raised about whether *Homo sapiens* is a rational creature at all, or, as might be inferred from Freud and his school, an irrational one driven by impulses of mainly sexual origin. The author points out that the question whether the scientific findings of our age give a true picture of human nature is not an academic one but is "practical and necessary because, in the last resort, our attitude to all human questions depends on our idea of human nature."

The first section of the book—entitled "Science and the Individual"—reports what modern science has revealed about life as a chemical phenomenon, about the machinery of reproduction and evolution, about the conception of man as an automaton, and about the problem of mind and matter.

Equipped with the necessary stock of scientific knowledge, the reader is led in the second section of the book—"Science and Human Society"—into the field of humanities, where the author turns out to be a humanist himself, crossing the border from science to practical philosophy. While no full and definite answer can be given to the questions put in the introduction, the author explains clearly the great complexity of human nature. Considerations are given thereby to practically important questions such as, for instance, the problem of human values, the lack of correlation between living standard and true happiness, and the responsibility of statesmen in our age in which means of global self-destruction are available.

A bibliography is added to the volume, in which, regrettably, the works by Butler's American colleague, the biochemist Roger Williams, are lacking. Williams' findings of the great differences between human individuals make important contributions to the very subject of Butler's book. Certainly Butler cannot be blamed for having overlooked Williams' work, in view of the vastness of the book market. Still, a closer cooperation between scientists working in the important field of "humanics" is desirable.

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Histoire Générale des Sciences. vol. I, *La Science Antique et Médiévale.* (Des origines à 1450). René Taton, Ed. Presses Universitaires de France, Paris, 1957. 627 pp. Illus.

The first volume of the new series of *Histoire Générale des Sciences,* under the editorship of René Taton, is the most complete and up-to-date survey of the science of these periods in any language. It is of course a collection of studies by experts in the different periods and cultures covered by this volume. But, surprisingly enough, the editor has managed to achieve a stylistic unity that is rather remarkable. As the title indicates, the volume includes science in antiquity and the Middle Ages. It contains three parts. The first part is devoted to pre-Greek science, more specifically, the science of Egypt, Mesopotamia, Phoenicia, Israel, ancient India, and ancient China. The second part is a study of science in the Greco-Roman world, covering, first, the science up to and through the time of Aristotle and, next, Hellenistic and Roman science. The third part includes science of the Middle Ages and, more particularly, that of Islam, India, China, Byzantium, and western Europe.

I think that the best thing about this volume is the fact that it reflects recent research more directly than any other survey volume of which I know. Obviously, with such a broad coverage, it cannot replace some of the standard single-volume studies of shorter periods. For example, the student and reader will still want to consult Neugebauer's brilliant survey of mathematics and astronomy in his *Exact Sciences in Antiquity.* It might be thought at first that the present volume would not completely displace the excellent single volume of Brunet and Mieli covering the ancient period, for that latter work contained a good number of source readings. Still, as the reader examines this volume more closely, and particularly the excellent section on Greek science, he will find woven into the context many fairly long representative passages from the original authors. I think that the reader who is coming to this field fresh, without much previous training, might perhaps do well to read this single volume and to accompany it with a reading of Cohen and Drabkin, *Source Book in Greek Science* —the best single collection of documents on Greek science.

Painfully small and inadequate is the description of the content of Arabic exact sciences. Thus, astronomy is brushed off in only two pages, mechanics and optics are virtually untreated. The chapter on the science of western Europe in the Middle Ages is, in my opinion, very good indeed, although I would like to have seen more space devoted to it (with some of the peripheral material, like that on Phoenician science, Hebraic science, and so on, dropped).

There are, of course, matters of detail I would quarrel about. The author gives the impression that the medieval source of Hero's formula for the area of a triangle in terms of its sides is the *Liber Embadorum* of Savasorda. It had already been stated in the material of the *Agrimensores.* The first time it appeared in Latin *with a proof* was in the *Verba Filiorum* of the Banu Musa, translated by Gerard of Cremona. The medieval section of the volume is quite up-to-date and gives a brief and accurate picture of the main movements in the high and late Middle Ages, but the account of early Latin medieval science, such as it is, is very brief and inadequate.

The volume includes 48 quite handsome plates, and the editor and the Presses Universitaires are to be congratulated on the volume's fine appearance.

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Roots of Scientific Thought. A cultural perspective. Philip P. Wiener and Aaron Noland, Eds. Basic Books, New York, 1957. x + 677 pp. $8.

Aside from prefatory matter, illuminating in its own right, which the editors have provided, the body of this volume consists of 33 papers (by 29 scholars) which first appeared as integral articles in *The Journal of the History of Ideas.* At least a dozen of them are acknowledged as classics in their kind. They have been arranged in roughly chronological order and range in subject matter from early Greek science to recent cosmology, though the heaviest concentration is on the 16th and 17th centuries. There are studies of individual scientists and scientific experiments, of philosophies of science, and of institutions, organizations, and ideas whose influence upon the development of science was more than peripheral. Yet this is not merely an anthology, nor is it only a guide for the antiquarian whose interest happens to be, *per accidens,* the scientific past. For each of the writers is in some measure concerned with the broader lines of interpenetration between science and the other components of culture—philosophy, industry, commerce, religion, and art; and the general theme, which each article has been chosen to illustrate, is that the *idea* of science has cultural roots. To be sure, the idea of science may be in principle distinguished from the positive discoveries and theories of science per se, but the two cannot be held asunder if we wish to comprehend the history of either. No one can read the papers of Moody, Koyré, Randall, and Zilsel and still suppose that the history of science may be written simply as the chronicle of discoveries. But neither can anyone suppose that a simple theory of historical (or cultural) causation can account for these. This double lesson is, perhaps, the chief contribution this volume makes, over and above the particular contributions of each of its remarkable chapters. It is these, of course, which are the most rewarding, and they can be read with fascination and profit quite in-

dependently of one's historical commitments. The editors have done a splendid service in making them available.

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Soviet Research in Glass and Ceramics. Chemistry collection No. 2. *Basic Science,* vols. 1 and 2; 497 pp. *Cements, Limes, and Plasters*; 203 pp. *Refractories*; 70 pp. *Glass, Glazes, and Enamels*; 197 pp. *Miscellaneous.* 31 pp. Consultants Bureau, Inc., New York, 1958. $150.

It is not convenient to comment on all of these papers. Rather it is the goal of this review to present some idea of their scientific and technological level—a level which can perhaps be expressed in terms of the experimental techniques, theories, and documentation that are employed.

The papers fall into several categories —theoretical papers, data papers, reviews, and purely engineering papers, plus several book reviews. They have appeared in several journals of applied chemistry and are not from the technological press.

There are numerous papers on phase equilibria, including water systems at room temperature and anhydrous systems at high temperatures. The water systems are carried out with standard techniques and appear to be carefully done. The high-temperature phase equilibria are usually carried out by means of the cone-fusion method; this technique, while rapid and inexpensive, is considered to be no more than exploratory in modern phase equilibria work. As an alternative, cooling curves are used. The method of phase characterization—microscopic and x-ray—is standard. In no case in this selection of papers is there a complete high-temperature phase diagram. Equipment-wise this part of the research reported is inferior.

The 12 papers in the *Refractories* section are carefully done pieces of work, reflecting the interest in high-alumina bodies and in such modern or potential refractories as boron nitride, zirconium carbide, graphite, and the borides of beryllium and magnesium.

In the *Cements, Limes, and Plasters* section, the 28 papers deal with the problems of hydration and with the effect of additives on the whole gamut of cement compositions. The most modern techniques and equipment are used in the studies discussed. Considerable space is devoted to petrographic examination of the various clinkers. The theory of the hardening of Portland cement (and the Russian role in its creation) is reviewed in a long paper. The technical part of this paper is current and quite well presented, but the paper has political and nationalistic overtones, including a quotation from Stalin: "No science can develop and prosper without combat of opinion and without free criticism." This quotation, justifying some of the author's criticism, is countered in the final paragraph of the paper by the following quotation: "Soviet students, armed with laws and methods of Dialectical Materialism, create new, purely scientific concepts, because, without Dialecticalism, there is no science."

Let us pass to another subject. A scientific author has a primary duty of adequate documentation. In these 28 "cement" papers, which cite 3 to 26 references apiece, only two references are to literature of European or American origin. This poses a problem the answer to which one can only guess at: (i) Does this particular series of laboratories lack world literature on cement? or (ii) lack knowledge of foreign languages or of translators? or (iii) reject foreign publications in this field? To this problem one can only report that, for many papers in the "glass" and "basic science" sections of this series of translations, the documentation with respect to world literature is quite adequate. This was especially true in the case of a recently translated symposium on crystal growth (issued by the same publisher), where the citation of world literature was excellent. Perhaps the absence of adequate citation in the "cement" papers as a matter of geographical obstacles.

There appears to be no pattern governing whether or not an author will include citations of obviously pertinent European or American references. In the papers on more strictly engineering and technological subjects, the citations are usually exclusively Russian. One must make allowances for the language barrier and the fact that the lifetime of Soviet science has been sufficiently long to permit the writing of adequate Russian reference books which eliminate the necessity of reference to world literature.

The 31 "glass" papers cover the field of modern glass technology. The techniques and methods of measurement are standard and adequate. The documentation shows wide reading in the world literature. There are several theoretical papers of interest.

One series of four critiques is of interest: (i) a paper criticizing the classical theory of solid phase reaction; (ii) two separate papers criticizing paper No. 1; (iii) an answer by the author of paper No. 1. The classical theory of solid phase reaction from Tamman, Hedvall, and others (metaphysicists, not dialectical materialists, and hence in error) was centered around reaction through solid-solid diffusion alone; the gas phase was not involved except in oxidation-reduction reactions. Critique i says this is in error and that the error is one of philosophical approach on the part of the founders of the theory. This author insists on the importance of vapor phase transfer in solid phase reaction. K. Marx and F. Engels are quoted in support of the philosophy. Critiques ii and iii criticize critique i for the misinterpretation of Marx and Engels. These criticisms are finally answered by the author of paper No. 1. One must point out that in current Western science the contribution of the vapor phase transfer to this reaction is gaining recognition.

In this series of translations the papers with political overtones are rare and are reviews or polemics, never experimental papers.

Finally, one should answer the question, "How many of these papers would pass the editorial board of the American Ceramic Society?" In my opinion, if one ignores the political papers, about 85 percent would be acceptable.

Incidentally, the translations are quite readable. There are occasional errors in transliteration of words, usually Western names. The reproductions are poor but simply reflect the inferiority of the original.

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On Nuclear Energy. Its potential for peacetime uses. Donald J. Hughes. Harvard University Press, Cambridge, 1957. xi + 263 pp. Illus. $4.75.

Atomic energy is here to stay, and we have to live with it. Therefore we have to know what atomic energy really is, and we have to learn about the fundamental facts which underlie all atomic energy phenomena, from the first horrifying explosions over Hiroshima and Nagasaki to the steadily growing applications for peacetime uses for our day and for the future.

Many books have been written on this subject; this one is distinguished by the ease and the superiority with which the most complicated problems are presented. The expert in the field enjoys reading the clear, well-written text, and the layman who, as a newcomer, looks for a serious, scientifically reliable introduction gets a real treat. Using only two equations in the entire book, the author develops and explains the solid facts of atomic structure, fission, chain reaction, fusion, and the many applications in such a way that he instills in the reader a keen desire to learn and to know still more.