

instead of one big quantum; this in turn seriously affects the logic of the deduction of the energy of activation from the temperature coefficient of the reaction.

Again, we may assume that when there is a continuous drain on one portion of the spectrum by absorption of the light of one particular frequency, the rest of the spectrum undergoes a continuous redistribution of the energy involving an increase in the absorbed radiation density and a decrease in the density of the radiation of greater and smaller wavelength. To account for such an hypothesis we must assume that there is some mechanism for the absorption of these rays in order to effect the redistribution, the purely monochromatic character of the reaction being thus lost, and a parallelism between these thermo- and photo-chemical reactions no longer exists. It is, of course, evident that such a redistribution of the energy does not take place when a reaction is illumined with ordinary visible light, since definite absorption bands are noted, and the rest of the energy either passes through the reaction chamber or is scattered from the molecule surfaces. A third hypothesis involves the assumption that the radiation density inside the actual molecules themselves is the important factor, and one which is greatly influenced by the refractive index of the molecule; computations on these lines lead to high values for the refractive index of the region inside the molecules which await other independent confirmation.

A second difficulty has been raised by a study of hydrolytic operations, *e.g.* sucrose; the temperature coefficient of the reaction indicates an activating frequency in the infra-red portion of the spectrum. Illumination with bright sunlight should cause a very great increase in the reaction velocity; no perceptible effect is actually observed. It is, however, possible to attribute the comparative inertness of these reactions to the strongly absorbent character of the environment to light of long wave length; and it has been suggested that a study of the reaction velocity in thin films under illumination might lead to positive results.

Of significance is the fact that the substance for which the activating frequency has been calculated from the temperature coefficient frequently shows no absorption band in that region. If the hypothesis be adopted that the activating frequency calculated in this manner is only a mean value, *i.e.* the possibility of activation in stages be envisaged, we are confronted with a difficulty in calculating the reverse operation, *viz.* the reaction velocity from a knowledge of the complete spectrum of the reacting system, since we have no information as to the manner of the distribution of the partially activated molecules.

The debate served clearly to emphasise the relationship of the quantum hypothesis to chemical action, and the fact that the radiation theory was not entirely convincing, but, on the other hand, it certainly contains the germ of the solution to the problem of the mechanism of the interaction of matter and radiation.

### The Teaching of Geography.

**I**N opening the discussion on the teaching of geography at a joint meeting of the Sections of Geography and Education of the British Association at Edinburgh on September 9, Mr. G. G. Chisholm laid stress on the physical basis of geography, but urged the importance of regarding the physical agencies not so much as changing the face of Nature as influencing the distribution of man and his activities. Mr. Chisholm pointed out that geographers have now reached a considerable measure of agreement in the work included under the head of geography. That agreement marks a step in the better recognition of geography in the educational curriculum. At a later stage in the discussion Dr. H. R. Mill dwelt on the urgent necessity of quantitative work in geographical research, and pointed out the enormous field of study which this opens.

Sir Richard Gregory spoke of the position of geography in relation to other science subjects in the school curriculum. He advocated a course of general science as more useful for a general education than the beginnings of heat and light and the laws of chemical action for pupils up to the age of sixteen. A course in geography for all pupils up to that age would at the same time provide the unifying principle for all the science work, bringing it into relation with the activities of man. After such a course it would be equally easy for pupils to specialise in mathematics, physics, chemistry, or geography. At present there tends to be a gap in geographical teaching between school and university work, because few schools have geography teachers capable of carrying the subject to a standard equivalent with the teaching in chemistry and physics.

Mr. W. H. Barker deprecated the tendency to divide studies into watertight compartments, and insisted that the teaching in geography must be given, not by the science master, but by a geography specialist who by his training is fitted to bring out the unifying

influence of the subject. Geography serves to unite the two main groups of subjects, natural sciences and humanities, and therein lies its great educational value. To reunite the specialisations is the function of the geography teacher.

Some of the difficulties of getting adequate recognition of geography in the university curriculum were pointed out by Dr. Rudmose Brown. The rigid division of studies into the faculties of arts and science is only slowly breaking down, and, in consequence, geography has a fight to find its true position. The geographer has a definite outlook, and his subject is the same, no matter in which faculty it is placed. The narrow conception of science as being confined to the so-called natural sciences must give way before geography can find adequate recognition. Meanwhile, the practical result of dividing knowledge by a rigid line of demarcation is reflected in the difficult task of giving students of geography the wide outlook that the subject requires.

A plea for the value of geography in historical study was made by Prof. R. K. Hannay. He complained of the non-geographical attitude of many historians, and urged that students of history should follow courses in geography. Prof. J. W. Gregory, in emphasising the scientific basis of geography, thought that it should be included in the science faculties of universities, but did not disparage its inclusion among arts subjects. While there has been much improvement in geographical education in Scotland in recent years, the subject still suffers from neglect and failure to take its due portion in education. This is most noteworthy in secondary schools. Dr. F. Mort was hopeful of the position of geography in Scottish schools, and quoted figures to show the increased numbers taking advanced work in the subject and taught by specially trained teachers. Prof. J. A. Green regretted that much school geography was above the heads of the pupils, the teacher not in-

frequently using words and ideas that bore no relation to the mental development of the children. He advocated more attention to methods of presenting the matter of geography.

Among many aspects of the subject on which Prof. P. Geddes touched was the necessity for travel, for student and teacher alike, in order to broaden the outlook and bring the study of geography into touch with realities. Geography that relied solely, or even mainly, on maps was as lifeless as anthropology which depended solely on skulls.

### Centenary of McGill University, Montreal.

McGILL University of Montreal, which has just been celebrating the centenary of its foundation, has shown of late a capacity for attracting prodigious benefactions, such as may well excite the envy of less fortunate institutions even in America. A gift of 1,000,000 dollars from the Carnegie Corporation, New York, "in recognition of the noble and devoted service and sacrifice of McGill towards Canada's part in the Great War," was followed by subscriptions last year by citizens of Montreal and graduates amounting to more than 4,000,000 dollars, a grant of 1,000,000 dollars by the Quebec Provincial Government, and 1,000,000 dollars for medical education from the Rockefeller Foundation of New York. To few institutions has it been given to receive within a short space of time such magnificent tributes from such various sources.

The University was founded by the Hon. James McGill, a leading merchant of Montreal, who died in 1813. Among the principal events in its history are: the opening of the Peter Redpath Museum, 1882; opening of Royal Victoria College, founded and endowed by the late Lord Strathcona as the Women's Department of the University, 1899; opening of Macdonald College, founded and endowed by the late Sir Wm. C. Macdonald, including the School of Agriculture, School for Teachers, and School of Household Science, 1907; gifts of estates valued at 1,117,640 dollars by Sir Wm. C. Macdonald, and of 1,500,000 dollars by various donors, chiefly Montreal citizens, 1911.

Of McGill's two most important professional schools, the Medical and the Engineering, the former will itself soon be able to celebrate its centenary, its first session having been opened in the Montreal Medical Institution in November, 1824. Engineering courses were first established thirty years later. They are now organised on a system thus described by the principal, Sir Arthur Currie, in an address delivered at the Congress at Oxford last July: "Four academic sessions of formal instruction, with the accompanying laboratory, drawing-room exercises, and shop-work, alternating with three summers of practical experience in some branch or branches of the work of the student's future profession." Among recent developments in the advanced courses in chemical engineering is the provision for instruction in the technology of the paper industry, for which the Government Forests Products Research Institute, adjacent to the University, affords special facilities.

### Canadian Insect Pests.

IN the Report of the Dominion Entomologist and Consulting Zoologist for the years 1917-18 the late Dr. C. G. Hewitt presents a record of much useful work carried out on behalf of the Canadian Government. During the two years under review

the work of controlling the brown-tail moth in Nova Scotia and New Brunswick is regarded as satisfactory, but it is solely due to the careful scouting for, and destruction of, the winter webs during each winter. The control of several indigenous insects is being attempted by means of the introduction and dissemination of their parasites. The "mussel scale" is largely preyed upon by the predaceous mite *Hemisarcoptes malus*, and colonies of the latter have been liberated in infected orchards; the future of the experiment will be awaited with interest. The cabbage-root maggot continues to extend its ravages, and not only was the value of tarred felt-paper discs again demonstrated, but promising results were also obtained with bichloride of mercury. A remarkable and extensive outbreak of the sugar-beet webworm, *Loxostege sticticalis*, occurred in the Prairie Provinces. The millions of migrating caterpillars caused much alarm among the farmers, but, as usual, they confined their attention in the fields to weeds, and the only cultivated crops attacked were garden plants. Owing to the increasing prevalence in many parts of Canada of insects affecting livestock, special attention is now being given to these pests, in conjunction with the Health of Animals Branch of the Department of Agriculture. A joint study has been entered upon with reference to the bot-flies of horses, and many new facts have been discovered relating to their life-histories from the point of view of preventive measures. Entomologists will also be interested in the plans of an underground insectary which are appended to this report. It is hoped by such a contrivance to overcome the difficulties in conducting investigations on soil-infesting insects, particularly during the high temperature which prevails in the summer months.

### University and Educational Intelligence.

CAMBRIDGE.—Dr. O. Inchley, St. John's College, has been appointed assistant to the Downing professor of medicine, and Mr. C. Warburton, Christ's College, has been re-appointed demonstrator in medical entomology.

GLASGOW.—The University Court has appointed Dr. Percy A. Hillhouse to the John Elder chair of naval architecture and marine engineering in succession to Sir John Biles, retired. Prof. Hillhouse was appointed in 1898 the first European professor of naval architecture in the Imperial University of Tokyo. Since 1907 he has been the chief naval architect to the Fairfield Co., Govan. The Court has also promoted Dr. William J. Goudie from the lectureship in heat engines in the University to the newly established James Watt chair of the theory and practice of heat engines, endowed in commemoration of the James Watt centenary by the Institution of Engineers and Shipbuilders, Glasgow. Dr. Goudie was formerly reader in the University of London.

The University Court has appointed Dr. G. W. O. Howe, head of the department of electrical standards and measurements at the National Physical Laboratory, to be the first James Watt professor of electrical engineering in the University of Glasgow. From 1909 to 1921 Prof. Howe was assistant professor of electrical engineering in the Imperial College of Science and Technology (City and Guilds), South Kensington. He is recorder of the Engineering Section of the British Association and editor of the *Radio Review*. The new chair was one of those endowed by the Institution of Shipbuilders and Engineers of Glasgow in commemoration of the James Watt centenary.