matical backgrounds differ as much as their senses of humour. It is an engaging *mélange* of shaggy-dog stories, whimsy, facetiae and mathematics; a book to be dipped into, rather than read from cover to cover. One hopes, however, that a paperback edition will soon appear, for in its expensive, hard-back form the book might have disappointingly few readers. A. G. HOWSON

# Uses of Far Infrared

*Far-Infrared Spectroscopy*. By K. D. Möller and W. G. Rothschild. Pp. xix+797. (Wiley: New York and London, June 1971.) £14.25.

THIS book is in the tradition of monographs on special aspects of optical spectroscopy exemplified by the classical works of Theodore Lyman on the vacuum ultraviolet and of Coblentz and Lecomte on the infrared spectrum. In the far infrared, defined as the range of wavelengths from 50 $\mu$m to 1 mm, black-body radiation from incandescent sources is several orders of magnitude less intense than in the near infrared. Absorption spectroscopy is correspondingly more difficult, and only since the early 1950s have new instruments and techniques enabled the ready exploitation of the region. In fact, according to the bibliography given in the present volume, in the past twenty years four times as many far infrared papers have been published as in the entire previous history of the subject. It is thus time for a monograph to review the status of the field, and the authors have provided a good one.

The first quarter of the text is devoted to instrumentation. Grating spectrometers, Fabry-Perot and Michelson interferometers, and auxiliary components—sources, detectors, multireflexion cells, filters and so on—are reviewed in satisfactory detail. The treatment of order-separating filters for grating spectrometers is particularly well done.

The main part of the book reviews applications of far infrared spectroscopy to physical chemistry and solid-state physics. Of interest to chemists are four chapters on low molecular frequencies due to heavy-atom vibrations, hydrogen-bonded complexes, and multiple potential minima, and three chapters on free and hindered molecular rotation in gases and condensed phases. The solid-state topics are introduced by two chapters on elementary theory and applications of the vibrational spectra of crystals. These are followed by five appendices on the far infrared spectroscopy of lattice impurities (written by A. J. Sievers), ferroelectric materials with the perovskite structure (C. H. Perry), magnetic phenomena (I. F. Silvera), semiconductors (R. Kaplan) and superconductors (G. K. Gaulé). In view of the specialized nature of such topics, the preparation of the appendices by experts makes the treatment authoritative. The volume concludes with a brief appendix on rapid-scan Fourier-transform spectroscopy (E. V. Lowenstein) and a reproduction of the widely known far-infrared bibliography of E. D. Palik (1,512 entries from 1892 to 1969).

A serious flaw in the book is the omission of any treatment of laser studies in the far infrared. While it is true that tunable far infrared lasers are not yet widely used for spectroscopic purposes, their potential for high-resolution and high-speed spectroscopy is clearly indicated by work at shorter wavelengths. However, because of the rapidity with which the laser art is advancing, it is perhaps unfair to expect to find such material in the present volume. Though its copyright date is 1971, the last year covered in the bibliography is 1969, and the references at the end of the individual chapters contain few entries later than 1968.

Other topics where the book seems to me to fall short in completeness or scholarship are in the references to the older literature and in the subject of ring vibrations. The book quite rightly regards Rubens as the father of far infrared research, but the bibliography seems to include all of Rubens's papers, without regard to whether they have anything to do with the far infrared (for example, ref. 84 is a paper on the photoelectric effect in gold films). Conversely, other early contributors to the development of techniques that have become valuable in the far infrared are omitted. So far as I could see, the only reference to A. H. Pfund is a bibliography entry dealing with the Welsbach mantle as a source of far infrared radiation. His classical works on crystalline powders as selective radiators, on selenium-plate polarizers for the infrared, on the properties of blacks for detector surfaces, and especially on the resonance radiometer (the forerunner of narrow-band AC amplification) are missing entirely. R. W. Wood, the inventor of the echelette grating, rates only seven entries, and W. W. Coblentz none at all. The classical 1931 paper of Cleeton and Williams on the absorption of ammonia gas at 1.5 cm, the first to bridge the gap between radiofrequency and far infrared spectroscopy, is not cited.

The least satisfactory of the chemical chapters is that on the "Skeletal Modes of Strained Ring Systems". The choice of four-membered-ring molecules for discussion is poor and pseudorotation in five-membered rings is inadequately treated. The work of Durig and Wertz on cyclopentane, in which pseudorotation in that molecule was first shown spectroscopically, is not cited. All but one of the examples selected to illustrate the topic with spectral data are not in fact true pseudorotators because the five-membered ring contains a double bond.

Apart from these minor points, the book is to be warmly recommended. It belongs on the shelves of science libraries and of serious workers in the field of infrared spectroscopy. Research workers in other areas will find it a good place to learn what the far infrared can offer to help them attack their own problems in molecular structure and solid-state physics. RICHARD C. LORD

# Russian Fluid Mechanics

*A History and Philosophy of Fluid-mechanics*. By G. A. Tokaty. Pp. vii+241. (Foulis: Henley-on-Thames, April 1971.) £4.50.

ACCORDING to the jacket, in 1947 the author "became the Chief Rocket Scientist responsible to I. V. Stalin himself". According to the author (p. 155), "The history of science and technology is far from being free from misconceptions and the tyrannical influences of certain dogmas . . ."; fluid philosophy seems to consist in a dogma attributed to Bobylev (p. 127): "No man should ever undertake experimental investigations until and unless they are demanded by a 'solid theory'." Of course Russians must be given credit for a lot of things denied them by the dogmatic. The author attributes to Lomonossov (p. 121) the "outstandingly original" proof "both theoretically and experimentally" that gases are compressible, the concept that the "insensible particles" of bodies have "mass, weight, volume, colour, taste, etc.", on which "the whole continuity theory of of fluid mechanics rests", and the invention of the helicopter (pp. 122–123). As evidence that "the secrets of the atmosphere captured Mendeleyev's imagination to such an extent that he soon became an organic part of the Russian school of fluid mechanic thought", the reader learns that (pp. 123–124) Mendeleyev "personally ascended in a balloon to an altitude of more than three kilometres". While the author lists the titles of eight of Ostrogradsky's papers on subjects other than fluid mechanics, he deprives his countryman Euler, despite heaping upon him more than his customary number of superlatives, of credit for several of his abundantly documented discoveries: the "Lagrangian description" (p. 78), the "Bernoulli equation" (pp. 79–80), the stagnation region ahead of and behind a blunt obstacle (p. 81), and the d'Alembert paradox (pp. 81–82).

This book should be rated strictly X for those who do not already understand the mechanics of fluids and know its history. For those who do, it may pander to the wicked habit of collecting howlers. Examples on fluid mechanics itself: "Experimentally . . . in actual fact, bodies of all weights fall from the