the affluent and the miserable, one of which must inevitably exterminate the other. The Paddocks are both more pessimistic and more realistic. They pinpoint 1974 as the year of onset of general, widespread famine, and round the date off to 1975 for convenience. Their book both documents convincingly the basis for their conclusion and supplies, as no one else has done, a realistic suggestion for American action during the years of food crisis.

That famine must come to the underdeveloped nations is self-evident, because it is already there. Widespread starvation has been averted in China, India, Egypt, and other countries only by the massive importation during recent years of grain from those few nations which still have surplus, the United States, Canada, Australia, and the Argentine. The first 201 pages of this book are devoted to an extraordinarily detailed analysis of the present famines, their cause, and the possible ways in which they might be mitigated. That to hope for a "technological fix," getting food from the sea, for example, is unrealistic is convincingly demonstrated. The clear-cut, well-documented conclusion is that (i) population growth (now greater than 3 percent a year in many places) cannot be slowed sufficiently before (ii) the present exceedingly slow increase in agricultural productivity (less than 1 percent a year), which also cannot be importantly influenced in the short time available, causes (iii) a decrease in available per capita food supplies in many of the developing nations to levels below those at which the life of their populations can be sustained. I stress again that all responsible investigators agree that the tragedy will occur. They differ only as to whether it will take place in ten years or less, or in ten years or a little more. The underdeveloped world is on a collision course with starvation. No technology short of nuclear warfare can be spread with sufficient speed to avert the catastrophe. The only remaining question for the United States and for the nations of the developed world is how to deal with the starving nations, when starvation comes. The remaining 47 pages of the book are devoted to this matter.

To the problem the Paddocks propose a cold-blooded, but logically realistic solution. Let the developed nations not attempt (it would be logistically impossible anyway) to help all starving peoples equally. Let them instead establish criteria by which the hungry nations may be divided into three categories, to wit, those which given food and technical help may be able to develop into self-sufficient countries; those which cannot so develop, which are hopelessly enmeshed in their own backwardness; and the "walking wounded" which with minimal support may be able to survive. In short, let the developed nations use their food surplus (and we will have to become much more vegetarian than we are at present if we are to have the required surplus) as an instrument of selection, helping and indeed permitting those peoples of the underdeveloped nations who have done best by the standards of our industrial-technical society to survive, and purging the remainder. A grim solution. Does anyone have a better?

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Lectures for Chemists

Nuclear Magnetic Resonance for Organic Chemists. D. W. MATHIESON, Ed. Royal Institute of Chemistry, London; Academic Press, New York, 1967. 297 pp., illus. $10.50.

"The chapters which comprise this book were delivered as a series of lectures at a summer school . . . in 1964. The course . . . was run specifically for Organic Chemists and was primarily concerned with the interpretation of NMR spectra in terms of molecular structure." This quotation from the preface explains, in part, some of the shortcomings of the book. Although each of the contributors is an acknowledged expert, the quality of the chapters shows enormous variation. Jarring discontinuities appear in several places; for example, the A_2B, A_2BX_2 type of designation is introduced without comment, and relaxation times and saturation effects are mentioned without a word of explanation. It also appears that the editor and contributors have been overly condescending in compiling a practical text for the organic chemist. Their desire to be qualitative leads them to omit many important aspects of theory the neglect of which, it seems to me, would seriously hamper the understanding of NMR, even by a practical organic chemist.

The chapter on principles is quite inadequate, not even explaining the origin of the Larmor precession frequency or its relation to the strength of the external magnetic field. The chapters on chemical shift are generally useful. Those on spectral analysis of complex spin systems quote line frequency-intensity tables without ever setting up even the simple quantum mechanical problem of the AB system. It is difficult for me to believe that the reader will fully understand and appreciate such tables and energy diagrams unless he knows their origin. For reasons which escape me the difficult ABC system is discussed before the ABX one. The chapter on the latter is a good, complete, extensive discussion of the practical analysis of ABX systems. Four-spin systems are discussed much less completely than is possible even with a qualitative approach. The AA'XX' system could certainly have been dealt with by consideration of its two AB subspectra. A generally useful section on proton-proton coupling and stereochemistry is followed by one on "other nuclei," which should provide incentive for those used to thinking of only proton work. Problems (and their answers) at the end cover a reasonable range of complexity, with those involving spectral analysis probably being the most useful because of the present abundance of problems of the spectra-structure type in which only chemical shifts and integral data are utilized. The number of errors is modest. An amusing instance is the incorrect statement on page 91 that $D_+ \geqq D_- \geqq 0$ for ABX, whereas a worked problem on page 263 is an example in which $D_+ < D_-$.

In summary, it seems that this text is too late with too little. It does not seem to fill any gap in the presently available reference works.

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17th-Century Atomic Theory

Atomism in England from Hariot to Newton. ROBERT HUGH KARGON. Oxford University Press, New York, 1966. 178 pp. $6.75.

Kargon seeks a reappraisal of the introduction of atomism in 17th-century England. Well aware of the fallacy of chaining the history of science to an internal, technical account, he

turns to social, political, theological, and personal, as well as scientific, problems which affected the main figures of his story—men such as Hariot, Bacon, Boyle, and Newton. Rapidly sketching in the background, Kargon turns to the Northumberland group of savants, among whom Thomas Hariot (1560–1621) emerges as the chief character. Called the reviver of atomism by an associate, Hariot appears as an interesting figure who attempted to use the analogy of the machine to explain phenomena and who relied on matter and motion for physical explanation. After tracing the relationship of these atomists with the "Cavendish circle," Kargon leads us on to well-known figures of the scientific revolution. It is of special interest that Robert Boyle's corpuscular hypothesis is shown to be far more derivative than is commonly thought. This bears out other recent studies which have resulted in similar conclusions about Boyle as an innovator.

Yet, if Kargon opens a new approach to 17th-century atomism here, he does not grant sufficient recognition to the chemists' concepts of matter in this period. In Francis Bacon's view the natural magicians and the chemists offered the major alternative philosophies for those who were disenchanted with Aristotelian thought. And although atomism was hardly a major pillar of support of traditional alchemy, we find a change occurring in the early 17th century. The important English mystical alchemist Robert Fludd (1574–1637) called for a new philosophy (1617) and set up a series of key questions which must be answered. Among them was the question whether it might not be true that all things are composed of atoms. A few years later Fludd was able to answer that they probably were. And with an interest in 17th-century intellectual history similar to that of Kargon, McGuire and Rattansi [*Notes and Records of the Royal Society* **21**, 108–43 (1966)] have shown that the attempt to clothe theologically unrespectable concepts with the mantle of a *prisca theologia* affected this field as well. The early 17th-century scholar Isaac Casaubon identified the traditional first atomist, a Phoenician named Mochus, with the Biblical Moses. It was an assertion to be repeated by men no less respected than Sennert, Gassendi, and Boyle.

As we shift our emphasis from internal to contextual history we open a floodgate of new relationships which influenced the rise of our scientific age. The complexity of the process becomes ever more evident, and although Kargon appreciates the need to broaden our studies of key concepts in this crucial period, he has not gone far enough. We have here a useful first step toward a much-needed reappraisal, but there remains much to be done.

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Infant Nutrition

Utilization of Nutrients during Postnatal Development. P. HAHN and O. KOLDOVSKY. Pergamon, New York, 1967. 189 pp., illus. $8.

Late effects of early malnutrition or of other environmental factors, to name among these only maternal deprivation, are at present in the forefront of biomedical and social research. The irreversibility of such effects, when it occurs, is based on imprinting and specific adaptation.

The present book, by authors at the Institute of Physiology, Czechoslovak Academy of Sciences, deals with postnatal development of processes related to food intake and utilization. Inasmuch as it is extremely difficult to carry out long-term observations on man, rats with their relatively short life-span were mostly used. However, in a special chapter the energy metabolism in the human fetus and newborn is discussed by V. Melichar and M. Novak of the Institute for the Care of Mother and Child, Prague, with reference chiefly to their own investigations.

Infant rats utilize both endogenous and exogenous fat in preference to other substances. The fat content of rat milk is about 12 to 20 percent. It is noteworthy that in the experiments of the authors both prematurely and normally weaned rats when permitted to choose consumed a diet the major constituents of which were very similar in composition to rat milk. Proteins are used mostly for growth. Carbohydrates play a less important role than later in life. Even in newborn infants administration of free fatty acids obtained from the cream of breast milk raises the concentration of glucose in the blood.

Fat seems to be the main energy source for the human infant also. In the opinion of the authors it seems justified to feed lipids in the amounts and proportions found in breast milk, if artificial milk mixtures are used very soon after birth. With infant formulas relatively low in fat and high in glucose and, especially, in protein, energy is obtained also from excess protein; such a diet might therefore place an additional burden on the infant.

Premature weaning, with a sudden change to a low fat mixture, produces lasting effects in rats, demonstrable even in 1-year-old animals. In such animals spermiogenesis is impaired, conditioned reflexes are elaborated at a slower rate, and the memory trace of such a reflex is also retained for a shorter time than in rats weaned normally. Prematurely weaned female rats fed an atherogenic diet later in life have much higher serum cholesterol concentrations than do normally weaned animals. Even in premature weaning a high-fat diet appears to prevent all these changes.

Development during early postnatal life is accompanied by many new adaptive processes, and the final adult picture is the result of interaction between environmental and internal, chiefly hormonal, factors.

"It may well be asked whether similar conditions prevail in man. . . . It appears that long-range longitudinal studies in man could be of immense value and the work devoted to such studies must be well worthwhile."

The reviewer fully concurs.

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Books Received

Advanced Accounting: An Organizational Approach. Norton M. Bedford, Kenneth W. Perry, and Arthur R. Wyatt. Wiley, New York, ed. 2, 1967. 840 pp. Illus. $10.95.

Advanced Engineering Mathematics. Erwin Kreyszig. Wiley, New York, ed. 2, 1967. 918 pp. Illus. $11.95.

Advances in Enzymology: And Related Areas of Molecular Biology. vol. 29. F. F. Nord, Ed. Interscience (Wiley) New York, 1967. 649 pp. Illus. $18.75. Nine papers.

The American Influence on English Education. W. H. G. Armytage. Humanities Press, New York, 1967. 128 pp. $3.

The Analysis and Design of Pneumatic Systems. Blaine W. Andersen. Wiley, New York, 1967. 314 pp. Illus. $13.50.

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