and kept in an excellent state of preservation. In this he was assisted by Dionigi Franzese, who had been trained in the Zoological Station, and had embarked as a sailor on board the *Vettor Pisani*. The *Vettor Pisani* continued its course from Peru across the ocean towards the Philippine Islands and China, and we may look for a new shipment of specimens. In this we have a striking confirmation of my opinion that zoology might receive material aid in its work from naval officers trained for the purpose, rather than from the employment of young naturalists. The example thus presented has been followed by other individuals, and already three more naval officers, Lieuts. Cercone, Orsini, and Colombo, have been trained in the same way at the Zoological Station. It is a matter for regret that the first-mentioned has made but one voyage, a short one towards the West Indies, in which violent gales were encountered. The result of his researches may be seen at the "Station." Lieut. Orsini is in the colony of Assab, at the mouth of the Red Sea, and has despatched thence a valuable and well-preserved collection. Lieut. Colombo is the only one of the three whose studies have been of a more extensive and continuous nature, and for them opportunitp has on several occasions been given him by the Minister of Marine. On board the vessel attached to the Hydrographical Survey, commanded by Capt. Magnaghi (equally well known as a man of science and an officer), he has made excellent collections in the Mediterranean itself, and has now returned once more to the "Stazione" to further prosecute his studies there.

From the very first it has been my intention to invite the naval services of other nations to join us in this line of research, and accordingly, in the autumn of 1882, I proposed to the German Minister of Marine that he should send a naval officer or surgeon to Naples to receive a training such as I have indicated. The head of the Admiralty then, Herr Von Stosch, accepted my proposal, and sent a naval surgeon, Dr. Sander, for four months to Naples. In the autumn of the following year Dr. Sander embarked on board the frigate *Prinz Adalbert* for Eastern Asia. We still await its arrival, and hope for valuable results from the expedition.

A preliminary conversation which I had last summer at St. Petersburg with the head of the staff of the Russian Marine Admiral Tchichatchoff, leaves room for hope that Russia too will consent to join us in the matter, and that so in the course of a few years we may look for a still further and wider development of this connection between the "Stazione Zoologica" and the various marine war services of the world. From such a connection great advantages would accrue, not only to science in general, but also to the naturalists of those several countries, which in their turn would be the richer for the collections made by their respective navies.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—There will be an examination in certain branches of natural science for minor scholarships at Downing College, on Tuesday, June 2 next, and following days. Persons who have not entered at any college in the University are eligible to the minor scholarships, which will be of the value of from 40*l.* to 70*l.* per annum, and tenable until their holders are of standing to compete for a Foundation Scholarship. Further information will be given by Dr. Perkins or the Rev. J. C. Saunders, tutors of the College.

SCIENTIFIC SERIALS

Annalen der Physik und Chimie, No. 3, March, 1885.—Prof. R. W. Bunsen, on capillary absorption of gas. Shows a direct dependence between the capillary pressures and the volumes of gas absorbed. This discovery, doubtless, has important relations in physiological processes. Prof. G. Quincke, electric researches (No. 10), on the measurement of magnetic forces by hydrostatic pressure. The author adopts the formula

$$p = \mathfrak{K}_1 H_1^2/8\pi,$$

where H_1 is the intensity of the magnetic field, and $\mathfrak{K}_1$ a "dimagnetisation constant" analogous to the dielectric constant in the analogous formula for the pressure in the electric field. Observations have been made on many magnetic liquids to ascertain the numerical values of this constant.—O. Lummer, on the theory and form of some newly-observed interference curves. These relate to certain phenomena of thick plates.—C. Christian sen, researches on the optical properties of finely-divided bodies.—W. Möller, on Wild's photometer.—E. and L. Natanson, on the dissociation of the vapour of hyponitrous acid.—M. Thiesen, researches on the equation of state; a discussion of the laws of gaseous pressure.—Prof. L. Pfaundler, on the action of strongly-compressed carbonic acid on glass under the influence of light. W. Voigt, reply to Prof. Wüllner's remarks respecting Jamin's observations on metallic reflection.

Journal of the Russian Chemical and Physical Society, vol. xvi. fasc. 9.—On the oxidation of acetones (second memoir), by G. Wagner. The behaviour of ketones to chromic acid mixture are described, and the general laws of their oxidation are deduced. — On the action of the iodides of allyl and zinc on epichloridrine, by M. Lopatkin. — On isopropyl allyl dimethyl carbinol, by M. Kononovitch.—On the relation between diamagnetism and the temperature of fusion of bodies, by P. Bachmetieff. The absolute heat of fusion being represented by the equation $W = (t + 273)\,cs + bs$, where c is the specific heat, b the latent heat of fusion, and s the specific weight of the body; then, the series $(t + 273)\,s$ being taken according to the figures of Regnault and M. Carnelley—it appears to be in reverse order to Faraday's diamagnetic series, the bodies appearing in the following series which culminates with Bi and Sb:—K, Na, P, Br, S, Mg, Ca, I, Al, In, Sn, Bi, Sb, Zn, Cd, Pb, Ag, Cu, Pd, An, Ur, W, Pt, Ir, Os.—On the atmospheres of planets, the temperature of the sun in cosmic space, and the earth's atmosphere, by E. Rogovsky.—On some new demonstrations of the conditions for a minimum of deviation of a prism, by N. Poltschikoff.—A note in answer to M. Stankevitch, by the same.—Studies in cosmical physics: III. the heating of meteorites when falling on to the earth, by Th. Schwedoff.—Answering to an objection made at the British Association of 1882 by Sir William Thomson to his cosmic theory of hail, the author discusses the heat which a meteoric stone may receive when piercing our atmosphere. He shows by several examples, by our experience of meteorites, and by M. Daubrée's testimony, that they never have been brought to fusion. The meteorite must be compared to a fire syringe (*Briquet pneumatique*), which condensates the air and raises its temperature, remaining nearly cold itself when its conducting power is feeble. The *vis viva* of the meteorite is spent in piercing the layers of air—that is, in bringing them into motion (like a bullet which would spend its force in piercing 1000 sheets of paper before reaching the target), and to admit that its *vis viva* be transformed into heat, would be to forget the force spent in piercing the air.—Index to the sixteenth volume.

Bulletin de la Société des Naturalistes de Moscou, 1884, No. 2.—Materials for the flora of Central Asia, by Prof. N. Sorokine. After having twice visited several parts of Russian Turkistan and the delta of the Amu-daria, M. Sorokine returned with a rich collection of phenogams, which proved this part of the Central Asian flora to be very rich, original, and interesting. The department of Gasteromycetes alone offered the greatest interest, on account of its containing forms peculiar to Algeria, Egypt, Cuba, and so on. There are even several indices which would seem to indicate that the Aral-Caspian region has been a centre of dispersion of several forms, whose sporæ were transported by winds across the Red Sea to Africa, and thence to Spain and France. The whole work of the author could not be published at once, on account of its numerous plates. The description of the Chytridiaceæ has appeared in the *Archives botaniques du Nord de la France*, the remainder will appear in the Moscow *Bulletin*, which contains now the descriptions, with five plates,

of the Hypodermei and the Gasteromycetes.—Plantæ Raddeanæ Monopetalæ, by Ferd. von Herder (continued).—Solution of a problem of the theory of comets, by N. Joukovski (Russian). The geocentric position of a particle of the tail which has left the nucleus since a given time under the action of a given repulsive force, to determine the displacement of the particle for a given change in the repulsive force—such is the problem treated.—Analyses of salt and mud from a volcano of Trans-Caucasia.—An essay on the solution of the geodetical problem, by Th. Sloudsky (in French). The already-known formulæ already give the possibility of embodying all anomalies less than 30″ in latitude and less than 15 oscillations of the pendulum in twenty-fours against the calculated ones. The author tries, however, to give a more theoretical formula, which might at the same time embody larger anomalies.—List of the herbaria of the Moscow University and of the Society of Naturalists, by J. Goroshankin.—Studies on the averages of the relative moistness, by Dr. K. Weihrauch (continued; in German).—Necrology and Annual Report.

Rendiconti del R. Istituto Lombardo, March 26.—History of the first century (1783-1883) of the Reale Istituto, by G. B. Venturi.—On the persistence of the thymus gland in children and adults, by Prof. Giovanni Zoja.—Account of a successful operation performed on a young girl for the purpose of closing an open sore on the left cheek produced by a severe attack of typhoid fever.—Further notes on conformable representations in higher mathematical analysis, by Prof. Giulio Ascoli.—Meteorological observations made at the Royal Observatory of Brera, Milan, during the month of March.

Rivista Scientifico-Industriale, March 31.—A new explanation of the red crepuscular lights that have been attributed to the Krakatoa eruption, by Prof. Carlo Marangoni.—Variations in the electric resistance of solid and pure metallic wires according to the temperature (continued), by Prof. Angelo Emo.—A visitation of caterpillars (*Lithosia caniola*, Hl.) in Florence during the present season, by P. Bargagli.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, April 23.—"On the Changes produced by Magnetisation in the Length of Rods of Iron, Steel, and Nickel." By Shelford Bidwell, M.A., LL.B.

The earliest systematic experiments on the effects produced by magnetisation upon the length of iron and steel bars are those of Joule, an account of which is published in the *Phil. Mag.* of 1847. Joule's experiments have many times been repeated, and his general results confirmed. In particular, Prof. A. M. Mayer carried out a series of very careful observations with apparatus of elaborate construction and great delicacy. The conclusions at which he arrived were in accord with those of Joule, so far as regards iron; in the case of steel there was some apparent discrepancy, which, however, might to a great extent be accounted for by differences in the quality of the metal used and in the manner of conducting the experiments. In 1882 Prof. Barrett published in NATURE an account of some experiments which he had made, not only on iron but also on bars of nickel and cobalt, with the view of ascertaining the effect of magnetisation upon their length.

The knowledge on the subject up to the present time may be summarised as follows:—

(1) Magnetisation causes in iron bars an elongation, the amount of which varies up to a certain point as the square of the magnetising force. When the saturation-point is approached the elongation is less than this law would require. The effect is greater in proportion to the softness of the metal.

(2) When a rod or wire of iron is stretched by a weight, the elongating effect of magnetisation is diminished; and if the ratio of the weight to the section of the wire exceeds a certain limit, magnetisation causes retraction instead of elongation.

(3) Soft steel behaves like iron, but the elongation for a given magnetising force is smaller (Joule). Hard steel is slightly elongated, both when the magnetising current is made and when it is interrupted, provided that the strength of the successive currents is gradually increased (Joule). The first application of the magnetising force causes elongation of a steel bar if it is tempered blue, and retraction if it is tempered yellow: subsequent applications of the *same* external magnetising force cause temporary retraction, whether the temper of the steel is blue or yellow (Mayer).

(4) The length of a nickel bar is diminished by magnetisation, the maximum retraction being twice as great as the maximum elongation of iron (Barrett).

In order that the results of Joule and Mayer might be comparable with those obtained by the author, he made an attempt to estimate the magnetising forces with which they worked. From data contained in their paper, it was calculated that the strongest magnetising force used by Joule was about 126 units, while the strongest used by Mayer did not on the highest probable estimate exceed 118 units. In the author's experiments the magnetising force was carried up to about 312 units. The metal rods, too, were much smaller than any which had been before used for the purpose, ranging in diameter from 1·40 to 6·25 mm. Their length was in every case 100 mm., and the apparatus was capable of measuring with tolerable certainty an elongation or retraction equal to a ten-millionth part of this length.

By using thinner iron rods and greater magnetising forces than those previously employed, the following curious and interesting fact was established. If the magnetisation be carried beyond a certain critical point, the consequent elongation, instead of remaining stationary at a maximum, becomes diminished, the diminution increasing with the magnetising force. If the force is sufficiently increased, a point is arrived at where the original length of the rod is totally unaffected by magnetisation; and if the magnetisation be carried still further, the original length of the rod will be reduced. It also appeared that the position of the critical point in steel depended in a very remarkable manner upon the hardness or temper of the metal; considerable light is thus thrown on the apparently anomalous results obtained by Joule and by Mayer. Further experiments disclosed strong reason for believing that the value of the critical magnetising force in a thin iron rod was greatly reduced by stretching; this would explain the fact that Joule obtained opposite effects with stretched and unstretched wires.

By ascertaining the relative values of the temporary moments induced by gradually increasing external magnetising forces, an attempt was made to connect the point of maximum elongation with a definite phase of the magnetisation of the several rods in which the elongation had been observed.

Though more experiments must be made before it is possible to generalise from them with perfect safety, the results so far obtained by the author indicate the laws given below. The elongations and magnetisations referred to are temporary only; before the beginning of an experiment the rod was permanently magnetised by passing through the magnetising coil a current equal to the strongest subsequently used. In iron the greatest elongation due to permanent magnetisation was generally found to be about one-third of the total elongation, while in nickel the permanent retraction amounted only to about one-twenty-fifth part of the whole.

I. IRON

(1) The length of an iron rod is increased by magnetisation up to a certain critical value of the magnetising force, when a maximum elongation is reached.

(2) If the critical value of the magnetising force is exceeded, the elongation is diminished until with a sufficiently powerful magnetising force the original length of the rod is unaffected, and, if the force is still further increased, the rod undergoes retraction. Shortly after the critical point is passed the elongation diminishes in proportion as the magnetising force increases. The greatest actual retraction hitherto observed was equal to about half the maximum elongation, but there was no indication of a limit, and a stronger magnetising force would have produced further retraction.

(3) The value of the external magnetising force corresponding to maximum elongation is for a given rod approximately equal to twice its value at the "turning point."

Definition.—The turning point in the magnetisation of an iron bar is reached when the temporary moment begins to increase less rapidly than the external magnetising force.

(4) The external force corresponding to the point of maximum elongation increases (when the quality of the iron is the same) with the diameter of the rod. So also does its value at the turning point.

(5) The amount of the maximum elongation appears to vary inversely as the square root of the diameter of the rod, when the quality of the iron is the same.