book. One finds a series of small points that are simply and clearly wrong. Thus, Baron Ungern-Sternberg of Mongolian fame is given a "von" in the middle of his name; Feng Yü-hsiang is listed among the Kuomintang members who remained on the mainland to work with the Communists in 1949, although he had been killed in September 1948 by a fire on a ship sailing from the United States to Russia; and so on. No one of the errors is particularly important, but their cumulative effect destroys confidence in the book as a reference work. A large part of the value of a good textbook is the time it can save in securing factual accuracy. It took me about 3 hours to find a reliable reference for Feng Yü-hsiang's death (my memory was also wrong and had put it in 1947). It would probably take even longer to check many other statements of fact which one would like to get from a good textbook.

In addition to the minor points that are clearly wrong, one finds a good many others which are somewhat misleading. Thus, Mao's speech of February 1957 on contradictions among the people is described as "confidential"; we are told that "the world will probably never know" how much it differed from the version finally published, and that publication preceded the start of the antirightist campaign (p. 350). In fact, the speech was given to an audience of about 2000 in Peking, was recorded for similar audiences in other centers, and some duplicate texts were in circulation. And the published version appeared not before but just after the start of the antirightist campaign.

Again, to understand Communist agrarian policy, it is important to realize that the policy which won large-scale support between 1937 and 1946 was very different from the preceding and the subsequent policies and was actually based on a National Government land law which the Kuomintang seriously implemented only in Taiwan. But the reader would hardly gather this from the one mention of the subject when Clubb, after suggesting that all landlords lived in market towns or county seats, says that "In their Yenan period the Communists had exercised moderation with respect to the landlords, but that reflected wartime exigencies" (p. 318).

Yet again, we are told that the Nationalists ". . . won no victories in guerilla operations against the Japanese, for their 'guerillas,' once sent into occupied territory, with lamentable regularity defected to the enemy" (pp. 236–237). In fact, although few Kuomintang units adopted the organization needed for really successful guerilla warfare, even Communist sources report large-scale defections as starting only in 1941, and a few Kuomintang guerilla units survived into 1945. One could give many more examples of rather misleading statements, some on quite important topics.

For anyone who wants a one-volume general history of 20th-century China, this book is probably the best available. But it could have been so very much better if the author had taken a little more trouble. It must have taken at least a year's work to produce this book, and it would have taken only 1 or 2 months' additional work to check all statements of fact instead of relying on memory. Many errors could have been eliminated even more simply by asking several people working on this period to read the manuscript and to note any statements that seemed doubtful.

In an address to the AAAS, "The moral un-neutrality of science," Sir Charles Snow pointed out that a basic component of science is respect for the truth [*Science* **133**, 257 (1961)]. Sir Charles went on to argue that the nature of the scientific process makes it impossible for fraud to remain undetected for long—"So that all a fraud can do is to waste the time of the scientists who have to clear it up." But this is only true when inaccurate statements are uncommon. If they become common, the time wasted in clearing them up becomes a very serious obstacle to the advancement of knowledge. In any subject, unsubstantiated statements can be compared to the "noise" of communications theory. A low noise level is comparatively harmless, but a high noise level makes it hard to transmit information. And the noise level in modern Chinese history is extremely high. For example, a few years ago a British journalist published a biography of Mao Tse-tung which was very largely pure fiction, and this biography has now started to appear as a source in students' term papers, wasting the students' time in reading the book and the teacher's time in pointing out that this book is worthless as a source. A serious historian should be prepared to undertake the effort, which may be considerable, of sorting out "information" and eliminating "noise." This is the justification for making rather strong criticisms of a work in which the author, on a number of points, has actually added to the noise level by failing to take the trouble to check his statements.

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Biography

Yankee Scientist: William David Coolidge. John Anderson Miller. Mohawk Development Service, Schenectady, N.Y., 1963. viii + 216 pp. Illus. $3.95.

William David Coolidge is a physicist held in the highest regard for his professional attainment, beloved by his colleagues for his warm and gentle personality, and revered by a host of younger men who have been inspired by his truly remarkable gift of being able to concentrate his whole attention on the time-consuming and intellectually interrupting process of welcoming the constant stream of visitors who beat their paths to his door. It is a pleasure to see a biography of Dr. Coolidge appear, to call attention to the tremendous effect which this man had in demonstrating to industry the vital role that physicists may play in the industrial complex.

I have one quarrel with the organization of the biographical material, in which Dr. Coolidge's private life is largely separated from his scientific achievements. In fact, the two are so interwoven in any scientist's life that it is not only artificial to separate them but adds credence to the myth that a man's science is somehow separate from his life in society. Thus, it seems to me that Miller's separation of Dr. Coolidge's science and laboratory struggles into specific chapters tends to eliminate the human touch. Coolidge's x-ray work in the early days was so poignantly related in his own life to the tragedy of his first wife's death, and his position as head of the General Electric Laboratory so strengthened and made real by his later happy family life, that it seems an opportunity missed not to portray life as he has lived it rather than to separate it into categories.

The only other jarring note that I found in this biography was the abrupt shift at the end of the book when, in discussing Dr. Coolidge's retirement years, the reader is suddenly faced with the author's calling both Dr. and Mrs. Coolidge by their first names. To those of us who have known and been inspired by Dr. Coolidge, stripping him of the dignity of his title seems to me an unfortunate quirk of biographical technique.

In spite of these few quarrels with this biography, I recommend it highly as a labor well done and commend the concept of highlighting the full life of this very modest man.

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Man in the Universe

The View from a Distant Star. Man's future in the universe. Harlow Shapley. Basic Books, New York, 1963. xii + 212 pp. $4.95.

The 15 chapters of this small volume are good reading, and stimulating to the thought of the reader. This is what Harlow Shapley intended, and what we might expect of him. As the title suggests, the book presents an appraisal of man's place in the enormous, almost inconceivably long-lived, inexorably developing universe, as that position is seen from the point of view of a nonhuman appraiser. Of course such a presentation is not really possible—the views of the viewer from a distant star bear a remarkable resemblance to those of the human being Harlow Shapley—but the attempt is rewarding.

An introductory chapter sounds the theme of the noncentral location of man in space and of man's relatively primitive and insecure stage of development. Then three chapters give a very fine description of the astronomical universe in space and time, as it is known today. The style is easy and vivid, the organization superb. It would not be easy to find an equally effective star's-eye view of the cosmos in 50 pages. Chapter 5 considers the origin and development of life on this planet, the multiplicity of planets (the only possible homes of life), and the probability that elsewhere among the galaxies exist living beings comparable to or superior to ourselves.

From time to time through these chapters emphasis is laid on the presumption of man in considering himself to have importance, and on his actual insignificance in space and time. Chapter 6, "The human response to an expanding universe," is devoted to readjusting his perspective, as is chapter 14, "Is mankind entering the psychozoic kingdom?" Here I must confess to a certain lack of sympathy with the author's position, and a certain impatience with what seems to me a rather shallow treatment of a difficult philosophical question; namely, what *are* "importance" and "significance"? This is not the place for argument; suffice it here to quote side by side the statement from the catechism—"The chief end of man is to glorify God and enjoy him forever"—and the sentence from chapter 6—"We have the potentiality not only of conforming to the cosmic theme of Growth but perhaps even of elaborating or revising some of its natural rules."

The remaining nine chapters are less closely connected. They deal with various aspects of contemporary life as a scientist sees life. "Stars, ethics, and coexistence" calls for international cooperation, "The one world of stars" points out that, among astronomers, one world exists now. "Must we climb steeples?" is a protest against specialization; "Science and non-science" ridicules flying saucers, astrology, and water-dowsing. "A design for fighting" recalls William James's "Moral equivalent of war," but with a difference.

Your reaction to Shapley's reflections on man in the universe may be enthusiastic, or critical, or slightly disappointed. But you will not find them dull.

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Cloud Physics

Thermodynamics of Clouds. Louis Dufour and Raymond Defay. Academic Press, New York, 1963. xiv + 255 pp. Illus. $10.

This monograph consists of two portions. Part 1 deals with the thermodynamics of the surface region. The approach, quite unfamiliar to most American workers, is that of De Donder as elaborated by Prigogine and Defay (in *Chemical Thermodynamics*, Longmans, New York, 1954). This treatment permits the discussion not only of systems at equilibrium but also of systems in partial equilibrium. Thus, for surfaces one may consider the situation in which the bulk and surface regions are in mechanical and thermal equilibrium but not in chemical equilibrium. In this nonequilibrium discussion, it is necessary to introduce the concepts of "affinity" and "extent of reaction" and, for the surface region, lateral thermodynamic functions. In the later application to cloud physics, however, little use is made of the partial equilibrium concepts.

The development is quite sophisticated and demanding; considerably more background in thermodynamics than the authors indicate as necessary is required for understanding. The approach is formal and mathematical; frequent references are given to more generalized works. The thermodynamic content is restricted almost entirely to systems of one component or to solutions in which the solute is nonsurface active. The term "surface tension" is used throughout to refer both to mechanical tension and surface free energy. The correlation between the surface properties of liquids and solids is outstanding.

In part 2 the principles developed are applied to a limited set of problems in cloud physics. It is shown, for example, in a somewhat lengthy fashion, that a mixture of air and water vapor may be treated as a mixture of two perfect gases. Several other approximations are also shown to be valid. The behavior of a water droplet and an ice crystal suspended in the atmosphere is dealt with fully; this is by far the best account of this subject that I have encountered.

The work concludes with an account of homogeneous nucleation. The treatment is largely classical and has been extended to quite complex situations; it is of particular value in dealing with the formation of solid phases. Nonequilibrium thermodynamic concepts are applied in the discussion of nucleation kinetics. The practical problem of heterogeneous nucleation is not considered.

This monograph should be of great value not only to those concerned with cloud physics but to those working in the field of surface chemistry and physics.

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