Hutton, Smith, and Cuvier together "possessed the secret of the past but they never sat down in the same tavern to put the chart together." It was Charles Lyell who first wrote a coherent, general account of geology; and while Lyell did not develop a theory of evolution, Darwin's debt to him—evolution's debt to him—is enormous. "One can scarcely resist the observation that the *Origin* could almost literally have been written out of Lyell's book, once the guiding motif of natural selection had been conceived."

Eiseley discusses Darwin's predecessors in evolutionary theory—William Wells, Patrick Mathew, Robert Chambers. But the major portion of Eiseley's book, naturally, deals with Darwin himself: with his ideas and the sources of his ideas. There is probably more documentation on Darwin—more letters, notebooks, impressions, analyses—than on any other scientist. Yet he remains a baffling personality—difficult to understand, perhaps, because of the very extent of the documentation. The Darwin of the *Autobiography* and of the letters to close friends is, surely, the conscious Darwin, self-revealed. But thought does not reach its full development through conscious processes, and subconscious influences were surely just as important with Darwin as with any of us. Darwin's own concept of how he arrived at an idea is often clearly inadequate, which makes the game of trying to untangle the influences on his thinking even more fascinating. Eiseley makes many thoughtful contributions to this study.

Eiseley has a particularly interesting discussion of two attacks on Darwin that are now not well enough remembered. An erudite Scotch engineer, Fleeming Jenkin, published an article in 1867, pointing out in neat mathematical terms that a newly emergent character, however favorable, would, with blending inheritance, be swamped through backcrossing. The Mendelian answer to this had already been written but was unknown, and Darwin could find no answer. The other attack was from the physicists. Lord Kelvin, looking at the heat production of the sun in thermodynamic terms, found that the biologists and geologists could not possibly have the vast stretch of time that they needed for evolutionary processes. Again Darwin had no answer; there was no answer until the discovery of radioactivity at the end of the century. Darwin could only become more cautious, more Lamarckian, with each successive edition of the *Origin*.

Eiseley draws a moral from this. "Today there is a tendency in some quarters to regard the physical sciences as superior in reliability to those in which precise mathematical adeptness has not been achieved. Without wishing to challenge this point of view, it may still be worth a chastening thought that, in this long controversy extending well over half a century, the physicists made extended use of mathematical techniques and still were hopelessly and, it must be added, arrogantly wrong."

The last chapters of the book are appropriately devoted to the problems of human evolution: to the controversies over the first human fossils, to the divergence between Darwin and Wallace over the special case of man, to the emergence of the concept of culture and of cultural evolution. The book ends with the end of the century, with only occasional allusions to the vicissitudes of evolutionary ideas in the present century. Perhaps Eiseley will now carry the story on, in another book, to our own time. Whether he carries on or not, he has made an important contribution both to the history of ideas in general and to the history of evolution in particular, and through this, I think, a very real contribution to the study of the evolutionary process itself.

MARSTON BATES
Department of Zoology,
University of Michigan

Hospital Treatment of Alcoholism. A comparative experimental study. Menninger Clinic Monograph Series No. 11. Robert S. Wallerstein *et al.* Basic Books, New York, 1957. xi + 212 pp. $5.

The past few years have seen an encouraging rise in the number and quality of investigations of the goals, methods, and results of therapies for alcoholics. Since we are yet far from a satisfactory knowledge of the causes and dynamics of uncontrolled, pathological use of ethyl alcohol, it is clear that methods for rehabilitating alcoholic patients are properly approached from a research viewpoint. The clinical study by Wallerstein and his colleagues, reported in the present monograph, is a commendable and welcome example of this point of view.

What the authors have done is to compare four different methods used in treating a group of 178 alcoholic patients at Winter Veterans Administration Hospital from 1 Jan. 1950 to 30 June 1952 with a subsequent 2-year follow-up. The treatment modalities selected were (i) Antabuse (Disulfiram) therapy, (ii) conditioned-reflex therapy, (iii) group hypnotherapy, and (iv) "milieu" therapy (a control group). Of these modalities, it appeared that Antabuse therapy was most helpful to the most patients. However, of those to whom Antabuse was administered, nearly one-half were not helped. Also, it was concluded that the practical values of the other methods were sufficient to preclude the use of Antabuse as optimal for the mental hospital treatment of alcoholic patients.

In a study of which kinds of alcoholic patients tended to improve with which kinds of therapy, the authors found a significant correlation between *compulsivity* and improvement with Antabuse. The greater the characteristic *passivity* of the patient, the greater, in general, was his improvement under hypnotherapy. The danger of precipitating a psychotic reaction with Antabuse was stressed in borderline depressive or schizophrenic patients; these were helped more by the milieu therapy, which emphasized individual contact with the physicians and avoided threat to defense structure. Hypnosis seemed temporarily helpful to schizoid patients. Conditioned-reflex treatment seemed to evoke a good response in clinically depressed patients, but this treatment was considered contraindicated for masochistic individuals. With every type of therapy, those patients did best who were able to form and maintain close ties with the therapist, the hospital, and the program and, in general, to sustain relationships.

The authors have provided a sound analysis of their study, including analysis of the limitations of their project design (follow-up, patient selection, and so on), and have suggested lines of further investigation.

Karl Menninger's introduction to this monograph points out that enough correlation between the success of specific methods of treatment and the psychological characteristics of the patients has been revealed to merit further exploration of this idea. It is to be hoped that studies of this design will be widely extended.

EBBE CURTIS HOFF
Division of Alcohol Studies
and Rehabilitation,
Medical College of Virginia Hospital

Integral Equations. F. G. Tricomi. Interscience, New York, 1957. viii + 238 pp. $7.

The subject matter of this book, as interpreted by the author, is a topic which has become a standard part of everyday analysis, to be used, in particular, in innumerable problems of applied mathematics. A few such problems are treated or alluded to, among them the critical speeds of a rotating shaft, the forced oscillations of finite amplitude for a pendulum, the airfoil equation, the vibrations of a membrane. The book is intentionally short, and yet it covers all the classical types; it presents as simply as possible the essentials of the theories of Volterra, Fredholm, Hilbert, Erhardt

Schmidt, Carleman, and Hammerstein. Standard real-variable tools, the Lebesque integral, the L_2 theory, orthonormal systems, and the transforms of Laplace, Fourier, and Mellin are used systematically but without ostentation, so as not to repel the physicist, engineer, or technician. Topological methods are not used. The style is attractive and is enlivened by some interesting personal comments (concerning Volterra, Fubini, and others).

L. C. YOUNG
Department of Mathematics, University of Wisconsin

Light, Colour and Vision. Yves Le Grand. Translated by R. W. G. Hunt, J. W. T. Walsh, F. R. W. Hunt. Wiley, New York, 1957. xiii + 512 pp. $11.

The French original of this book, published in 1948, was the second of three volumes which serve as a textbook in the Institute of Optics in Paris. The first volume (of which there have been two editions) dealt with the geometrical optics of the naked and corrected eye—material which we have abundantly available already in English. The third volume, concerned with spatial vision from the point of view of a physicist, is not one for which an English version would be wanted.

This translation of volume 2 of *Optique Physiologique* is superlative. The translators, with help from the author and three other consultants, have updated the contents to create what amounts to a second edition. The extent of this amendation is indicated by the fact that there are about four times as many references as in the French original, although the text is no longer. The translators introduced only one important error ("wave-length" for "purity" in the caption of Fig. 74.)

The briefest statement of the coverage of the book would be that it deals with photometry and colorimetry: "The eye is a selective receptor, and the way it behaves under radiation is the subject of this volume." Physiological optics is commonly taught, in our schools of optometry and teaching departments of ophthalmology, with ophthalmic optics excluded and taken care of in a separate course. This book, even with its volume 3 appended, could not serve as a textbook in such places. This is sad, for a good, well-rounded textbook is badly needed. The present work is both too narrow and too deep, and too preoccupied with "mathematical" modes of expression, for broad use by American students. It is, however, very welcome indeed as an aid to the researcher in visual science in understanding those aspects of vision which Le Grand, a physicist with a deep interest in vision, is eminently equipped to elucidate.

The first three chapters deal with light and the measurement of visible radiation qua radiation, artificial sources (including the full radiator) and the sun, and the receptoral properties of the eye that make necessary a photometric system. The next three are concerned with photometry. Chapters 7, 8, and 9 cover (and deeply) colorimetry for "standard" and individual observers. This discussion is strung on the thread of the observed "trivariance" of vision, which is independent of all theory. Le Grand's only large blind spot shows up here (doing no practical harm): his curious inability to see that there is no connection whatever between two kinds of trivariance which he lumps together—the kind that requires a monochromatic colorimeter to have three controls and the kind that makes a tricolorimeter possible. The fact that a color sensation has a hue, a saturation, and a brightness is quite unrelated to the fact that mixtures of three primary color stimuli can afford all hues, and all saturations below their own. Le Grand also, perhaps without realizing it, puts complementation on a sensory basis, whereas it pertains strictly to stimuli. Colored *lights* can be mixed; but since their *colors* cannot be mixed, they cannot be said to neutralize each other. Otherwise, the "errors" in this first half of the book consist mostly of tiny sins of omission, together with unacceptable definitions of "simultaneous contrast" and "purple."

Chapters 10, 11, and 12, dealing with absolute and differential intensitive and chromatic thresholds, are particularly strong. Only slightly less satisfying are chapters 13 ("Time effects") and 14 ("Spatial interactions"). From there on the book tends to come apart.

Chapter 15, on the color blindnesses, is spoiled by the naïveté of the physicist and by ignorance of the implications of genetics for the interrelations of the defects. Chapter 16 commences section B, entitled "Theories of Vision"—although its first three chapters, on the anatomy, photochemistry, and electrophysiology of the retina, respectively, deal essentially with basic facts and belong earlier in the book. The reader will absorb so many little errors about the retina that he had best get his information elsewhere. The whole of chapter 17 is already antiquated. In chapter 18, the paucity of sensory correlates reveals the poverty of the whole field of retinal electrophysiology. There is not even any mention of the controversy over whether the electroretinogram is not entirely generated by stray light.

Chapter 19, on theories of color vision, very thoroughly expounds the situation of the Young-Helmholtz theory as of about a decade ago. All other theories are allotted only two pages, which is about what one expects from a physicist. In the final chapter (chapter 20, on threshold theory) the quantal and probabilistic elements are well developed, and Crozier's law is tactfully divorced from its original entanglement with "neural effect" and applied to things it may really describe.

There is a good index, a triple bibliography which "just grew," and a section of exercises (with solutions) which leads a teacher in one of our schools of optometry to envy the quality of student which the Institute of Optics is able to attract.

GORDON L. WALLS
School of Optometry, University of California, Berkeley

Lectures on Nuclear Theory. C. Landau and Ya Smorodinsky. In English translation. Consultants Bureau, New York, 1958 (original text published by State Technical–Theoretical Literature Press, Moscow, 1955). 83 pp. $15.

This brief survey of nuclear physics is based on ten lectures given to experimentalists by Landau in Moscow in 1954. There appears to be little, if any, elaboration of the lectures' incisive, though necessarily fragmentary content. Numerous computations, none of them lengthy, are carried out, simplified frequently by approximate and intuitively reasonable arguments. The discussion, unhurried, is almost entirely self-contained. It assumes familiarity only with ordinary nonrelativistic quantum mechanics and, in lectures 7 and 10, with some thermodynamics and statistics. The presentation is rather consistently a statement of experimental results followed by theoretical analysis.

Lectures 1 to 3 are on nuclear forces. As an illustration, the first lecture starts by presenting the evidence for charge symmetry of nuclear forces, then discusses the deuteron bound state. Scattering of spinless particles is reviewed, phase shifts are introduced, and sign determination by Coulomb interference is mentioned. The general velocity-independent nucleon-nucleon interaction is developed, and tensor interaction is defined and its presence is inferred from the deuteron's quadrupole moment. Typical is the careful note, at the end of the first lecture, of the fact that for a loosely bound structure, such as the deuteron, even its small quadrupole moment requires a larger tensor interaction.

Nucleon-nucleon scattering at up to 20 Mev is discussed in lecture 2, and at