

description of current views on the mechanism of substitution reactions is hidden in the chapter "Walden Inversion". This book certainly suffers from the lack of a chapter on the electronic mechanism of organic reactions, and when mechanisms are illustrated the symbolism which is used (for example p. 158) does not agree with that now generally accepted. The author has included terms such as centro-asymmetric (p. 40), auto-racemization (p. 47), asymmetric decomposition (p. 54), and stereomutation (p. 105) which are not generally used.

In the first four chapters it is unfortunate that there are many cases where the numbers referring to diagrams do not match those given in the text. For example, on p. 27, Fig. 6 in the text refers to a diagram labelled Fig. 2.6.

The most important recent development in stereochemistry is conformational analysis and one would certainly expect a discussion of this topic in a general text-book having a long section dealing with stereochemistry. The treatment is unfortunately much too brief, and the terms axial and equatorial are now used rather than the alternatives mentioned (p. 113). Presumably this omission is due to the delay which occurs between the writing and printing of text-books; this also probably accounts for the incorrect statement (p. 220) that sucrose has not yet been synthesized chemically.

The second section, which deals with natural products, is excellent and is certainly one of the best accounts of the subject which has been written at this level. It consists of thirteen chapters which are devoted to carbohydrates, terpenoids, steroids, amino-acids and proteins, alkaloids, anthocyanins, purines and nucleic acids, vitamins, antibiotics and chemotherapeutic agents, haemoglobin and chlorophyll. Sections dealing with aromatic hydrocarbons, certain heterocyclics, and phthalocyanines are also included.

The treatment of the proof of structure of natural products by degradation and by synthesis is excellent and would certainly excite the interest of the reader in this type of work.

The presentation used in this text-book is very good. The formulæ are well drawn and the index is very comprehensive; the error in the formula of quininic acid (p. 558) should be corrected in future editions. At its price, this second volume of Finar's "Organic Chemistry" is excellent value.

W. D. OLLIS

HUMANITY AND SCIENCE

What Man May Be

The Human Side of Science. By George Russell Harrison. Pp. iv+262. (London: Cassell and Co., Ltd., 1957.) 18s. net.

IT has been estimated that each year sees the discovery of at least one million new scientific facts. Very few of us who are scientists have the capacity to digest more than a minute fraction of this feast, and to see the pattern to which it contributes. Yet we are vastly better off than the non-scientists, whose main contact with science is "through its slums, the half-world of such things as flying saucers and water dowsing". It is for the benefit of both the professional and the non-professional that Prof. G. H. Harrison, dean of the School of Science at the Massachusetts Institute of Technology, has written this book, "What Man May Be".

In at least one respect it is an astonishing book. For there seems scarcely any corner of the vast field of science about which Prof. Harrison is not able to write, simply and interestingly. Beginning with a chapter on what is meant by man's growing control of matter, he goes on through a survey of the human need for energy to the biology of living things, including man. Then he considers how life could first begin and afterwards become increasingly complex; he discusses the 'sharpening of the senses' by our inventions which can do for us things that we could not do by ourselves; this leads to a discussion of the control of information; and thus to an account of what is meant by human personality. The book concludes with a chapter on the age-old conflict between science and religion, and a glimpse into the possibilities for human life in centuries to come.

It is obviously a breath-taking tour of human knowledge, yet the writer bustles us along with an exuberant confidence that seems scarcely to have heard the word 'doubt'. Perhaps the confidence is a little too assured, as when we are told that carbon atoms "have an outer structure consisting of four electrons at the points of a pyramid"; but the number of these false statements is remarkably small for a book that covers so immense a variety of topics. It would indeed be hard to imagine anyone who would not continually find himself arrested, as he read this book, by some chance remark thrown off to illustrate a particular scientific influence. I made a note of two or three dozen such myself, varying from the fact that since he now needs to do less physical work than his father, the average American eats just one-half as much starch as in 1900, to the fact that the troublesome head noises which some people hear continually in their ears are probably the result of Brownian motion, so sensitive is the mechanism of hearing.

It would be impossible to write a book of this kind without raising certain fundamental questions. Prof. Harrison is aware of this, and tries, as dispassionately as possible, to deal with them. But I wonder whether he recognizes quite fully how far his own mode of description commits him to a kind of vitalist position. We find "Mother Nature" all over these pages; and such sentences as, "in the midst of this degeneration appears the directing force called life". Even genes "gradually learn the advantages of co-operation", and "Nature spends eons of time tinkering with her devices before she brings them to perfection". This is a fair enough way of talking if we know why we are doing it. But it can be dangerous; and when it leads the author to suggest that "there is evidence of servo-mechanisms in the soul", we may feel that something is somehow missing in the whole account. The chapter on religion makes clear that this missing element is a sense of the tragic in all life. "Physical pain is a form of evil"; it can be cured by more knowledge: "science furnishes us with one of the best means that men have discovered for discriminating between good and evil". It is so obviously partly true, but yet one cannot help feeling that one dimension in human experience had got left out in the telling.

This is an excellent book to give to almost anyone who wants to understand the way that science has changed both the things we do, and the way we think. There is not a dull moment in its reading, and probably most of those who do read it will catch something of the infectious optimism that underlies each page. Onward and upward in the best of all possible worlds.

C. A. COULSON