Book Reviews

Science and Human Values. J. Bronowski. Julian Messner, Inc., New York, 1956. 94 pp. $3.

Novels, histories, music, and paintings make it a pleasure for a worker in science to follow the humanities. Rarely are the human values of science presented with equal mastery and charm. Let the reader who believes in those values give a copy of this 94-page book to his nonspecialist friend. His gift will be gratefully acknowledged, and not only for the beautiful pictures, of which three come from William Blake and two from Leonardo da Vinci. Bronowski carries us far away from all the familiar talk of science and faster planes, cheaper electricity, and more creature comforts—talk all right as far as it goes, but so dismaying because it says no more. With rich allusions to science, literature, art, and human experience, Bronowski urges that science, if it can transmit its spirit to the world, will contribute even more to mankind than it can by all its discoveries.

Bronowski leads up to his central thesis step by step in the three sections of this book: (i) "The Creative Mind," (ii) "The Habit of Truth," (iii) "The Sense of Human Dignity." The factors making for creativity have been more fully treated in other places but perhaps nowhere with a broader range of allusion. His mention of Coleridge recalls the advice of Arthur D. Little to an industrialist wanting advice on how to set up a forward-looking research laboratory: "Read John Livingstone Lowe's *The Road to Xanadu!*"

How shall one assess the book? First, it states in a clear way the much needed message that science is an activity in which every human being can engage, not a cult practised by a sacred priesthood. Second, Bronowski makes a strong case for one simple thesis: To have a forward-moving human community in these days, general participation in the search for truth is a spiritual necessity. May he be widely read! He says we have not too much science today but too little: "the scientific spirit is more human than the machinery of governments. We have not let either the tolerance or the empiricism of science enter the parochial rules by which we still try to prescribe the behavior of nations." Finally, one can agree wholeheartedly with Bronowski that the search for truth is a necessity without accepting the implication that it is also sufficient by itself to achieve the world we want. Here the science-minded citizen will want to add some comments of his own. The culture of Greece was necessary for its greatness but not sufficient for its survival. The search for truth can flourish in a society strong enough to protect freedom, but to protect that freedom it is not enough only to search for the truth. The prime requirement is the survival of the free world. Rather than see it fall with its centuries-old heritage, more precious than any individual life, many would choose to join with dear friends, as others have in past ages, to give up their own lives. About self-sacrifice, kindliness, courage, and nobility, about how the highest human virtues were won for our race by millenia of struggle for survival, Bronowski says nothing. Nothing does he tell of the revolutionary and inspiring truths about man's origin and destiny to be read from the work of Darwin and his successors. How can one discuss science and human values without facing up to human evolution? But let Bronowski not be condemned for what he overlooks but praised for what he brings us: poetic insight into one aspect of evolution in this quotation from William Blake: "to be an Error & to be Cast out is a part of God's design." The reader of this charming book has much on which to meditate.

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The Life, Work and Times of Charles Turner Thackrah, Surgeon and Apothecary of Leeds (1795–1833). A. Meiklejohn. Livingstone, Edinburgh, Scotland, 1957 (distributed by Williams & Wilkins, Baltimore, Md.). 238 pp. $6.

The industrial revolution in England brought forward a number of able investigators on the many phases of occupational hazards, and none more able than Charles Thackrah of Leeds. Bernardino Ramazzini (1633–1714), with his *De morbis artificium diatriba* (Modena, 1700), became the father of industrial medicine, and many followed his lead with individual contributions to the subject, but it remained for Thackrah to extend primitive clinical observations into a comprehensive conception of industrial health based upon prevention and thus to become the founder of industrial hygiene. Charles Thackrah's views were first published in 1831 and became influential in initiating factory reforms.

The volume under review is a facsimile of the second edition (1832) of Charles Thackrah's principal work (the short title of which is *The Effects of Arts, Trades, and Professions*), supported by an excellent and informative biographical essay on Thackrah. Thackrah's principal publication has become rare. It "claims our attention not for its knowledge but for its wisdom." The author has made this wisdom readily available to all students of industrial medicine and hygiene who care to dip into this fountain.

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The Mango. S. R. Gangolly, Ranjit Singh, S. L. Katyal, and Daljit Singh. Indian Council of Agricultural Research, New Delhi, India, 1957. xiii + 530 pp. Illus. $12.

The mango is by far the most important fruit crop of India; approximately 1.5 million acres were in cultivation in 1955. It is estimated that there may be a thousand varieties, although the nomenclature is badly confused and the same mango is often known by different names in different regions. This book is devoted chiefly to eliminating some of this confusion by descriptions of 210 of the more important varieties; with each there is a very adequate color plate and a careful morphological description of the tree, leaves, inflorescence, fruit, stone, and quality of fruit. Actually, the descriptions of tree and leaf would not be very reliable guides in themselves for identification of variety, but the descriptions of fruit are very complete and distinct, and each morphological term used is carefully pictured. Most of the Indian varieties have green or yellow skins or a slight peach-colored blush. Only a few of the more than 200 varieties pictured have the attractive red blush considered essential in the United States for good marketability. The descriptions of variety, while of great usefulness in India, would be of only academic interest in most other mango-growing areas, since few of the Indian varieties are grown

elsewhere, due to their poor color and scanty yield. The key for descriptions of variety, however, might well be adopted by all who attempt to describe varieties of mango.

A brief chapter on the botany and cytogenics of the mango is well done. The balance of this volume (about 40 pages) is devoted to cultivation and to insect pests and diseases. In centuries past, Indian princes used to pride themselves on the possession of exclusive varieties and on large mango gardens. Akbar, the great Mughal Emperor, is said to have had a garden of 100,000 trees. These were chiefly, if not entirely, seedling trees, whereas most plantings now are vegetatively propagated. The book gives considerable detail on methods of vegetative propagation and of top-working, little of which is not well known to mango growers everywhere. Planting, irrigation, and manuring (fertilization) practices are discussed and serve to point up the fact that very little of an exact nature is known regarding the culture of this fruit, despite its antiquity. Irregular bearing of most varieties is a problem in India, as in other areas where mangos are grown. The insect pests and diseases of the mango in India are well presented; in each case the scientific name, the nature of the injury, and the control measures are given. A comprehensive bibliography of 162 citations is useful and also indicates that the authors are cognizant of such scientific work as has been done with this fruit.

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A Pictorial History of Science and Engineering. The story of man's technological and scientific progress from the dawn of history to the present, told in 1,000 pictures and 75,000 words. By the editors of *Year*. *Year,* New York, 1958. 263 pp. Illus. $7.95.

The lack of an adequate, brief, and popular history of modern science leaves unsatisfied an obvious demand which must seek its fulfillment in highly specialized works or in "picture histories" such as this. The editors of *Year* have endeavored to be up to date, even touching—the word should be emphasized—on automation and the Russian satellite. They have also done more justice than might have been expected to the science of antiquity and the other benighted centuries before modern times.

The topical subdivision is well conceived, and the narrative on the centuries up through the eighteenth is excellent, showing commendable concern for accuracy. The 19th and 20th centuries, however, seem to have been the editors' undoing, as they have been the undoing of others who have attempted to deal with them historically. The text here tends increasingly to vagueness—a vagueness liberally salted with names of inventors and inventions.

Many of the illustrations are interesting, but few are spectacular and many are very ordinary. On the whole, the selection of pictures is only fair, and the effectiveness of those that are included is badly marred by the editors' failure to identify them adequately; the reader is thus left free to suppose, for example, that some primordial photographer caught the cave men painting mammoths (page 16). Something more than the technical picture credits would certainly have been in order.

Its determined up-to-dateness will probably lead potential readers to regard the book as being out-of-date next year. This is a pity, for the first part, at least, deserves a longer life. When all is said and done, however, one can hardly expect to learn much more of the history of science from such a book than one could learn of physics from a picture history of that subject.

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Animal Behavior. John Paul Scott. University of Chicago Press, 1958. xi + 281 pp. Illus. $5.

No part in biology is more beset with the pitfalls of scientific methodology than is the study of animal behavior. The subject is intrinsically difficult—dealing, as it does, with the integrated totality of organisms—but because of its familiarity, it seems deceptively simple. Everyone has observed animals at one time or another and formed opinions about what they were doing. Putting these thoughts to paper, however, should quickly reveal that comparative psychology is no place for an amateur. John Paul Scott is a long-time professional in the field, and his book shows the wide range of his experience and knowledge. He has, however, attempted the perhaps impossible task of writing a book meant to serve both as a text and as an introductory account for the nonspecialized reader. Although he has produced the best general introduction to the subject we have ever had—one that can be read with profit by student and layman alike—his treatment lacks the emphasis on aspects of logic necessary to make it a satisfactory text. I should add that, in my opinion, there is *no* satisfactory up-to-date textbook on comparative psychology or animal behavior in existence today.

The study of animal behavior is in a protean condition; the serious student should be informed of this challenging state of affairs. The present volume, however, has little to say about the different points of view on fundamental questions currently under debate. In addition, making such topics as agonistic and allelomimetic behavior, learning, intelligence, and language the primary points of reference, rather than the various phylogenetic groups of animals, tends to encourage looseness of thought. As Scott himself puts it (although in a different context), "What words can we use to say that two animals as unlike as elephants and spiders are doing similar things?" The problem of finding criteria for meaningful similarities among divergent animal forms is one of the knottiest in comparative psychology.

Attention should be called to the fine illustrations, both drawings and photographs, that enliven and enhance this book.

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The Beginnings of Embryonic Development. A Symposium organized by the Section on Zoological Sciences of the American Association for the Advancement of Science, cosponsored by the American Society of Zoologists and the Association of Southeastern Biologists, and presented at the Atlanta meeting, December 27, 1955. Publication No. 48. Albert Tyler, R. C. von Borstel, Charles B. Metz, Eds. American Association for the Advancement of Science, Washington, D.C., 1957. 400 pp. Illus. $7.50, members; $8.75, others.

This volume includes the papers presented at a symposium organized by the Section on Zoological Sciences of the American Association for the Advancement of Science at the Atlanta meeting, 27 December 1955, as well as several chapters, contributed by other embryologists, which are intended to expand the coverage of this general field.

The book begins with an important chapter by W. S. Vincent on a relatively neglected area to which new techniques have been applied in recent years—namely, the differentiation and development of the oocyte, with particular emphasis on the role of the nucleus. The author comes to the conclusion that the nuclear ribonucleic acid molecules are carriers of structural specificity imparted by genetic loci and transferred to the cytoplasm. C. B. Metz discusses the role played by the interaction of specific egg and sperm substances in the fertilization and activation of the egg. While substances such as egg membrane lysin, fertilizin, and antifertilizin are apparently