in the long run, but, above all, because its consequences would be disastrous even if it did forestall nuclear war. Were we "to live for any length of time under the constant threat of destruction," we would lose all capacity to live in freedom and eventually turn into totalitarian "barbarians." The only way out consists of taking active steps toward disarmament, expecting reciprocation by the Russians but not making it a preliminary condition. This policy is risky, but its risks are less than those of nuclear arming. Moreover, the risk should not be overestimated; the present leaders of Soviet Russia are both too rational and too conservative (nay, reactionary) to be interested in military conquest for the sake of promoting world revolution.

This argument of Fromm's is logically consistent, but its underlying assumptions are open to question. If the deterrent "works," its psychological effect will be less and less that of a constant, vividly felt fear of destruction. Also, a sharp imbalance of strength between the East and West would enable Soviet Russia to undermine all free institutions without abandoning "rationality" and without aiming at military conquest. Any unilateral disarmament would open up tremendous possibilities of blackmail against which the idealism so eloquently evoked by Fromm would provide no protection. Balance therefore must be recognized as an indispensable requirement of a tolerable world order, and the task of coming to terms with the new weapons environment cannot be evaded.

Energy Transformation

The Fire of Life. An introduction to animal energetics. Max Kleiber. Wiley, New York, 1961. xxii + 454 pp. Illus.

This book is a delight: it is charmingly written by a world-recognized leader in bioenergetics, and it is witty, wise, and informative. Kleiber decided, after 10 years of writing, to take his title to indicate that the volume is "essentially limited to the classical rather than the newer aspects of metabolism and nutrition." He follows the educationally preferable procedure of leading gradually from the concrete to the abstract.

The purpose of the book is to describe fundamental concepts in bioenergetics, such as heat and chemical energy, and then to show the basic relationships between environmental factors and living organisms. Thus to introduce a discussion of the physiological effect of food, consideration is first given to what happens to an animal who goes without food. A survey of survival time in relation to starvation gives a chance to discuss basic concepts of statistics and their applications in bioenergetics. The composition of living bodies is discussed with extension to loss of body weight and loss of body substance. An excellent description is given of the evolution of methods for the measurement of respiratory exchange. There is then the problem of what a starving animal gains by burning up its own body. There is a review of principles of animal heat loss and animal temperature regulation. A chapter on basal metabolism explores the relationship of body size and metabolic rate, and there is modest reference to that relationship between body size and efficiency of food utilization often referred to as "Kleiber's principle."

Kleiber treats the prevention of starvation from the aspect of food as fuel. Clarification is offered of confusing opinion regarding losses of food energy, with detail on the calorigenic effect of food. Finally, there is an excellent appraisal of the necessities in food requirements for our increasing human population. Kleiber concludes that starvation today results more from economic conditions than from shortage of energy, and that "considerations of elbow room rather than scarcity of food should limit the growth of human populations."

Kleiber is generous in his acknowledgements of aid from his teachers and his colleagues. He is comprehensive in his references to significant contributions from scientists. He is lucid in the analysis of complex principles. And he is stimulating in the philosophical questions which he raises.

A series of appendices give much factual information and also offer a number of practice problems. The bibliography is excellent, and the volume is well indexed. Altogether, this is a skillfully and brilliantly organized discussion which may long serve as the definitive exposition of classical bioenergetics.

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Extinct Reptiles

Dinosaurs. Their discovery and their world. Edwin H. Colbert. Dutton, New York, 1961. 314 pp. Illus. $7.50.

This informative book is primarily intended for the average person who is curious about dinosaurs, but it also contains considerable detail on some genera of the different groups. Thus the book can be read and understood by the readers for whom it is primarily intended, and it will also be useful to paleontologists, especially for teaching.

Each group of dinosaurs is discussed, and one of the oldest or most primitive as well as one of the most advanced forms is described. The most important characters and usually the adaptive significance of these features are elucidated. Colbert directs attention to many interesting genera not previously mentioned in semipopular accounts.

Basic principles and techniques in paleontology, with which paleontologists are concerned, are included to give the reader a better background. These include geologic time, the discovery, collecting, classification, and preparation of specimens, and research. There are also interesting passages on the life and characteristics of dinosaurs—food habits, brains, brawn, temperatures, eggs, embryos, juveniles, tracks, environments, distribution, and extinction. It is stated there is no satisfactory explanation for their extinction but that evolution is in part dependent on extinction.

An important omission is the lack of citations in the text and in the bibliography to original descriptions and to the most recent or best technical revisions of the genera and families. This would have been most helpful to the thousands of youngsters and teachers who are making a serious effort to inform themselves by using original sources.

From time to time throughout the book, Colbert's years of contact with the literature and, more particularly, with unpublished documents and field notes, enable him to reveal incidents about fossil discoveries and the persons involved in them. This adds much local color and brings the reader into realistic contact with the historical context of the subject, although the versions of some of these anecdotes differ somewhat from those handed down to us. In these passages Colbert's choice of words and his sentences are usually colloquial.

There are 150 excellent photographs and 51 line drawings, charts and maps, each of which illustrates some point emphasized in the text. I recommend this book to teachers for use at almost any level of instruction.

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Auxins to 1959

Les Phytohormones de Croissance. Méthods, chimie, biochimie, physiologie, applications pratiques. Paul-Émile Pilet. Masson, Paris, 1961. 775 pp. Illus.

In the last 10 years the auxins have certainly been thoroughly written up; first Söding's *Die Wuchsstofflehre* (1952), then Audus' *Plant Growth Substances* (1953; ed. 2, 1959), Leopold's *Auxins and Plant Growth* (1955), my *L'Origine et les Fonctions des Auxines* (1956), and Linser and Kiermayer's *Methoden zur Bestimmung pflanzlicher Wuchsstoffe* (1957); there have been two full-sized symposia (in Wye, 1955, and in New York, 1959) and numerous smaller ones, and several chapters in large books. All this is not to mention a considerable number of special and general reviews. Now comes Pilet (himself an active contributor to the field of growth and auxins), with a 774-page book that covers the literature through 1959. Unlike several of the other authors, Pilet emphasizes pure science rather than horticultural uses. Systematically, he treats (in order) methods, chemistry, biochemistry, physiology, and practical applications. The literature coverage is extensive and thorough; although it includes only papers published since 1937, the list (with titles) still occupies no less than 105 pages.

In some parts of the field, critical evaluation would have been more useful than such complete reporting. For example, it is noted (page 328) that 2,4-dichlorophenoxyacetic acid promotes the oxidation of indoleacetic acid, but it is not mentioned that this was traced to 2,4-dichlorophenol as an impurity. It is noted too that several workers using the diffusion technique found that the molecular weight for natural auxin in seedlings was 306 to 384, while others found 155 to 200. But, except for drawing attention to the probable error of such measurements, no real explanation of these discrepancies is attempted. It is a pity, too, to perpetuate the old statement that indoleacetonitrile gives rise to indoleacetic acid via the amide, for this has been disproved; the amide is neither an intermediate nor an effective substrate for the enzyme.

A 40-page chapter, "Other hormones," treats of kinins, gibberellins, and the postulated calines. Here we find the surprising statement (page 385): "Theoretically, it is certain that a caline controls (*préside à*) root formation, but it must be recognized that we know nothing either of its chemical structure or its biological properties, and no one has been able to extract it or to make an analysis of its biochemical characters." This seems to make the caline about as substantial, and as useful to theory, as the luminiferous ether, and one wonders whether such faith might not be better tempered with a desire for evidence.

The section on physiology contains a good discussion of auxin transport and its complications and another of the role of auxin in tissue cultures, a review which, though brief, is a new and very useful departure. Pilet has a nice gift for making up little tables and diagrams, often bringing together the results of several workers. If the diagrams are sometimes not as easy to understand as a table would have been, they are, in any event, better than a desert of text.

The book is, alas, not free from the usual misprints and misspellings, especially in the bibliography, but it is very understandable that the *élan* which drives one to assemble 105 pages of references might well be exhausted when the time comes to correct the proofs.

What a pity that Pilet's clear exposition and beautifully phrased French will be lost on so many of our students who no longer learn to read the language.

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New Books

Mathematics, Physical Sciences and Engineering

Advances in Inorganic Chemistry and Radiochemistry. vol. 3. H. J. Emeleus and A. G. Sharpe, Eds. Academic Press, New York, 1961. 463 pp. Illus. $12.50.

Anodic Oxide Films. L. Young. Academic Press, New York, 1961. 390 pp. Illus. $11.

Astronomical Spectroscopy. A. D. Thackery. Macmillan, New York, 1961. 256 pp. Illus. $3.95.

The Chemistry of Heterocyclic Compounds. G. M. Badger. Academic Press, New York, 1961. 506 pp. Illus. $12.

Cosmology. H. Bondi. Cambridge Univ. Press, New York, ed. 3, 1961. 182 pp. Illus. Paper, $2.45.

Dispersion Relations and the Abstract Approach to Field Theory. Lewis Klein, Ed. Gordon and Breach, New York, 1961. 284 pp. Illus. $4.95.

Electronic Equipment Design and Construction. Geoffrey W. A. Dummer, Cleo Brunetti, and Low K. Lee. McGraw-Hill, New York, 1961. 248 pp. Illus. $8.50.

Elements of Queueing Theory. With applications. Thomas L. Saaty. McGraw-Hill, New York, 1961. 438 pp. $11.50.

Fundamentals of Heat Transfer. H. Grober and S. Erk (revised by Ulrich Grigull). McGraw-Hill, New York, ed. 3, 1961. 539 pp. Illus. $15.

Gyrodynamics and Its Engineering Applications. Ronald N. Arnold and Leonard Maunder. Academic Press, New York, 1961. 494 pp. $14.

Instruments and Measurements. Chemical analysis, electric quantities, nucleonics, and process control. vols. 1 and 2. H. von Koch and G. Ljungberg, Eds. Academic Press, New York, 1961. 1227 pp. Illus. vol. 1, $16; vol. 2, $22.

Mass, Length and Time. Norman Feather. Pelican Books, Baltimore, Md., 1961. 367 pp. Illus. Paper, $1.45.

The Mathematical Theory of Linear Systems. B. M. Brown. Wiley, New York, 1961. 278 pp. Illus. $8.

Modern Magnetism. L. F. Bates. Cambridge Univ. Press, New York, ed. 4, 1961. 526 pp. Illus. Paper, $2.95; cloth, $7.50.

Physical Methods in Chemical Analysis. vol. 4. Walter G. Berl, Ed. Academic Press, New York, 1961. 487 pp. Illus. $16.

Principles and Applications of Electromagnetic Fields. Robert Plonsey and Robert E. Collin. McGraw-Hill, New York, 1961. 570 pp. Illus. $12.75.

Proceedings of the International Conference on Semiconductor Physics, Prague, 1960. Academic Press, New York, 1961. 1133 pp. Illus. $35.

Random Variables and Probability Distributions. Harald Cramer. Cambridge Univ. Press, New York, 1961. 128 pp. Paper, $4.

Reagent Chemicals and Standards. Joseph Rosin. Van Nostrand, Princeton, N.J., ed. 4, 1961. 565 pp. $14.50.

Soviet Chemistry Today. V. I. Spitsyn. National Acad. of Sciences–National Research Council, Washington, D.C., 1961. 302 pp. Illus. $2.50.

Valency and Molecular Structure. E. Cartmell and G. W. A. Fowles. Academic Press, New York, ed. 2, 1961. 306 pp. Illus. $7.

Understanding Digital Computers. Paul Siegel. Wiley, New York, 1961. 413 pp. Illus. $8.50.

Unit Operations of Sanitary Engineering. Linvil G. Rich. Wiley, New York, 1961. 319 pp. Illus. $10.75.