well Lecture series at Rice University. In these lectures, the author placed Charles Darwin in the scientific, philosophical, and religious setting of his time and traced Darwin's influence on the development of these three overlapping fields. His treatment is lucid and objective, and it is given in some detail.

We can trace the conflict between revealed religion and Deism back to the time when Sir Isaac Newton first described the universe as operating according to law, rather than according to impulse or whim or a series of unlawful acts. Darwin entered the fray much later, and his contribution to the dispute was made nearer to our own time than to the beginning of the controversy. Darwin's demonstration of how natural selection caused species to evolve helped to undermine all static views of nature. It also helped to destroy any belief in the verbal accuracy of Scripture. But more important than this, Darwin applied the methods of natural science to the study of man as an individual and to the study of human society.

It was inevitable, perhaps, that this application would be accompanied by some confusion. For instance, the "struggle for existence" in nature was assumed by many to be homologous with business competition in a *laissez faire* economy and, if the results of the struggle in nature were beneficial, those in society were also assumed to be good; this in spite of the easily observed fact that social and biological successes were often antithetical! In evolution, biological success consists exclusively in leaving offspring. In human society, the social failures were, in general, the biologically successful because of the number of children they left, sometimes for the state to support.

The author holds that Darwin's influence on social thought has been both good and bad; good in that it showed man's relation to the animal kingdom, bad in that it encouraged Herbert Spencer's emphasis on individual, racial, and national competition and in that it encouraged the idea that the methods of the natural sciences are fully adequate for the study of human nature and human society. Science, the author holds, needs the support of both philosophy and religion before we can use it as a guide.

CONWAY ZIRKLE
Department of Botany,
University of Pennsylvania

Entropy in Communication

Life and Energy. An exploration of the physical and chemical basis of modern biology. Isaac Asimov. Doubleday, New York, 1962. 380 pp. Illus. $4.95.

This introduction to the manner in which living organisms derive energy from their surroundings is written in layman's language and starts with the assumption that the reader will not have even a high school background in physics, chemistry, biology, or mathematics. The first half of the book treats the underlying principles of work, energy, heat, chemical bonding, and kinetics of reaction. The second half, which is appreciably more successful and up-to-date than the first, then uses these concepts to discuss the action of enzymes, the assimilation of foodstuffs, intermediary metabolism, and the role of high-energy compounds in the chemistry of life.

The general organization of topics is excellent, and the author effectively uses concepts already developed to undergird subsequent presentations. The basic principles are illustrated with examples from the more familiar inorganic realm before they are applied to biological chemistry. Isaac Asimov, the author, is well-known for his readable style and his flair for putting scientific concepts into clear, understandable language. Unfortunately, however, that ability was not applied uniformly throughout this book. Marked unevenness in the presentation gives the impression that the volume was too hastily put together. A disappointing number of errors and distorted statements occur throughout the text (and in at least one quarter of the figures). Several of these will confuse readers who have little background in the subject. In general, both the figures and the uses of analogy are quite helpful aids to understanding; but a number of them are confusingly constructed, and the reader will wish for others that are not provided.

The concept of entropy, introduced in the first part and widely used in the second part, suffers from a particularly uninspired explanation. This is especially unfortunate since the average reader initially has little intuitive feeling for this thermodynamic property. The chapters on chemical bonding and on photosynthesis are also less ably written than one would hope for in a book of this kind. In the first part of the book, the author takes great pains to avoid using powers of ten—even Avogadro's number is written out at length. Subsequently he introduces them in a figure, without further explanation, and continues to use them in the latter part of the book.

The presentation is almost entirely historical and descriptive and does not contain the rigor and thoroughness that would be expected of an elementary textbook. Unfortunately, it also neglects much of the excitement of science, by failing to emphasize those areas in which present knowledge is lacking and in which scientists are actively seeking answers to profound questions. Furthermore, there are no references to additional sources for the interested reader. For these reasons, this book is not well-suited to the high school student contemplating a career in science, in spite of the fact that its style of writing might make it seem attractive.

KENNETH SAUER
Department of Chemistry,
University of California, Berkeley

Packets of Thought

Human Values and Science, Art, and Mathematics. Lillian R. Lieber. Norton, New York, 1961. 149 pp. Illus. $3.95.

This nicely issued and charmingly illustrated small volume consists essentially of two parts. The first half deals with a few key mathematical concepts presented with the conciseness and lucidity for which Lillian Lieber has won her well-earned, if limited, fame, and in the free verse which serves her manner so effectually. She conveys in pleasing phrases the meaning of geometrical systems, the role of the axioms or postulates that constitute their foundations, and the rules demanded of and the freedoms permitted to the superstructures erected upon them. She then elucidates the meanings of truth and functionalism in mathematical exploration and applies her particular gift of lucidity to some of the new systems of algebra, with their novel language and meanings. Even readers familiar with the essence of the modern vistas of mathematical thought, will delight in these lightly uttered free-verse lines, rich in ideas and carrying solid packets of thought and explanation.