

Mr. Clarke's mineralogical researches and his connection with the laboratory of the United States Geological Survey well qualify him for a task of this kind.

The volume begins with a brief notice of the chemical elements, as regards their distribution and relative abundance in the known part of the globe, a subject to which the author has himself made some interesting contributions. Then follows a valuable summary, from the chemical point of view, of the nature of the atmosphere, the waters and saline contents of rivers, lakes, seas, and springs, and the gaseous constituents of igneous rocks, volcanic emanations, and fumeroles. A large number of analyses of air, waters, and gases are collated, and their bearing on some of the questions of physical geology indicated, with an occasional discursus upon such subjects as the composition of the primitive atmosphere and the source of volcanic water and gases.

This occupies one-third of the volume. About half as much space is devoted to igneous rocks and their constituents. In this department any trustworthy data, beyond chemical analyses, are at present very scanty. The admirable work of Day and others at Washington, while providing us with accurate thermal constants for a few of the rock-forming minerals, has at the same time discredited practically all previous results in the same line. It appears, for instance, that the melting-point of anorthite, one of the most easily crystallised minerals, has been underestimated to the extent of 400°. The account here given of the several rock-forming minerals is accordingly little more than what is to be found in any text-book, excepting that the information concerning artificial reproduction of the minerals is brought down to date. The space might have been more profitably filled by a section written on the lines of the "Synthèse des Minéraux et des Roches" of Fouqué and Michel-Lévy. The fifty pages dealing with igneous rocks, under a peculiar scheme of classification, might well have been omitted. No useful purpose is served by selected analyses of rocks in a work of this kind, when complete collections of analyses are easily accessible.

The remaining chapters treat of the decomposition of rocks, sedimentary and detrital rocks, metamorphic rocks, metallic ores, the natural hydrocarbons, and coal. Under the last two heads especially there is a large amount of information which we have not seen elsewhere brought together in so complete a form.

The United States Geological Survey, taking a liberal view of its province, has from time to time issued publications dealing with general geological subjects, and among these the one now before us will take its place as a useful work of reference. It will be the more valued because the material is presented in a concise form, and the volume is of such size as to be easily handled without the aid of a lectern.

A. H.

THE INFLUENCE OF HUMIDITY ON RESISTANCES.

MESSRS. ROSA AND BABCOCK, at the Bureau of Standards, found that manganin wire resistances used in resistance boxes varied according to the time of the year; for instance, in summer they were 0.015 per cent. to 0.025 per cent. higher in value than they were in the same temperature in winter. These experimenters explain this periodic variation by the fact that with increased relative air humidity the shellac, especially that between the metal tube and the wire, swells; the base on which the wire is wound consequently increases in diameter, and the forces thereby created cause the resistance wire to expand elastically. With decreasing humidity the shellac gives off moisture and shrinks, the pressure on the wire is relaxed, and the resistance decreases.

Tests just completed, and the results published (*Zeitschrift für Instrumentenkunde*, August), by the Reichsanstalt go to confirm this view, but the variations observed there are much slighter than those found at the Bureau of Standards. The tubes on which the wire is wound had hitherto been covered, first of all, with a sheet of silk, this being well covered with shellac; but in view

of the humidity effect, tests were made with a number of specially prepared lacquers, but, so far as obtaining one which was impermeable to moisture was concerned, the experiments were futile. The author has therefore tried the effect of rendering the tubes to a certain degree elastic in order to combat the effect of the expansion mentioned, and has found that by providing them with longitudinal slots, and also dispensing with the preliminary covering of silk, a considerable advance has been made in this connection. In one coil mentioned in the results the six slots projected on both the upper and under sides to the extent of 3 mm. beyond the windings, while in another tube the slots on the upper side projected 1 cm. beyond the wire, reaching to the same distance as the wire on the under side. These coils were measured immediately after construction, and attained a constant value in a much shorter time than did the coils constructed hitherto.

With a view to obtain the maximum accuracy, the author also suggests that the resistance boxes should be continually filled with paraffin oil of a density of about 0.86. Whether better results will really be obtained in this manner is at present the subject of experiment.

The test coils experimented on up to the present are, without exception, the long, thin form usual in resistance boxes. A few slots will not suffice for rendering more elastic the short, wide tubes used for standard resistances. It must remain for tests to ascertain what is the best form for these coils, and a research is already in hand with this object.

The paper gives a full description of the experiments, and contains a number of curves showing the variations of a number of coils at the Reichsanstalt.

THE OPENING OF THE MEDICAL SESSION.

THE medical year of the schools of medicine in London and the provinces may be said to commence on or about October 1, and the opening of the session is in many instances made the occasion for the distribution of prizes, the delivery of addresses of welcome and advice, and the re-union of old friends at the "old students' dinners."

At University College, after the distribution of medals and prizes by the Dean, Dr. Batty Shaw, Sir Edward Fry addressed the students and their friends. He first offered his congratulations on the admirable buildings in which the work of the school is now carried on, and then made some remarks on the professional ideal. The advantage of a profession over a trade is that it sets a higher ideal before a man; it requires of him to benefit the persons for whom he acts without regard to any private interest of his own. The legitimate gain which must accrue will be a secondary object rather than a primary one. It is on this ground that, quite justly, the world expects of professional men a higher standard of intelligence and of morals than it requires of the mere tradesman. Every true student should be a student all his life through; he should be able to say with old Solon, "I grow old always learning many things." Finally, Sir Edward touched on the relation of the medical profession and the State, pointing out that it is obvious that the medical profession is becoming more and more occupied with public business, and that its aid is being more and more invoked by the governing authorities. He referred to the investigations that are being made by the direction of the Privy Council, the various commissions that are being issued dealing with tuberculosis and other aspects of disease, the scheme now being put into practice for the medical examination of scholars in the primary schools, and the appointment of medical officers of health throughout the country. The medical profession is being drawn in an increasing degree closer to the work and objects of the State. However close that relationship may become in the future, it is hoped that the medical profession will strive to maintain its independence, and will never believe that it is to be subservient to the State.

At King's College Dr. Alexander MacAlister delivered an address on fifty years of medical education. After

referring to some of the salient discoveries during this period, he pointed out that each decade since has witnessed a lengthening of the course, an increase in the number of subjects of examination, and a greater stringency in the standard required. The modern curriculum is an attempt to realise a scientific ideal. At every stage practical work goes hand in hand with the teaching of theory. The result is that, even with the present five years' minimal course, anatomy, instead of being, as it used to be, the one dominant subject of drill, has to take its place as one out of five sciences in which laboratory work has to be done. He then made some remarks on the mystery of life, holding that the physicochemical hypothesis of life which has come into vogue is inadequate. Evolution is the name we give to the modal process of growth, but we are left where we were as regards the mystery of origins, or of the forces by which this process is brought about and directed. But if the physicochemical hypothesis is incompetent to account for the mysteries of organisation, it is still more inefficient as an explanation of the psychological processes of consciousness.

Prof. Myers also delivered an introductory lecture on the aims and position of experimental psychology, at the close of which he dealt with what he described as the inadequate provision of the University of London for the teaching of psychology. The subject is recognised in six separate courses of study in the University; this distribution is harmful to its progress. It is an independent science with methods which are distinctly its own. Yet there is no body of professed psychologists within the University. He pleaded for the institution of a board of studies in psychology in order that the teaching of the subject may be reorganised and coordinated. Describing the provision made for the teaching of psychology on the Continent and in the United States, Dr. Myers showed that London is conspicuously backward, and he said there are not more than half a dozen medical men in the country who could carry out such observations upon a patient as would satisfy a psychologist.

The Huxley lecture, on recent advances in science and their bearing on medicine and surgery, was delivered at Charing Cross Hospital by Sir Patrick Manson, F.R.S. The lecturer dealt first with the geographical limitation of disease and the factors causing it—local and climatic conditions, the presence of other forms of life which act as intermediaries for the germ, &c. The principal tropical diseases are caused either by protozoa or by helminths. So far as we accurately know, none of the disease germs of strictly tropical diseases is bacterial. Several bacterial diseases which are often classed as tropical—for example, cholera, certain kinds of dysentery, leprosy, plague, Mediterranean fever, &c.—are not really tropical. Experience has shown that these diseases can flourish in any climate. It is only because those hygienic and social conditions most favourable to their spread are met with at the present day in greatest perfection in the tropics that they are conventionally regarded as tropical.

At St. George's Hospital Dr. Slater took as the subject for his address the laboratory in medical education and practice, in which he demonstrated the growth of knowledge of morbid states consequent on investigations carried out in the laboratory. It is quite certain that if the maximum benefit is to be derived from the laboratories, consultations between the clinician and the laboratory will have to be more resorted to.

At the Middlesex Hospital Mr. Rudyard Kipling presided, and Dr. Kellas delivered an address on the development of medicine as a science, giving an interesting account of the history of medicine from the earliest times.

At St. Mary's Sir John Broadbent remarked on the great advances that have been made in medicine, as in surgery, in recent years, and deplored the tendency of modern times to fly to the so-called remedies for every ill now advertised widely in the daily Press.

Addresses were also delivered at the London School of Medicine for Women by Dr. Sainsbury; at University College, Bristol, by Sir Rubert Boyce; at the University of Manchester by Sir Clifford Allbutt; and at the Pharmaceutical Society by Mr. Harwood Lescher.

THE BRITISH ASSOCIATION.

SECTION L.

EDUCATION.

OPENING ADDRESS BY PROF. L. C. MIALI, D.Sc., F.R.S.,
PRESIDENT OF THE SECTION.

Useful Knowledge.

I PROPOSE to speak to you about useful knowledge, and you will, I think, admit the importance and the appropriateness of the subject. But you may be surprised that I venture upon so wide a theme. For my part, I maintain that the extent of a subject gives no notion, however vague, of the time required to discuss it. If you have a quarter of an hour and a sheet of paper you may employ them with about equal probability of success in delineating a hand's breadth of greensward, or the British Isles, or the whole world. Bossuet handled universal history from his own point of view in a volume of no more than six hundred octavo pages, and Buffon¹ remarks, quite truly, that every subject, no matter how vast, can be treated in a single discourse. You will observe with satisfaction that I deny myself the commonest and most plausible excuse for an unduly prolonged address; that, I mean, which pleads the magnitude of the subject.

I do not wish to exaggerate the importance of useful knowledge. It is not everything, nor yet the highest thing in education. There are things which we rarely mention in a British Association section, and which are perhaps best left undiscussed, except where there is entire sympathy between speaker and hearer; some of these stand above useful knowledge of every kind. But the fact that useful knowledge occupies nearly all the school-time shows its practical importance, and disposes us to welcome any means of making it more effective.

*Book-learning.*²

The knowledge of books may be an excellent form of useful knowledge; it may also, when it strives merely to record and remember, be unproductive and stupefying. Let me give you an example, by no means an unfavourable one, of the book-learning which becomes sterile for lack of method and aim. My example shall be the elder Pliny, Pliny the naturalist, who lost his life in an eruption of Vesuvius, and whose many virtues were piously described by his nephew, Pliny the younger. The elder Pliny wrote a voluminous Natural History, and left behind him 160 books of unused extracts. His appetite for reading was insatiable. Reading filled all the hours which could be spared from public duties or snatched from sleep. Once, when a friend interrupted the reader to correct a mispronunciation, Pliny asked, "Did you not understand?" "Yes." "Then why did you interrupt? You have made us lose ten lines." The Natural History compiled during years of such reading is wholly uncritical; any testimony is good enough for the most improbable story. We look in vain for interpretation, combination, or inference. The facts are indeed rudely sorted, usually according to subjects, but sometimes alphabetically. The chief use of Pliny's Natural History has been to promote the fabrication of more books of the same kind.

Pliny, with his unlimited appetite for knowledge and his very limited power of using it, might seem to have been taken as a pattern by scholars. Like him, they have amassed knowledge in heaps. It has been the ambition of many scholars to read everything that was worth reading, and to fill great volumes with the imperfectly digested fragments.

In the ages of learning, the schoolmaster too became a pedant. His chief duty he supposed to consist in furnishing his boys with knowledge which they might some day

¹ "Discours à l'Académie."

² In the preparation of this Address I have been much embarrassed by the inexactness of the terms used to denote different studies. Some, such as science, literature, &c., include both process and product, which is as if we had but one name for weaving and cloth. The accepted names of the divisions of knowledge are neither exhaustive nor mutually exclusive; they are not so much logical terms as names of occupations, each of which might well occupy one man's time. We acquiesce in such anomalies because we feel the need of brief and comprehensive expressions, and find that bad definitions are not so intolerable as cumbersome and unfamiliar terms.