

United Nations, his work as a senior adviser on education to the Secretary of State for the Colonies, give him an authority which will be a reassurance to those still serving that nothing is too difficult for courage and that good human relationships are still more important than politics or race.

The major educational issues with which the book deals—poverty, syllabuses, language, the education of women, selection for secondary work, multi-racialism and teacher-training—will continue to find their various experimental solutions; but the need of humanity for humanity is timeless. There is a charming parable of interdependence in the story of the student offering his notes for a school practice lesson on "The Elephant, a Pachyderm". The apparatus listed was "one elephant, one pin", the latter to prove the toughness of the elephant hide. "Have you your pin?". "Yes Sir, here it is". "And your elephant?" "Sir, as for that, I thought that you could help me".

Mr. Ward points out, soberly enough, that the enormous growth in demand for education, off-set by lessened recruitment from the United Kingdom, is likely to result in a temporary loss of standards in schools. He records the political and social implications of so-called education by teachers who are "mainly chalk and talk" and stresses that, so far as possible, quality should be maintained at the top. One is left guessing at the contents of the unwritten chapter on the influence of the new leadership on education and the length of time during which, with genuine trust and expectation, those who are achieving independence will continue to look to an older order for the production of the elephant.

MIRIAM JANISCH

A HISTORY OF METALS

A History of Metals

By Leslie Aitchison. Vol. 1: Pp. xxi+1-304 (figures 1-127). Vol. 2: Pp. xvii+305-647 (figures 128-262). (London: Macdonald and Evans, Ltd., 1960.) 168s. the two volumes.

"A HISTORY OF METALS" differs from many others on a similar theme, first in that it has been written by one who is a metallurgist of wide experience and high reputation, qualifications not found in all writers on the subject. In the second place, the author has painted his picture against a background of the history of civilization itself, which both provided the conditions in which metallurgy could develop and which, on the other hand, were themselves fundamentally modified by those very developments. The appeal of these volumes should, therefore, be not only to the metallurgist but also to the archaeologist and social historian.

In the author's treatment there emerges little which is essentially novel; in his own words the book is "a fractional distillation" of the work of others. His duty has been to collect facts already known, to sift the wheat from the chaff, and then to present a reasoned, critical account of his harvest. It follows, therefore, that he has inevitably been dependent on others for his original data. Cross-linkages, however, are not infrequently possible which strengthen the main structure and give it a stability in so far as the chief features are concerned. Details, at times even important ones, particularly those relating to the

earlier stages of development, are still uncertain, and not everyone will agree with the author in all particulars. This is perhaps especially true, as he makes abundantly clear, in connexion with any attempt to provide more than an approximation to actual dates.

These volumes cover a period of some six or seven thousand years of which Volume 1 carries the story down to about 1000 A.D. and deals with the seven metals gold, copper, silver, lead, tin, iron and mercury together with their alloys bronze, brass, pewter, steel and amalgams. "Broadly, the several metals and alloys were used for much the same purposes at the end of this long period as at its beginning the evidence of development appearing more in the variety of articles made . . . than in novel applications. As the centuries passed, technological improvements in metallurgical processes were effected and greater weights of material were handled, but during the whole of the . . . years dealt with . . . metals were won and worked by manual power. . . . Appropriately, therefore, Volume 2 opens at the time when power that has not been generated by human muscles was first applied to metallurgical operations", in any event on a substantial scale. The processes by which the metals were extracted from their ores, however, remained essentially unchanged for another two or three centuries at least. As Dr. Aitchison points out, "when the thirteenth century opened, iron—in most parts of Europe and certainly in England—was still being extracted by almost exactly the methods that had been used three millenia earlier" and much the same is true of the other metals.

In the author's view a metallurgical medievalism then occurred which lasted until the beginning of the eighteenth century, though these five hundred years were by no means static. From a craft an industry was relatively rapidly evolved, a medieval industrial revolution. It may well be that Dr. Aitchison's main contribution is to be found in the three chapters which, starting with the Crusades and followed by the discovery of the American Continent, deal with this period.

It is not surprising that an author, most of whose life has been spent in industry, should turn his readers' attention to commerce as well as to technology. His chapter on "Traders from Troy" draws a picture of the commerce of the third millennium B.C. of particular importance from his point of view in its profound influence on the resulting dispersion of knowledge of the technologies in general.

The predominating importance of the metals in moulding and stimulating scientific thought in all ages is reflected in three chapters concerned with this aspect of his history, first in antiquity, then during the birth of modern science and finally in the present era of nuclear transformations. Although the later parts will be well known to scientific readers, Dr. Aitchison justifiably stresses the part played by technological processes and products in the evolution of our scientific and philosophical ideas.

No review of these volumes would be adequate which did not emphasize the author's easy presentation of his material and his skilful avoidance of technicalities. The excellent illustrations have been well chosen, and many, in any event, will be new to most readers: there are a list, comprehensive but not exhausting, of sources for further reference and a good index. The price is high, but those who are able to acquire this book will have a treatise well worth possessing.

F. C. THOMPSON