A CRITICISM OF MODERN METHODS OF MEDICAL EDUCATION.[1]

THE report drawn up by Mr. Flexner for the Carnegie Foundation is a sequel to the report on medical education in the United States and Canada issued in 1910. Primarily intended for the guidance of medical education in the United States, the report deals so fully with conditions in Germany, Austria, France, England, and Scotland, and adopts so critical an attitude towards them, that it must compel the attention not only of those directly concerned, but of educational authorities everywhere.

The report opens with an historical sketch of the rise of modern medicine, and is followed by a chapter on the number and distribution of physicians in the countries under review. We learn that the medical profession is overcrowded both in countries like Austria and Germany, where the practitioner is educated entirely on a high university basis, and in countries like our own, where medical qualifications of varying standards, some undeniably low, are obtained partly in universities and partly in proprietary schools under the control of the medical and surgical corporations. A later chapter in the report shows how quackery flourishes in Great Britain and Germany, a phenomenon Mr. Flexner attributes solely to the laws which permit it. Incidentally he remarks upon the inconsistency of British law which throws all manner of restrictions upon properly qualified men of science in experimentation upon the lower animals, but allows medical and surgical practice upon human beings without evidence as to training, competency, or skill, provided only the practitioner does not assume an unearned title.

From a purely educational point of view the most interesting part of the report is that which deals with the nature and standard of the medical preliminary examinations, and with the position of the preliminary sciences, physics, chemistry, and biology. The conditions in Germany, France, and Great Britain are closely reviewed, and much valuable information is collected. The German system of secondary-school leaving certificates, and the somewhat similar French system, are favourably considered; the want of method, multiplicity, and low standard of some of the British medical preliminaries receive severe condemnation. The work of the General Medical Council in raising the standard of the preliminary is acknowledged, but the condition of secondary-school education in England, though improving, is still lamentably poor, proprietary interests in the medical schools, and even in the universities, constitute a formidable barrier to progress, and the General Medical Council is not vested with sufficient legal authority to enforce everything it deems desirable.

The existence in Great Britain of proprietary interests in the teaching of medicine meets with severe criticism throughout the report; again and again vested interests are held responsible for inefficient teaching, low standards, and other evil influences. While we can agree with the author in many of his strictures, it must be remembered that the proprietary conditions have often been the only ones possible in a country which prides itself upon the voluntary character of its institutions. It must be remembered, too, that this report is drawn up for an educational body in the United States, where the proprietary medical school is a source of much scandal. The president of the foundation, in an introduction to the report, states that if the lowest terms upon which a medical school can exist abroad were applied to America, three-fourths of the existing American schools would be closed at once.

Mr. Flexner advocates the omission of physics, chemistry, and biology from the overcrowded medical curriculum, and would have them taught in the secondary schools. Much of this part of the report is a plea for the development of efficient secondary schools in which higher mathematics, the sciences, and German must replace the time-honoured classics.

Laboratory development is found to be very uneven in Great Britain as compared with Germany. Anatomy is too much drilled into the students by repeated lectures and demonstrations; more practical work is necessary, but is largely restricted by insufficiency of material. British physiology receives a high tribute, but is hampered by the student's lack of preliminary training in physics and chemistry, and by the anti-vivisection laws. Pharmacology barely exists but for a few notable exceptions. Pathology suffers by the separation of its laboratories from the post-mortem departments of the hospitals, by lack of funds for research, and by sentimental objections to pathological experimentation which carry great weight in hospitals chiefly supported by voluntary contributions.

Clinical instruction, the medical curriculum, and the position and standard of the professional examinations are each considered separately in the case of Germany, Great Britain, and France. Clinical education in England is essentially practical, and at graduation the English product is more dexterous than the German, but the latter is held to have received the more stimulating scientific training, and one which will eventually carry him further. The English graduate lacks ideas, the German lacks practice.

Criticism is abundant and frankly bestowed. The clinical school in Great Britain is accused of being unproductive of research, and wanting in scientific ideals. The German clinician and the British physiologist seek advancement by scientific achievement. The English medical man is able and practical, makes a good physician and surgeon, but is empiric, and only occasionally a contributor to scientific knowledge.

The report is bound to excite adverse criticism, for it is often detailed and very frank. It is the

[1] "Medical Education in Europe." A Report to the Carnegie Foundation for the Advancement of Teaching. By Abraham Flexner. With an Introduction by Henry S. Pritchett. Pp. xx+357. (New York City: 576 Fifth Avenue, 1912.)

work of an educational expert who has certain ideals, and does not hesitate to show how far existing conditions differ from them. Strong opinions are given on the vexed question of the London hospital medical schools, and on the constitution of London University. How far the recommendations are practical is a question that must be left for the authorities concerned to decide. It is certainly desirable that London as a teaching centre of medicine should not occupy a position inferior to the great schools of Berlin, Vienna, and Paris.

Whatever we may think of some of the author's criticisms, one cannot but admire the ability and thoroughness with which he has collected information and drawn up his report. Educationists generally, and medical teaching authorities in particular, owe a debt of gratitude to the Carnegie Foundation for the Advancement of Teaching.

LIQUID CRYSTALS AND THE X-RAY WORK.

IN two memoirs contributed to the current volume of the *Verhandlungen des Naturwissenschaftlichen Vereins*, Karlsruhe, Prof. O. Lehmann gives a valuable summary of his well-known researches on the so-called liquid crystals, and reviews the proofs now available of molecular structure and of the operation of molecular forces, and especially the tangible proofs of the actual existence of molecules. Naturally, the most interesting part of such a communication from Prof. Lehmann is the expression of his views concerning the most recent of such proofs, afforded by the experimental work of Laue, Friedrich, and Knipping with X-rays and crystals at Munich and Zurich. The events leading up to this remarkable development are clearly indicated, and their individual significance emphasised. From the initial stages of the kinetic theory of gases in the days of Count Rumford and Robert Mayer—the former of whom was connected with Munich, and is there represented by a fine statue—to the reflection of X-ray electromagnetic waves from the invisible parallel planes of atoms in the interior of a crystal, and the impression of the systematic symmetry of the crystal on a photographic plate by the reflected rays, is a long step.

It will be with universal consent that Prof. Lehmann hails this new work as of richest consequence not only to crystallography, but to general physics. He considers it the first practical proof of the existence of those molecular forces which he has so long contended for as causing the deposition, layer upon layer in regular order, of the chemical molecules in their erection of the edifice of a crystal—that is, in the production of a three-dimensional grating or "space-lattice."

One of the surest signs of the magnitude of the discovery made at Munich is the fact that the experiments, as on the occasion of the discovery of radium, are being repeated and extended by numerous workers all over the world, as the columns of NATURE, in which many of the results have been described, have lately abundantly testified.

It is a generally accepted maxim amongst men of science that the pioneer of a new discovery should be permitted to work out undisturbedly its further development, and it is sincerely to be hoped that Prof. Laue and Drs. Friedrich and Knipping will be able to carry their work to its logical conclusion. The bearing of the discovery on Prof. Bragg's theory of X-rays has, however, fully justified its further independent investigation by him and by his son, Mr. W. L. Bragg, who has crystallographic knowledge, and has added very considerably to the subject, both by further experiments and by an explanation which agrees with the crystallographic facts in a most remarkable manner. There are indications that the near future will see a surprising further development in the direction of arriving at the absolute dimensions of the cells of the space-lattice—that is, of the actual distances separating the chemical atoms, thus converting the topic axial ratios, which have been so useful a conception for affording us the relative dimensions of the cells in related compounds, into absolute spacial values. Moreover, the dimensions of the material parts of the atoms themselves appear likely to be also determinable within definite narrow limits, for the reflector, the atom, must be larger than the wave reflected, and it is now clearly proved that an ordinary reflection, and not a diffraction effect, is in question.

Another secondary result is that the intensity of the reflection is proving a direct function of the density with which the atoms are strewn in the reflecting plane, thus affording us an experimental means of carrying out Prof. von Fedorow's quest for the primary facial planes, so as to arrive at a proper descriptive setting for the crystal; for these primary planes, sometimes obscured by fortuitous better development of other planes on the exterior of the crystal, are invariably those most densely strewn with the atomic points.

For a discussion of the physics of the whole subject, especially as regards the position immediately before the Munich discovery, the two memoirs of Prof. Lehmann forming the subject of this notice may with advantage be consulted. A brief abstract of some of the most recent work of Mr. W. L. Bragg will be found in the report of the proceedings of the Mineralogical Society of June 17 (see NATURE of June 26, p. 441).

A. E. H. TUTTON.

THE PILTDOWN SKULL.

AMONG the questions discussed by the anatomical section of the International Congress of Medicine was the date and reconstruction of the famous Piltdown skull. At South Kensington the fossil portions of the skull have been put together by Dr. Smith Woodward so as to represent a being partly ape, partly human, and named *Eoanthropus dawsonii*. From this model the brain gives a capacity of 1076 c.c.—an amount