throughout the whole course below the high school. In the next place, they agreed that in these early lessons in natural science no text-book should be used; but that the study should constantly be associated with the study of literature, language, and drawing. It was their opinion that the study of physiology should be postponed to the later years of the high school course; but that in the high school, some branch of natural history proper should be pursued every day throughout at least one year. Like the report on physics, chemistry, and astronomy, the report on natural history emphasises the absolute necessity of laboratory work by the pupils on plants and animals, and would have careful drawing insisted on from the beginning of the instruction.

As the laboratory note-book is recommended by the conference on physics, so the conference on natural history recommends that the pupils should be made to express themselves clearly and exactly in words, or by drawings, in describing the objects which they observe; and they believe that this practice will be found a valuable aid in training the pupils in the art of expression. They agree with the conference on physics, chemistry, and astronomy that science examinations should include both a written and a laboratory test, and that the laboratory note-books of the pupils should be produced at the examination. The recommendations of this conference are therefore very similar to those of the physical conference, so far as methods go; but there are appended to the general report of the conference on natural history sub-reports which describe the proper topics, the best order of topics, and the right methods of instruction in botany for schools below the high school, and for the high school itself, and in zoology for the secondary schools. Inasmuch as both the subject-matter and the methods of instruction in natural history are much less familiar to ordinary school teachers than the matter and the methods in the languages and mathematics, the conference believed that descriptive details were necessary in order to give a clear view of the intentions of the conference. In another sub-report the conference give their reasons for recommending the postponement to the latest possible time of the study of physiology and hygiene. Like the sixth conference, the conference on natural history protest that no person should be regarded as qualified to teach natural science who has not had special training for this work—a preparation at least as thorough as that of their fellow teachers of mathematics and the languages.

GEOGRAPHY.

Considering that geography has been a subject of recognised value in elementary schools for many generations, and that a considerable portion of the whole school-time of children has long been devoted to a study called by this name, it is somewhat startling to find that the report of the conference on geography deals with more novelties than any other report, exhibits more dissatisfaction with prevailing methods, and makes, on the whole, the most revolutionary suggestions.

It is obvious, on even a cursory reading of the majority and minority reports, that geography means for all the members of this conference something entirely different from the term "geography" as generally used in school programmes. Their definition of the word makes it embrace not only a description of the surface of the earth, but also the elements of botany, zoology, astronomy, and meteorology, as well as many considerations pertaining to commerce, government, and ethnology. "The physical environment of man" expresses as well as any single phrase can the conference's conception of the principal subject which they wish to have taught. No one can read the reports without perceiving that the advanced instruction in geography which the conference conceive to be desirable and feasible in high schools cannot be given until the pupils have mastered many of the elementary facts of botany, zoology, geometry, and physics. It is noteworthy also that this conference dealt avowedly and unreservedly with the whole range of instruction in primary and secondary schools. They did not pretend to treat chiefly instruction in secondary schools, and incidentally instruction in the lower schools; but, on the contrary, grasped at once the whole problem, and described the topics, methods, and apparatus appropriate to the entire course of twelve years. They recognised that complete descriptions would be necessary in all three branches of the subject—topics, methods, and equipment; and they have given these descriptions with an amplitude and force which leave little to be desired.

More distinctly than any other conference, they recognised that they were presenting an ideal course which could not be carried into effect everywhere or immediately. Indeed, at several points they frankly state that the means of carrying out their recommendations are not at present readily accessible, and they exhibit the same anxiety which is felt by several other conferences about training teachers for the kind of work which the conference believe to be desirable. After the full and interesting descriptions of the relations and divisions of geographical science, as the conference define it, the most important sections of their report relate to the methods and means of presenting the subject in schools, and to the right order in developing it. The methods which they advocate require not only better equipped teachers, but better means of illustrating geographical facts in the schoolroom, such as charts, maps, globes, photographs, models, lantern slides, and lanterns. Like all the other conferences on scientific subjects, the ninth conference dwell on the importance of forming from the start good habits of observing correctly and stating accurately the facts observed. They also wish that the instruction in geography may be connected with the instruction in drawing, history, and English. They believe that meteorology may be taught as an observational study in the earliest years of the grammar school, the scholars being even then made familiar with the use of the thermometer, the wind vane, and the rain gauge; and that it may be carried much further in the high school years, after physics has been studied, so that the pupils may then attain a general understanding of topographical maps, of pressure and wind charts, of isothermal charts, and of such complicated subjects as weather prediction, rainfall and the distribution of rain, storms, and the seasonal variations of the atmosphere.

Their conception of physiography is a very comprehensive one. In short, they recommend a study of physical geography which would embrace in its scope the elements of half a dozen natural sciences, and would bind together in one sheaf the various gleanings which the pupils would have gathered from widely separated fields. There can be no doubt that the study would be interesting, informing, and developing, or that it would be difficult and in every sense substantial.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

PROF. G. B. MATHEWS has resigned the chair of Mathematics in the University College of North Wales, in order to be able to devote more time to study and research.

THE Executive Committee of the City and Guilds of London Institute have appointed Mr. W. E. Dalby, since 1891 University Demonstrator of Mechanism and Applied Mechanics at Cambridge, to the Professorship of Mechanics and Applied Mathematics at the Institute's Technical College, Finsbury, rendered vacant by the resignation of Prof. Perry.

Science reports the dedication, at the University of Vermont, of two new buildings—Converse Hall, a dormitory presented to the University by John H. Converse at a cost of £25,000; and a science building presented by Dr. Edward H. Williams, which, with its equipment, will cost about £40,000. The dormitory was formally presented to the University by Mr. Converse; and the science building, in the absence of Dr. Williams, by his son, Prof. Edward H. Williams, jun., of Lehigh University. On the front of the latter building are three medallions with the heads of Agassiz, Henry, and Prof. Marsh. The building contains ample accommodation for the departments of physics, chemistry, biology, electrical engineering, and metallurgy.

EARL SPENCER, in distributing the prizes on Monday to the successful pupils at Northampton School, spoke of the absolute necessity of a sound primary education for a sound secondary technical and even University education. In Japan, and in Canada, too, he found that both secondary and University education were secured to the people. The fact that England should be behind was rather curious, and he took it that a great deal of it was due to the old grammar schools and the dislike of Parliament, with these schools existing, to create a national system of secondary education in England. That more secondary and University education was required was illustrated by the fact that, while Germany, with a population of 45,000,000, had 24,000 people using her Universities, England, with 30,000,000, had only 5500 at the University.

WE learn from *Science* that a State Veterinary College has been established in New York. It is pointed out that the animal industry of the State is so important and extensive, and the relations of animal diseases so intimately interwoven with human health and well-being, that the financial and sanitary interests of the State will derive benefit from the knowledge and continued investigations of the body of experts which the College will bring together. The following have already been appointed upon the staff of the College:—Director and Professor of Veterinary Medicine, Principles and Practice, Zymotic Diseases, and State Medicine, Dr. James Law; Professor of Veterinary and Comparative Pathology and Bacteriology, Dr. V. A. Moore; Assistant Professor of Veterinary and Comparative Physiology, Materia Medica and Pharmacy, Dr. P. A. Fish; Assistant Professor of Veterinary Anatomy and Anatomical Methods, Dr. G. S. Hopkins; Professor of Microscopical Technology, Histology and Embryology, S. H. Gage; Instructor in Microscopy, Histology and Embryology, Dr. B. F. Kingsbury; Assistant in Veterinary Bacteriology, Dr. R. C. Reed.

SCIENTIFIC SERIALS.

Wiedemann's Annalen der Physik und Chemie, No. 7.—Polarised fluorescence, by L. Sohncke. The polarisation of fluorescent light is capable of giving hints concerning the manner in which the molecules of a solid substance vibrate, and its study may form the basis of the kinetic theory of solids. Theoretically, all doubly-refracting crystals should emit polarised fluorescence. This is found to be the case. Crystals of the regular system are the only crystals which do not. The author has investigated the fluorescence of a large number of substances in confirmation of this view.—Uniformities in the spectra of solid bodies, by F. Paschen. The author investigates the distribution of energy in the spectrum of glowing iron oxide at various temperatures. Of the formula hitherto proposed for its expression, that of Weber most closely approaches the reality. It gives a nearly parabolic curve in which the energy declines on both sides from a maximum which decreases in wave-length as the temperature rises. But the want of symmetry in Weber's curve is greater than in reality. The author finds a new formula, for which he claims that it covers all the observations.—The electrical behaviour of vapours from electrified liquids, by G. Schwalbe. The author finds that the vapours rising from electrified liquids are not capable of bearing away with them any portion of the electric charge, and that Exner's theory of atmospheric electricity must therefore be abandoned.—The damping action of magnetic fields upon rotating insulators, by William Duane. Cylinders and discs of glass, sulphur, paraffin, ebonite, or quartz, oscillating between the poles of a magnet with their axes vertical and at right angles to the lines of force, experience a damping action proportional to the field intensity and to the speed of rotation. This is not due to an action on the suspending threads, nor on the viscosity of the air, nor an electrostratic effect from the current in the coils, nor to induction currents in the substance, as was proved by test experiments and calculations. It must therefore be regarded as a hitherto unobserved magnetic effect upon the insulators in question.—Effect of magnetism upon electromotive force, by A. H. Bucherer. The author finds that in solutions of neutral ferrous salts no E.M.F. exceeding 0·00001 volt can be produced by the magnetisation of one of the two iron electrodes. The E.M.F.s observed by Gross and others must be attributed to changes of concentration produced by the magnetised electrode during its solution.—On the measurement of flame temperatures by thermo-elements, especially the temperature of the Bunsen burner, by W. J. Waggener. The temperatures were determined by various thermo-couples in different parts of the flame. The highest temperature, 1700° C., was indicated in the lower portion of the external mantle. But an infinitely thin thermo-element free from conduction would probably indicate over 1770°. A wire 0·05 mm. thick still suffers from conduction, and it is actually fused in the hottest portion. A more refractory metal is required for these measurements.

Bollettino della Società Sismologica Italiana, vol. ii., 1896, No. 1.—Velocity of propagation of the Paramythia (Epirus) earthquake of the night of May 13-14, 1895, by Dr. G. Agamennone. From time-observations obtained at several places near the epicentre, at six Italian observatories and at Nicolaiew, it appears that the early tremors travelled with a velocity of 1·94 km. per sec., and the oscillations constituting the maximum phase at the rate of 1·42 km. per sec. There is no evidence of any change in the velocity with the distance from the epicentre.—Vesuvian notes (July–December 1895), by Prof. G. Mercalli.

THE last number of the *Izvestia* of the Russian Geographical Society (1895, vi.) contains a new map of Lake Onega, in which last year's measurements of the depths of the lake are embodied. The greatest depths are in its western part, where they attain from 31 to 68 fathoms. This last depth is reached in the branch by which the lake protrudes towards the north-west. A narrow valley is thus formed at its bottom, and runs north-west to south-east, in the direction of the glacial striation in that region. Another great depth is found at the top of the other fjord-like bay in the northern portion of the lake, also directed to the north-west.

WE find in the last numbers of the *Izvestia* of the East-Siberian branch of the Russian Geographical Society (1895, Nos. 1 to 5) a very good sketch of the Yakutes of Verkhoyansk, by S. Kovalik; and an interesting note on the little-known customary hunting laws of the Buryates, by M. Croll; as also a full translation, from the Mongolian, of the renowned Buddhist "Mirror of Wisdom," which gives the "History of the Kingdom of Sukawadi."—M. Prein's preliminary article on the presence of the lime-tree in the neighbourhood of Krasnoyarsk is especially interesting. It is known that that tree does not appear to the east of the Urals, and only reappears in the Amur region on the very slopes of the high central plateau. But it was lately found in the Kuznetsk Alatau mountains, and has now been discovered further to the north-east, in the neighbourhood of Krasnoyarsk.

SOCIETIES AND ACADEMIES

LONDON.

Royal Society, June 18.—"Magnetisation of Liquids." By John S. Townsend.

The experiments on the coefficient of magnetisation of liquids were made with a sensitive induction balance. Both circuits were commuted about sixteen times a second, so that very small inductances could be detected by the galvanometer in the secondary circuit. The principle of the method consisted in balancing the increase of the mutual induction of the primary on the secondary of a solenoid arising from the presence of a liquid in the solenoid against known small inductances. Thus, if the sum of the inductances be reduced to zero, as shown by the galvanometer in the secondary giving no deflection, the balance will be disturbed to the extent $4\pi k\mathrm{M}$, due to the insertion of a liquid into the solenoid whose coefficient of magnetisation is k, and the galvanometer in the secondary circuit will give a deflection when the commutator revolves. An adjustable inductance is then reduced by a known amount, m, till the deflection disappears; so that we get

$$4\pi k\mathrm{M} = m \qquad \therefore k = m/4\pi\mathrm{M},$$

where m and M are quantities easily calculated.

Since the formula does not contain either the rate of the rotation of the commutator or the value of the primary current, no particular precautions are necessary to keep these quantities constant.

In all the determinations the magnetising force was varied from 1 to 9 centigram units, and in no case was there any variation in k. The densities of the salts in solution were also varied over large ranges, and showed that the coefficient of magnetisation for ferric salts in solution depended only on the quantity of iron per c.c. that was present, giving the formula

$$10^7 k = 2660\,\mathrm{W} - 7{\cdot}7$$

for ferric salts, where W is the weight of iron per c.c., the quantity $-7{\cdot}7$ arising from the diamagnetism of the water of solution.

A similar result was obtained for ferrous salts, the corresponding formula being

$$10^7 k = 2060\,\mathrm{W} - 7{\cdot}7,$$

the temperature being 10° C.

Experiments were also performed to find the effect of heating,