the numerical code to accommodate new entries will surely be necessary by the time of the next edition. It is to be hoped that revised editions will be forthcoming at frequent intervals.

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Modern Physics for Students

Atomic and Nuclear Physics. DEREK L. LIVESAY. Blaisdell (Ginn), Waltham, Mass., 1966. 539 pp., illus. $10.50.

A Collection of Problems in Atomic and Nuclear Physics. I. YE. IRODOV. Translated from the second Russian edition by Stevan Dedijer. S. Doniach, Translation Ed. Pergamon, New York, 1966. 249 pp., illus. $9.50.

The course in modern physics has been for some time a standard feature of the undergraduate physics curriculum. Compared to the texts of a decade or two ago many of those now available are considerably more sophisticated in their presentation. Much of the material that was once presented in graduate courses has now been inherited by a senior or even a junior course. This "hardening" is natural. After all, the subject has grown considerably. New concepts and principles have been developed, new areas of investigation even in relatively old and exploited fields have been opened up. Our understanding of older concepts has deepened, and much that was once difficult has with time become both clear and "obvious." In addition, our first-year students arrive with greater resources of knowledge and technique. They know quite a bit of modern physics and are very eager to learn more. It would be a pity, of course, if the increased sophistication of today's modern physics courses was achieved simply by introducing more complication. It is more desirable, but much more difficult, to deepen the content of the course and yet in some sense keep it simple.

Atomic and Nuclear Physics covers the standard set of topics. Perhaps there is more material than usual on the quantum theory of solids. In addition, being the latest book, this one treats, in the chapter on particle physics, the various mesons and hyperon properties. But quantum mechanics, relativity, the atom, the nucleus, and so on—the traditional topics—are all included as well. The level of difficulty is intermediate. The Schroedinger equation, for example, is solved for various bound state situations, but very little attention is paid to a quantitative theory of scattering. The treatment is straightforward, in some places almost to the point of bluntness, although on occasion comparatively subtle points are uncovered. The gain in this style is the comparatively fast pace of the discussion. The material is there. The presentation is clear. It is left to the instructor to refine it, to deepen and broaden it, to point up what is profound. The production of the volume cannot be faulted. The page size is large, the type clear and legible and uncrowded.

The volume by Irodov contains some 850 problems, together with answers and hints for solution. The problems are broken up into chapters covering the usual modern physics material. Each chapter is preceded by a short but by no means complete list of fundamental concepts and formulas needed for the solution of the problems.

The problems are more or less standard in type. One would find similar problems at the end of the chapters of most textbooks on modern physics. There are a few problems in each chapter which essentially verify that the definitions of the symbols in various formulas have been understood. There are some problems that can be used to review a given topic. Not many of the problems require a great extrapolation of concepts to new or novel situations. There are no problems on scattering or reactions besides Rutherford scattering and various kinematic calculations. The problems in nuclear physics are few and quite elementary. The answers for the more complex examples seem to be sufficiently detailed.

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Avian Population Dynamics

Population Studies of Birds. DAVID LACK. Oxford University Press, New York, 1966. 247 pp., illus. $10.10.

There is little doubt that bird populations are regulated by density-dependent factors. Not only does the availability of food appear to be the ultimate factor regulating population size in most birds, but at least in many species it appears to be the proximate factor. In *Population Studies of Birds*, David Lack examines in the light of recent studies the theme of his earlier book *The Natural Regulation of Animal Numbers* (Clarendon Press, 1954; now out of print). The present book considers in critical detail work on birds which has appeared since 1952 and which does not duplicate the 1954 effort. Whereas the 1954 book included material on invertebrates and on vertebrates other than birds, the new one deals entirely with population studies of birds. Lack presents the pertinent material from 13 major studies, each of at least four years' duration and consisting of substantially more than an annual census, and from 11 minor studies, each relevant to a major study. The species included are 13 passerine birds, representing insectivorous, graminivorous, and fungivorous forms, and bigamous, promiscuous, and colonial species in addition to the more commonly treated monogamous, solitary nesters; eight other land birds, nearly all territorial nesters, some vegetarians and some carnivores, with nidicolous and nidifugous forms represented; and four sea birds, all colonial, including both inshore and pelagic species.

Eleven of the 13 major studies were done by British workers—nine in Britain and two in the tropics. None of the major studies was American, although four of the five major studies included in the 1954 book were done in North America. This bias in coverage reflects a paucity of such work in the Americas since 1952, not the author's choice.

Lack's decision to restrict the book to birds has permitted him to write in greater depth. He has been successful in baring critical, often limiting, factors for inspection. In summary of his present views he states "(a) that the reproductive rates of birds have been evolved through natural selection and so are in general as rapid as the environment and the birds' capacities allow; (b) that mortality rates balance reproductive rates because bird populations are controlled by density-dependent mortality; (c) that starvation outside the breeding season is much the most important density-dependent factor in wild birds (but not necessarily in other animals); (d) that breeding birds are dispersed broadly in relation to food supplies, through various types of behaviour which are as yet little understood, but which are to be explained by natural selection."

It is apparent that Lack finds food

to be the most important proximate factor in the density-dependent regulation of bird populations. He presents evidence of the direct influence on clutch size of food availability at the time of laying. He also shows that the availability of food during incubation and nestling life affects reproduction success. That starvation outside of the season of reproduction is an important factor is largely inferred rather than confirmed by actual data, but Lack argues strongly for the hypothesis.

Of more than usual interest is his critical approach to findings consistent with his own thesis and his efforts to represent other points of view. A useful 31-page appendix, in three sections, considers theoretical controversies concerning animal populations. The first section gives a chapter-by-chapter summary of his 1954 book and considers four major criticisms of it. He discusses agreements and differences expressed by E. M. Nicholson regarding the application of the density-dependent mechanisms. The second section deals with criticism by H. G. Andrewartha and L. C. Birch of the importance of density-dependent factors in population dynamics. The third section considers in critical detail dispersion and social interaction in population regulation as proposed by V. C. Wynne-Edwards.

I find the book well composed and provocative. It brings together in one place pertinent parts of significant population studies and treats them critically. Although it deals chiefly with birds, the underlying principles must apply widely to other vertebrate and to invertebrate animals.

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Temperature and Order

The Quest for Absolute Zero. The Meaning of Low Temperature Physics. K. MENDELSSOHN. McGraw-Hill, New York, 1966. 256 pp., illus. Paper, $2.45.

Until about 1900, the objective of low-temperature research was simply to liquefy gases with lower and lower boiling points and thereby obtain ever decreasing temperatures. In 1908 when helium was finally liquefied and a temperature of 1 degree absolute had been reached, it seemed neither feasible nor profitable to seek still lower temperatures. However, with the development of the quantum theory and the third law of thermodynamics, the situation changed rapidly and the investigation of the last few fractions of a degree above absolute zero assumed importance. It was known that there exist systems, such as paramagnetic salts, which from a statistical point of view are in a state of complete disorder even at 1 degree absolute, and consequently are still at a very "high" temperature.

In order to learn how such systems ultimately achieved order, it became necessary to study them at lower temperatures. At the same time it was realized that by virtue of their disorder these systems themselves furnish a means of reaching temperatures much below 1 degree absolute. The exciting discoveries of superfluidity in helium and of superconductivity in metals had already provided great incentive for investigating lower regions. Today the study of matter near absolute zero is not only one of the most flourishing branches of pure science but has also given rise to a new technology. In the words of the late Sir Francis Simon, it is a region where "man has considerably surpassed Nature herself."

The Quest for Absolute Zero is a fascinating account of the development of low-temperature physics. Starting from the liquefaction of oxygen by Cailletet in 1877, the author narrates, with many interesting details, the entire story of the liquefaction of gases, ending with the liquefaction of helium by Kamerlingh Onnes. He then discusses the origin of the quantum theory and of the third law of thermodynamics, explaining clearly how these developments influenced the progress of low-temperature research. This is followed by an up-to-date account of the phenomenon of magnetic cooling (which made it possible to obtain temperatures within a few millionths of a degree), superconductivity, and superfluidity in helium. Experimental and theoretical aspects of all these phenomena are discussed with the help of a large number of explanatory diagrams and pictures.

Mendelssohn has succeeded in conveying to the reader the atmosphere of excitement and mystery which accompanied the unexpected and challenging new discoveries near absolute zero. The narrative is enlivened by zestful anecdotes about the rivalries and clashes between personalities who competed with each other in this field. The book is intended both to serve as an introduction for university students and to be of interest to the general reader. It fulfills its dual purpose well.

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Decision Makers in the U.S.S.R.

Managerial Power and Soviet Politics. JEREMY R. AZRAEL. Harvard University Press, Cambridge, Mass., 1966. 258 pp. $4.95.

Azrael lays the foundation for his analysis at the outset with a series of questions: "Is it true that the managers have acquired an increasingly powerful voice in the policy-making process? What truth is there in the view that the managers have served as representatives of the broader ranks of the technical intelligentsia or 'new class' within the political arena? Have the managers utilized their political influence to move the system in the direction anticipated by the liberal-democratic or the administrative-technocratic school?" (p. 5). To each of these provocative questions Azrael voices a cautious no. Important as the managerial elite in the Soviet Union is and has been, he does not find evidence that managers will be playing an innovating role in Soviet politics.

A careful and rewarding analysis of the Soviet managerial elite supports the reservations of the author on the imminence of a Soviet managerial revolution. He traces the Soviet manager through the various periods of development over the 50 years of Soviet power. In successive chapters he deals with the ideological background with which the Bolsheviks approached the managerial problem in the civil war; the "bourgeois specialists" of the New Economic Policy (1921–1927); the emergence of the "Red Directors" with the initiation of the Five-Year Plans in 1928; the managerial elite after the purges of 1937–38; and the new post-war, post-Stalin, developing managerial elite.

In his analysis of the political role of the manager, Azrael uses a definition of the manager similar to that employed by David Granick in *The Red Executive* and Joseph Berliner in *Factory and Manager in the U.S.S.R.*, that is, "those executives who have borne primary responsibility for the