Book Reviews

The Tao of Science. An essay on Western knowledge and Eastern wisdom. R. G. H. Siu. Technology Press, Massachusetts Institute of Technology; Wiley, New York; Chapman & Hall, London, 1957. xvi + 180 pp. $4.25.

William James once described a philosopher as a person who can pick a thing up and lay it down again. The book under review suggests that the contemporary scientist is a person who is trying to lay something down while wondering whether he has picked up anything in the first place.

James' definition of the philosopher may be interpreted as meaning that the philosophical method of investigating many different hypotheses for the analysis, description, coordination, and understanding of facts prevents the error of confusing the theoretical description of fact with undescribed fact itself and thereby prevents the philosopher from becoming so obsessed with a particular theory of the facts that he cannot lay that theory down and look at the facts from another theoretical standpoint.

R. G. H. Siu's suggestion (as I interpreted it) that the contemporary scientist is not sure that he picked up anything in the first place is expressed in the three sentences at the beginning of the final chapter of Siu's book (page 145): "Let us distill the previous deliberations. We have touched upon the ancient roots of modern science. We have uncovered the shaky uncertainties on which her facts and methodologies are grounded."

This judgment is reached after a wide reading and analysis of recent studies in the methodology and philosophy of natural science and in the meaning of the value concepts of ethics and the normative social sciences. In his philosophy of the natural sciences, Bridgman's emphasis upon the operational meaning of the concept plays an important role. The theories of Whewell, Mach, Keynes, Feigl, Reichenbach, Wittgenstein, Whitehead, Einstein, and myself are also referred to.

In connection with the theory of scientific concepts of the two last mentioned, Siu's remarks suggest a slight misconception on his part. After describing correctly the theory of scientific knowledge which Einstein and I hold, Siu comments in part as follows (page 18): "Yet it is inconceivable that absolute truth will be given to mere man." Then follows what Siu describes as a "barrage of questions" from which in "contrast to Einstein most scientists have retreated. . . . They have contented themselves with more tangible goals. Prevailing theories are modified in the light of more accurate observations. . . . We cannot extrapolate from thin statistical slices into the remote reaches of space and time" (pages 18–19). It is to be emphasized that there is nothing in the theory of scientific knowledge of Einstein and myself which entails such consequences. The thesis that there are methodological criteria for affirming that the theories of physics are not merely subjective constructs but refer also to the epistemological object of knowledge is in no way incompatible with the fact that the basic assumptions of the theories change with time. A concrete example should suffice to make this clear. Every human being has had the experience of having certain images of a person approaching him at a distance and of interpreting these images initially as a sign of a well-known friend, only to find, as the images become less blurred with the approach of the person, that one has made the wrong hypothesis and that it is not the friend one supposed. From this one does not conclude that there was no objective person present. The same is true of the historical fact of the change of hypotheses concerning the more subtle scientific objects. Maybe, therefore, the scientist has picked up something after all.

In his discussion of value concepts, Siu is equally aware of the major theories and problems. His conclusions will, moreover, stand critical analysis. So also will the criticisms which he draws from these conclusions concerning the adequacy of much of contemporary social science, particularly that part of social science which purports to be able, in the name of scientific method, to make judgments concerning intrinsic or goal values as well as judgments about instrumental values and matters or theories of fact. Social scientists may well ponder the distinction, well known to philosophically minded students of ethics, between instrumental and intrinsic values and its implications for the social sciences. To pay attention to this distinction is to realize that social science must have a method for the determination of intrinsic or goal values that differs from the methods it uses to determine either instrumental values or verified theories of what is the case in fact. A major original contribution of this book is its specification of the consequences with respect to the administration of scientific research and educational institutions, foundations, and laboratories.

In his chapter entitled "Values and incentives in organized research," Siu writes (page 116): "It is unfortunate . . . that overemphasis on consultation and coordination has led to a confounding of values at different levels and of values as a means and as an end. The expertness of an individual in a particular science frequently overflowed into decisions influencing the purposes for which the discipline was but the means." As an example he refers to an army and its military leaders. Their value is instrumental rather than intrinsic or "an end." Their expertness consequently is merely with respect to instrumental values. When, therefore, judgments concerning goal values are made by the military, they are being made by those who lack the expertness to make them. Inevitably, the result, Siu concludes quite correctly, is a "tampering with the free use of scientific disciplines" (page 117) and a "self-injuring confusion in the management of research" (page 117).

But Siu sees that the same errors occur in "industrial concerns and their laboratories and in universities and their research groups"; also (page 116) in the wealthy foundations dispensing grants, when the administrative decision-making heads of these organizations, even though scientifically trained in the scientific methods for making decisions about theories of fact or instrumental values, possess no scientific or philosophical insight into the problem involved in making normative judgments concerning goal values. The danger of corrupting both education and scientific research, in the name of scientific method, because of a restricted conception of method which may be appropriate for solving some problems but is inappropriate for the normative type of problem at hand is indeed very real. The danger is the greater because of the frustrated psychology of many of the directors of research and of the large money-laden foundations—a psychology which Siu describes with realistic concreteness.

What are his positive prescriptions for meeting this situation? Roughly, they are two in number. The first is the supplementation of what he calls the "rationalistic" scientific methods of the West

with the Tao or Way of No-knowledge of China and Asia generally. Hence the title of his book. Operationally speaking, what this amounts to is the realization that living experience is an art as well as a science and that it requires the cultivation of intuitive esthetic sensitivity and normatively guided choosing as well as formal theory construction with its indirect operational and experimentally defined methods of confirmation. I welcome this conclusion by Siu because it amounts to an independent confirmation, by a Western trained scientist of Asian name and cultural background, of the analysis of scientific procedures and the interpretation of Taoist and Buddhist Asian culture of *The Logic of the Sciences and the Humanities* and *The Meeting of East and West.*

Siu's second prescription is even more specific and follows from the first. The adequate executive in any social institution, whether it be the government, a university, a research laboratory, or a foundation, must combine an appreciation of the scientific method for solving problems of fact with (i) aesthetic sensitivity to the problematic subtleties of experience and (ii) disciplined philosophical analysis of its problems of value of the two different types. In the words of the title of this book's final chapter, the truly scientific decision-maker must be "The philosopher-executive."

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The Admirable Discourses of Bernard Palissy. Translated by Aurèle La Rocque. University of Illinois Press, Urbana, 1957. vi + 264 pp. $5.50.

The only major publication by Bernard Palissy, *Discours admirables,* summarizes the lectures he started to present to a selected group in 1575. The book appeared in 1580 when Palissy was perhaps 70; his birth date is not definitely known. The discourses between Theory and Practice are "on the nature of water and fountains . . . on metals, salts and salines, on rocks, earths, fire and enamels. . . . Plus a treatise on marl, very useful and necessary, for those who practice agriculture . . ."

Aurèle La Rocque presents an introduction and an annotated translation from the rather difficult, antiquated French. This is the book of a practical man who liked to call himself *"ouvrier de terre et inventeur des Rustiques Figulines du Roy et de Monsieur le duc de Montmorency"*—a worker in earth materials and inventor of the naturalistic patterns. He is not a "skeptical chemist" like Robert Boyle in his dialogues (1661), but he criticizes philosophers, alchemists, and certain physicians. From his experiences with the crystallization of salts, the working of clays, and the coloring of glass he derives very definite concepts of good and bad water and their role in the formation of ores, stones, and petrifacts and the operation of salt flats and pumps. He is particularly moving when he describes his long struggles with potteries and enamels, which taught him the difference between "evaporative and accidental humors" and "fixed and radical humors" in clays.

Both the translator and publisher deserve our thanks for this addition to the historical library of the geologist, mineralogist, and chemist.

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Livestock Improvement in Relation to Heredity and Environment. J. E. Nichols. Oliver and Boyd, Edinburgh, ed. 4, 1957. xi + 240 pp. Illus. 16 s.

Few books have been written on livestock breeding in which a successful balance was achieved between genetical theory and actual breeding practice. The volume by Nichols is probably the outstanding example of a happy synthesis in this field. First published in 1944, the book is now in its fourth edition. Its author, who is professor of animal husbandry at the University College of Wales, has had wide experience in Australia and Britain, and this has been of remarkable benefit to his presentation.

After short introductory chapters the author presents the bare principles of heredity and brief discussions of the complexity of genic interaction and of the interplay between genotype and environment. The major substance of the book is indicated by chapters on the following subjects: gene and character frequency; environmental aspects; genetic aspects of (i) selection; (ii) inbreeding as a mating system, (iii) line-breeding; outbreeding and hybrid vigor; mating likes and unlikes; performance and progeny testing; breed construction; and type and environment. There is a concluding review of the present status of animal breeding research and its applications.

The book is written in a clear but condensed style and demands an attentive reader. It should admirably answer its purpose, though one may hope that most students will read it with a broader grounding in genetics than is provided by the author. As complementary reading in courses on general genetics, Nichols' book is to be recommended highly, since it gives an excellent picture of the many and intricate problems associated with the improvement of slowly reproducing animals of economic value. One might wish for somewhat more extensive illustrations. There are a good list of references and a satisfactory index.

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The Human Sum. C. H. Rolph, Ed. Macmillan, New York, 1957. vi + 232 pp. Illus. $3.75.

This book deals with two distinct, though related, topics: the changing structure of the family and world population problems. The essays on the family, by C. J. Rolph, Jacquetta Hawkes, Michael Young, Peter Willmott, Edward Blishen, J. M. Mackintosh, James Lansdale Hodson, and Sherwin Bailey, do an admirable job of making clear the changes that have taken place in the structure and emotional flavor of the family unit during the last hundred years, particularly among the lower classes in England. Jacquetta Hawkes epitomizes the present-day urban family as a unit that is "living in its own small box, belonging to no living community and perhaps even ignorant of the names of its neighbors"—a unit that, of all forms of the family so far invented, is "probably the hardest to maintain." This theme is developed further by the other essayists, with little overlap of material. The illustrations by Alfred G. Wurmser enliven an already lively text.

The portion of the book that deals with population problems is somehow less satisfactory. It is not that the essays are not sensible, for they are. Julian Huxley gives a graphic picture of present-day overpopulation; Mary Stocks writes an interesting history of the birth control movement; while A. S. Parkes brings us up to date on recent contraceptive experimentation. Bertrand Russell writes with his usual pithy common sense. It's all good. But it's all been said before. There are so many good books on population problems now—books that remind us of those Dylan Thomas complained about ("books that told me everything about the wasp except *Why*"), books that tell us all that we need to know about population except *what now*? Are we really so unable to see the end of the story? Or are we afraid to describe what we see? Two generations ago there were those who realized that "sex" was a problem, and they sought to grapple with it by writing books just filled with facts about stamens and pistils and pollen and birds and bees. Their facts were true, but these had little relevance to the human problem. Is it not possible that most of what now passes for discussion of "the