Book Reviews

Fads and Fallacies in the Name of Science. (Revised edition of *In the Name of Science.*) Martin Gardner. Dover, New York, rev. ed., 1957. 363 pp. Paper, $1.50.

It sometimes surprises me, as it may have surprised other readers of this journal, that no one has yet founded an American Association for the Advancement of Pseudoscience. Its potential membership would be enormous—the adult population of the United States plus or minus a few million. Furthermore, we can all think of a number of persons in high places who could be persuaded to serve on its board of trustees.

In the beginning, at least, the association might have rough going. The genuine pseudoscientist is reluctant to leave his celluloid tower and instinctively resists being organized. But he would have much to gain. Among other things, the association could work for more adequate financial support and legal representation, fuller coverage of its activities in the nation's press (the ranks of pseudoscience writers are dwindling), and the education of the few publishing houses which still reject pesudoscientific works, even those works endorsed by literary critics and magazine editors.

We may be thankful that no such body exists. Pseudoscience is doing well enough as it is, without the benefit of organization. Many of its most widely hailed efforts are described and dissected in *Fads and Fallacies,* a revised and expanded edition of a volume published five years ago. Martin Gardner, the *Scientific American*'s mathematical-puzzles editor, has written an illuminating and often depressing account of scientific nonsense prepared in the name of science. Bridey Murphy is here as the latest example of the way in which the cheapest sort of publicity can cash in on the notion of an afterlife.

The long parade includes Reich's blue-glowing "orgone energy," Immanuel Velikovsky's colliding worlds, L. Ron Hubbard's "dianetics," which out-Freuds the Freudians by tracing our troubles back beyond early childhood to the instant of conception. There are also flat-worlders, flying-saucer enthusiasts, anti-evolutionists, dowsers, and a rich variety of obscure and not-so-obscure medical crackpots. Their writings are often amusing, but Gardner is not amused. He points out that such works are becoming increasingly popular—a situation which would not exist if nonscientists were as well acquainted with the basic approach and attitudes of science as they are with the specific achievements of applied research.

"In the last analysis, the best means of combating the spread of pseudoscience is an enlightened public, able to distinguish the work of a reputable investigator from the work of the incompetent and self-deluded." *Fads and Fallacies* offers the layman some general ways of telling the difference. For instance, the pseudoscientist commonly considers himself a misunderstood genius, unabashedly regards workers in the same field as crooked or stupid, and has a compulsion to attack the greatest scientific investigators and their theories. Also, he often writes in a complex jargon—a fault he shares with some of his more legitimate colleagues!

Gardner tends to overprove his points, to devote too much space to the details of past cases. Certain current areas of pseudoscience are omitted entirely. To cite only one example, there is no systematic survey of the sort of unscrupulous, dishonest advertising which exploits and degrades everything that science stands for. But this book is a valuable indication of troubles ahead—and of the fact that an active fight against all forms of pseudoscience is one of the most important social responsibilities of the scientist.

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Statistische Thermodynamik. Arnold Münster. Springer, Berlin, 1956. 852 pp. DM. 138.

This book is impressive in its bulk, thoroughness, quality, organization, clarity, and typography. It may well become a standard, if not a classic, reference book in the field of statistical thermodynamics. The author has succeeded in presenting a panoramic view of the field as a unified whole, and in discussing the major concepts and techniques against a background of numerous applications important to physicists and physical chemists. Literature references are copious and remarkably current. An attractive feature, too often lacking in theoretical works, is the large number of tables and graphs of experimental data.

Its four major divisions are general foundations, theory of gases, theory of crystals, and theory of liquids. The discussion of foundations invites comparison with Tolman's famous tome, devoted entirely to this subject. Tolman is discursive, devoting almost 200 hundred pages to an introductory presentation of quantum mechanics, for example, in order to exhibit the foundations of quantum statistics with admirable clarity. Münster is much more concentrated, including in his 300-page discussion not only most of the territory covered in Tolman but also the Darwin-Fowler method and a 60-page chapter on molecular distribution functions, covering the work of Born and Green, of Kirkwood, and of Mayer. Münster is very clear, but as might be expected, since he is more comprehensive, more effort is required to read him than to read Tolman.

The five chapters on gas theory (173 pages) deal with the standard problems involving ideal gases (for example, monatomic and polyatomic gases, ortho and para hydrogen, molecular rotations and vibrations); chemical equilibrium in gases; theory of the second virial coefficient; theory of condensation (including the Einstein condensation); and molecular distribution functions for real gases. A fair-sized fraction of the material was worked out in the last decade and thus has been available only in scattered journal articles heretofore. This last remark applies to a surprisingly large amount of material throughout the book. It is a pity the author did not include a discussion of the increasingly important plasma state of gases in this section. Saha's equation would have naturally found a place here, also. It is hoped that Münster will add such a chapter in a future edition.

Five chapters (171 pages) cover crystal theory: ideal crystals; crystal-vapor equilibrium and the Nernst heat theorem (two chapters); and cooperative phenomena (three chapters). The first of these three chapters gives the classical treatments of order-disorder of Gorsky, Bragg and Williams, Bethe, and Kirkwood. The second goes into the matrix theory of the Ising model in considerable detail, giving the fundamental contributions of Onsager and others. The third discusses solid solutions and rotational transitions. I was somewhat surprised at the omission of a discussion of semiconductors, which would have afforded an opportunity to treat the electron gas

from the classical, dilute case to that of complete degeneracy, with many comparisons between theory and experiment. It is hoped that such a chapter will appear in a later edition. Current solid state theory has been so profoundly affected by semiconductor progress in the last decade that the lack of a chapter on semiconductors is, in my opinion, a regrettable omission.

It is a little strange to find the statistical thermodynamics of radiation, including Planck's law, compressed into a few pages and treated as a digression sandwiched between the Einstein and Debye theories of crystal properties. Perhaps I am sentimental, but I cannot help feeling that Planck's law should be set to better advantage in any complete treatment of statistical thermodynamics.

The four chapters of the last part (on theory of liquids, 173 pages) are devoted to pure liquids, solutions of nonelectrolytes, strong electrolytes, and solutions of macromolecules. Cooperative theories of melting, theory of free volume, critical points, orientation effects, and Debye-Huckel theory are among the topics discussed. A mathematical appendix concludes the book.

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Oeuvres de Lavoisier. Correspondance. Fascicule II. René Fric, Ed. Michel, Paris, 1957. 285 pp. Illus.

Fascicle I of this work was reviewed in *The Scientific Monthly* [**83**, 211 (1956)]. It was there pointed out that the correspondence of the great French chemist Antoine-Laurent Lavoisier (1743–1794) is now being published as a supplement to the standard six-volume 19th-century edition of his collected writings. Hence, fascicle II may be considered to constitute pages 251 to 536 of volume VII of the *Oeuvres de Lavoisier* (the pagination is continuous with that of fascicle I). These pages contain 162 documents, emanating from the six years 1770 to 1775, inclusive. The costs of issuing fascicle II were contributed in part by certain outstanding French business firms and by the University of Delaware.

Here, as in fascicle I, we see Lavoisier tirelessly striving to wrest from nature a few of its tenaciously guarded secrets. In this connection we are given a photocopy of the famous memorandum which he wrote with his own hand and deposited under seal with the secretary of the French Academy of Sciences, on 1 November 1772, for the purpose of fixing the date of a discovery about combustion that he was not yet ready to announce publicly (pages 388–389). The foresight shown on this occasion is so characteristic that it is surprising to see him ask one of his correspondents to return his letters for several days because he wanted copies made of them (page 268); evidently even the methodical Lavoisier sometimes neglected to preserve the preliminary drafts of his messages, so that after the latter had been sent off, he had no permanent record of what he had written.

In these days of intensive specialization it is particularly interesting to catch fleeting glimpses of Lavoisier's manifold scientific activities outside the field of chemistry proper. His correspondence shows him observing astronomical phenomena, accumulating meteorological data, conducting a geological survey, and investigating the optical properties of mirrors and lenses.

In these days of hot and cold wars it is well to be reminded by the editor that when one of Lavoisier's French colleagues, who had been sent to help in the American Revolution, was captured by the British, he was released in recognition of his scientific attainments (page 335).

Another valuable service rendered by the editor consists of his inclusion of biobibliographical sketches of the scientists prominent in Lavoisier's correspondence. But here and there the editor has blundered. For example, Patrick D'Arcy began his studies in France in 1739, not 1769 (page 480). Charles LeRoy, a nonresident member of the Academy of Sciences, was designated correspondent of Jean-François-Clément Morand on 16 February 1774, not 19 February 1752 (page 416). The assertion (page 359) that Newton belonged "to the Unitarian sect" rests on flimsy evidence. In the list of Guyton de Morveau's publications, his 1782 memoir on chemical nomenclature appears twice (page 405). Document No. 281, dated 16 November 1775, should precede No. 280; the latter is misdated 28 October 1775 (page 508), although the correct date (28 November 1775) appears in the provisional index, which is supplied as a separate sheet not bound with fascicle II.

In like manner, Nos. 145 and 146 should come before No. 144. On 26 November 1770 Lavoisier wrote four letters, two of them (Nos. 145 and 146) from Charleville, and the other two (Nos. 144 and 147) from Stenay, a small town about 30 miles away from Charleville. While he was still in Charleville, he began No. 145, with the statement, "In a moment, sir, I shall enter the carriage to go to Stenay." Obviously, then, No. 144 (written at Stenay) is later than Nos. 145 and 146, which were composed at Charleville prior to Lavoisier's departure from that city for Stenay.

Three other documents (Nos. 173 to 175) form a related group, all undated. But the first two (Nos. 173 and 174) contain only the opening words of a section which appears in full in No. 175. Would it not have been better editorial judgment, then, to place No. 175 in front of Nos. 173 and 174?

An "errata" sheet rectifies some of the typographical errors in fascicle II. While we are all grateful to the editor for making available to us the correspondence of his eminent fellow-countryman, we may be permitted to hope that the forthcoming fascicles will maintain a level of excellence fully worthy of their subject.

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Craig and Faust's Clinical Parasitology. Ernest C. Faust and Paul F. Russell. Assisted by David Richard Lincicome. Lea & Febiger, Philadelphia, ed. 6, 1957. 1078 pp. Illus. $15.

This sixth edition of Craig and Faust's textbook of the same title has two new authors, Paul F. Russell and David L. Lincicome, who rendered editorial assistance. It is thoroughly revised, the text now exceeding that in the fifth edition by about 75 pages. There has been little change of emphasis in this edition; the greatest emphasis is still upon helminthic disease. The section on arthropods has been increased by about 14 pages, but that on protozoology has been reduced. In keeping with current needs, there has been greater emphasis on toxoplasmosis and visceral larva migrants. The book still retains the high standard of excellence of the earlier editions.

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Theories of Nuclear Moments. R. J. Blin-Stoyle. Oxford University Press, London, 1957. 89 pp. $1.40.

This monograph, *Theories of Nuclear Moments,* by R. J. Blin-Stoyle is the first to appear in a series aimed at the postgraduate reader. Within the short compass of 75 pages, the subject of nuclear moments is covered under the following chapter headings: "Electromagnetic multipole moments," "Measurement of nuclear moments," "Exchange currents and velocity dependent forces," "Nuclear moments of H^2, H^3 and He^3," "Nuclear models," "Magnetic dipole moments of odd A nuclei," "Electric quadrupole moments of odd A nuclei," "Magnetic dipole and electric quadrupole moments of odd-odd nuclei," "Moments of excited states of nuclei," and "Nuclear