

Attached to the Institute is a library of works on forestry, and also the requisite collections and instruments, both chemical and scientific. A nursery which contains nearly 450,000 plants, and which can supply annually nearly 100,000 plants of from three to five years old, is also annexed. There is also a small fish-breeding establishment, in which about 10,000 trout-fry are annually hatched, and placed in the neighbouring streams.

The Royal School of Pomology and of Horticulture was established in 1882, and is now under the direction of Prof. Valvassori. Its object is to train vegetable and fruit gardeners. The course lasts three years, and is both theoretical and practical. The age for the admission of pupils is from fourteen to seventeen, preference being given to the sons of the smaller farmers, and the charges are 25 lire per month, besides 20 lire for the purchase of gardening-tools, &c., and an entrance fee of 10 lire. There are five professors, with a censor and two gardeners, and at present the number of pupils is thirty-two. For practical instruction the school possesses an orchard, and kitchen and flower gardens.

The Agricultural Institute of Castaletti has been in existence since 1859, when it was founded by Commendatore Leopoldo Cattani-Cavalcanti. It is now under the direction of Signor Riccardi-Manelli. One section of the school was placed on the footing of a Government technical institute during the life-time of the founder; but this has now been changed by the present Director, because the school has for its object, not the production of engineers and surveyors, but of factors or agents and head gardeners. The course of instruction in this institution lasts for four years, and the age of admission is from eleven to fifteen. Of late the charges have been increased, and in consequence the number of students has fallen from seventy to fifty. The entrance fee is now 50 lire; board, lodging, &c., 165 lire for the first and second years, and 180 lire for the third and fourth years; and 8 lire in addition per month for washing. The institution is not self-supporting.

The Agricultural School of Scandicci was founded as recently as 1884 by Count Napoleone Passerini for charitable purposes, his own villa being given up to the work. It was first only a day-school, but this year boarders have been admitted, and there are now ten boarders and eight externs. The object of the institution is to make good managers of rural estates. The course of study lasts for three years; the ages of admission are from fifteen to eighteen; the entrance fee is 10 lire, boarders paying in addition 36 lire per month, and 2 extra for washing. There are in all seven professors and masters. There is an experimental farm of 100 hectares in extent attached to the school, and a good library, and zoological, mineral, and agricultural collections, a chemical laboratory, an apiary, and a pigeon-house. A meteorological observatory of the second class, affiliated to the Central Observatory at Rome, is also annexed. The diplomas awarded to the pupils at the close of their course of study are countersigned by a special delegate of the Government.

According to the Report recently presented to the Foreign Office by Sir E. Malet on agricultural education in Prussia, the State annually gives £49,625 for agricultural instruction in that country, and £38,401 to the veterinary Colleges. Out of the former grant are supported the two Agricultural Colleges of Berlin and Poppelsdorf, the Pomological Institutes of Proskau and Geisenheim, and a station near Wiesbaden for experiments in agricultural chemistry; and subsidies are given to various provincial schools which are supported by local Boards but inspected by the central executive of the province. At the two Colleges the education is mainly scientific and theoretical, the ordinary course consisting of two terms of six months each. At the end of each term the subjects of examination are the science of farming and planting, farm management, physics and chemistry, botany, zoology, animal physiology, mineralogy, and geology. On passing these examinations the students are entitled to diplomas of proficiency in agricultural science. Those who wish to become land-surveyors can proceed to a further course of two terms of six months each, in which the instruction given is of a most advanced kind, embracing mathematics, trigonometrical surveying, levelling, engineering, forestry, and plantation, the science of breeding and rearing cattle, dairy farming, mechanics and agricultural machinery, besides a course of law bearing on questions with which land surveyors have to do. According to the most recent report, the Berlin Agricultural College was attended by 98 students in the summer term, 12 of whom pro-

ceeded to the more advanced course, and in the winter term by 155 students, 27 of whom went in for the higher course. Poppelsdorf College was attended by 76 in the summer term, of whom 45 went on to the higher course, and in the winter term by 87, of whom 57 attended the larger course. With regard to the lower-grade schools receiving help from the grant in aid of agricultural education, 16 are intermediate schools which get £13,365 every year from the State. The school money varies from £3 5s. to £1 10s. per term of six months, and the subjects taught in these institutions comprise chemistry, mineralogy, physics, zoology, veterinary science, and farming. There are also numerous local winter elementary schools which supplement by theoretical training the practical teaching which the pupils have had in the fields in spring and autumn. £6648 is annually given to them.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—An examination will be held at Cavendish College on Tuesday, July 24, and following days, according to the results of which it is intended to award eight Scholarships of £30 a year, provided that candidates of sufficient merit present themselves. Candidates must be under eighteen years of age on October 1, 1888, and may offer for examination one or more of the following subjects: Classics, Mathematics, Natural Science, Modern Languages. The Scholars elected will be required to come into residence at Cavendish College in October 1888, and commence study for a Tripos or the Engineering course. Medical students may conveniently combine their medical work with the course for the Natural Science Tripos. It is also intended to offer in June 1889 three Scholarships of £30 to be competed for by students of the College who will then have resided not longer than one year. The College fee for board, lodging, and tuition, is £25 for each of the three University terms, and £15 for residence (optional) in the Long Vacation. For further information apply to the Bursar, Cavendish College, Cambridge.

In the paragraph last week about Prof. Darwin's lectures (p. 117), for "tin" read "sun."

SCIENTIFIC SERIALS.

Bulletin de la Société des Naturalistes de Moscou, 1887, No. 4.—On organic compounds in their relations to haloid salts of aluminium, by G. Gustafson (in German). In this second part the following conclusions are arrived at. The organic compounds undergo deep modifications in presence of the above salts. The reactions of addition are the chief ones, but the most interesting are those undergone by the aromatic hydrocarbons under the influence of chloride and bromide of aluminium; although most unstable, and therefore sometimes viewed as mere molecular compounds, they show a deep modification of the hydrocarbons from which they issue. They explain also the rôle of salts in organisms.—On the regeneration of lost organs in spiders, by V. Wagner (in French). This is the result of a double simultaneous process; the atrophy of the tissues belonging to the lost member, and the growth of the new one in the atrophied remnants of the old member. Both processes are described and illustrated.—Short notes on some (eighteen) Russian species of the genus *Blaps*, by E. Ballion (in German).—On two new Branchiopods from the Transcaspian region (*Apus haackelii*, n. sp., and *Artemia asiatica*, n. sp.), by Dr. A. Walter.—Enumeration of the vascular plants of the Caucasus, by M. Smirnow (continued). The Ranunculaceæ are described; they contain ninety-eight species, belonging to seventeen genera, and out of them thirty-seven belong to the genus *Ranunculus*, and thirteen to that of *Delphinium*. The *Myosurus*, *Gariadella*, *Calltha*, and *Actæa* number only one species each. The total number of Caucasian Phanerogams, according to Ledebour's "Flora Rossica," is 2965; now it must be estimated at about 4000 species. Out of the ninety-eight species of Ranunculaceæ described, forty belong exclusively to the flora of the East, while fifty-two are met with in South Russia, thirty in the Crimea, thirty-three in the Altai, twenty-four around Lake Baikal, and only twenty-one in the Urals, and eighteen in North Russia. Very interesting remarks follow as to the distribution of the Ranunculaceæ in separate parts of the Caucasus.

1888, No. 1.—Some remarks on the consequences of the earthquake of February 1887 in the Riviera, by H. Trautschold.—The chief noxious insects on tobacco in Bessarabia, an elaborate research by Prof. K. Lindeman. (Both papers in German.)—Count Alexis Razumovsky, first President of the Society, by Dr. Benzengre (in French).—List of plants of Tambou, by D. Litvinoff (continued).—On the hairs called auditive of the spiders, by W. Wagner (*Gehör-Organ* of Dahl). They belong to different types, and none of them can be recognized as performing the auditive function; they seem merely to be tactile organs of a higher structure.—Studies on the palæontological history of the *Ungulate*, by Marie Pavloff (second memoir). After having discussed the genealogy of the horse as viewed by V. Kovalevsky, Messrs. Marsh, Cope, Lydekker, Branco, and Schlosser, and discussed the rich material which Mrs. Pavloff was in possession of, the writer arrives at the following scheme. The eldest ancestors of the horse, *Phenacodus*, are found in the Eocene of North America; in Europe they are represented by the *Hyacotherium leporinum*, which, together with the *Pachynolophus* and *Anchilophus*, inhabited both continents. In the Miocene we find the *Anchitherium*, in America first, and later on in Europe; it was transformed in America into the *Protophippus* of the Mio-Pliocene. This last gave rise to the *Hippidium* and *Equus*, which largely developed during the Pliocene period in America (*E. parvulus*), Asia (*E. nomadicus*), Europe and Africa, where the *E. stenonis* was the ancestor of the Post-Pliocene *Equus caballus*. In how far our present horse originates from this later will be discussed next. Two plates illustrate the paper, written in French.

THE *Memoirs of the Odessa Society of Naturalists* (vols. xi. and xii.) contain the usual quantity of elaborate work, especially in anatomy and physiology. The papers on the embryogeny of the fresh-water lobster, by M. Morin; on the embryogeny of the Caucasian scorpion *Androctonus ornatus*, by MM. A. Kovalevsky and Shulghin; on the development of the *Urospora mirabilis*, by M. Woltke; on the embryology of the *Mysis chameleo*, by M. Nusbaum; and on the morphology of the *Haplotrichum roseum*, by M. Khmielevsky, are elaborate articles profusely illustrated by excellent plates.—M. Krasilchik's researches on the structure and life of the *Cercobodo laciniagerens*—a new genus of the Flagellata—are most interesting, showing how this microscopic organism preys on Bacteria and digests them, and how complicated is its organization altogether.—The same author contributes an interesting paper on the parasite Fungi of insects, and M. Khawkin has an article on the buccal apparatus of the *Euglene* and *Astasia*, as also on the laws of heredity in the case of unicellular organisms; and Dr. Kultchitsky studies the intestinal canals of several fishes.—Geology and mineralogy are represented by R. Prendel's article on the Wiluite, from which it appears that the crystals of this interesting mineral have a double composition—those parts of it which penetrate into the depth of the crystal as cones set upon the surfaces of the pyramids differing both by their density and refractive power from the parts which are built upon the faces of the prisms; three papers by Prof. Sintsoff on the water-bearing deposits of Kishineff, the Steppe deposits on the left bank of the Lower Volga, and the Pliocene of South Russia; and on the crystalline rocks of Crimea, by M. Prendel.—Prof. Klossovsky contributes a paper on the oscillations of temperature and density of the water of the Black Sea in the neighbourhoods of Odessa; and Mrs. Mary Balashoff has an article on the influence of small ponds and of limited supplies of water on the development of *Planorbis*.—Chemistry is represented by one paper, on the laws of dissolution of salts, by R. Umoff.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 26.—“On the Occurrence of Aluminium in Certain Vascular Cryptogams.” By A. H. Church, M.A., F.C.S. Communicated by Dr. J. H. Gilbert, F.R.S.

Most of the older and more complete analyses of plant-ashes disclosed the presence of sensible quantities of alumina. But of late years this substance has been regarded as accidental, and has been excluded from ash-constituents with the single exception of certain species of *Lycopodium*. Since 1851 several analysts have proved the presence of large quantities of alumina in the ashes of these plants. The author has confirmed and

extended their results, and has shown that the allied genus *Selaginella* does not absorb alumina. He found, however, two species of *Lycopodium*—namely, *L. Phlegmaria* and *L. bilardieri*—from which this constituent is absent. The anomaly was explained by the epiphytic nature of these plants, which have no direct access to the soil. The author has further examined certain species belonging to genera nearly related to *Lycopodium*, such as *Equisetum*, *Ophioglossum*, *Salvinia*, *Marsilea*, and *Psilotum*, in all cases with negative results. But he has found 20 per cent. of alumina in the ash of a New Zealand tree-fern, and has also discovered abundance of this substance in *Cyathea medullaris* and *Alsophila australis*, and more than mere traces in *Dicksonia squarrosa*. The last part of the paper is occupied with some considerations having reference to the connection between elementary plant-food and the periodic law.

May 17.—“On the Electromotive Properties of the Leaf of *Dionea* in the Excited and Unexcited States.” No. II. By J. Burdon-Sanderson, M.A., M.D., F.R.S., Professor of Physiology in the University of Oxford.

The author has continued his experimental inquiries, of which the results were communicated to the Royal Society under the same title in 1881. In the introduction to the paper he gives a summary of his previous observations, which led to the conclusion that the property by virtue of which the excitable structures of the leaf respond to stimulation, is of the same nature with that possessed by the similarly-endowed structures of animals. He then proceeds to state that the main purpose of his subsequent investigations has been to determine the relation between two sets of phenomena which might, in accordance with the language commonly used in animal physiology, be termed respectively those of the “resting current” and of the “action current” of the leaf, *i.e.* between the electrical properties possessed by the leaf when stimulated, and those which it displays when at rest. Assuming the excitatory response in the leaf to be of the same nature as the excitatory variation or “action current” in muscle and nerve, the question has to be answered, whether in the leaf the response is a sudden diminution of a previously existing electromotive action (according to the pre-existence theory of du Bois-Reymond), or the setting up at the moment of stimulation of a new electromotive action—in short, whether and in how far the two sets of phenomena are inter-dependent or the contrary.

An observation recorded in his former paper suggested proper methods. It had been shown that by passing a weak voltaic current through the leaf for a short period in a particular direction, its electromotive properties could be permanently modified without loss of its excitability. If it could be shown that the influence of this modification extended to both orders of phenomena, those of rest and excitation, and that both underwent corresponding changes of character under similar conditions, this would go far to prove that an essential relation existed between them.

Acting on this suggestion, the author has had recourse to modes of experiment similar to those which have been employed during the last few years in the investigation of the newly-discovered “secondary electromotive” phenomena of muscle and nerve (see “Oxford Biological Memoirs,” vol. i. part 2). The details of these experiments, made in 1885, are given in the first three sections of the paper. They relate to (1) the more immediate effect of the current as seen in the records of successive galvanometric observations made at regular intervals; (2) the more permanent influence of the current on the electromotive properties of the unexcited leaf, and on its electrical resistance; and (3) the concomitant modification of its behaviour when stimulated.

The general result of these experiments is to show that the two orders of phenomena, the excitatory and those which relate to the resting state, are so linked together that every change in the state of the leaf when at rest conditionates a corresponding change in the way in which it reacts to stimulation—the correspondence consisting in this, that the direction of the response is opposed to that of the previous difference of potential between the opposite surfaces, so that as the latter changes from ascending to descending, the former changes from descending to ascending.

The author considers that this can only be understood to mean that the constantly operative electromotive forces which find their expression in the persistent difference of potential between the opposite surfaces, and those more transitory ones which are called into momentary existence by touching the sensitive filaments or by other modes of stimulation, have the same seat, and that the