volume, and their reproduction is excellent.

We are entering a new era of lunar surface studies, of which the Surveyor landing and Lunar Orbiter are but the beginning. Undoubtedly our fund of knowledge and working theories will soon be revised beyond the reports contained in *The Nature of the Lunar Surface*. These reports provide a useful and valuable fossilization of the state of knowledge before *in situ* investigations of the lunar surface.

JOHN C. BRANDT
Institute for Space Studies, National Aeronautics and Space Administration, New York City

Organisms in Communities

George Bernard Shaw, in a discussion of medical education, said:

> . . . there are two ways of making the action of the heart visible to students. One, a barbarous, ignorant and thoughtless way, is to stick little flags into a rabbit's heart and let the students see the flags jump. The other, an elegant, ingenious, well informed and instructive way, is to put a sphygmograph on the student's wrist and let him see a record of his heart's action traced by a needle on a slip of smoked paper.

Robert H. MacArthur and Joseph H. Connell have written their book **The Biology of Populations** (Wiley, New York, 1966. 216 pp., illus. $5.95) in such a way that I am not convinced that they could tell what was wrong with Shaw's argument.

At the end of their book is an appendix of exercises designed to demonstrate the "mechanisms of evolutionary change. . . . The materials are beads [or] lead shot." These beads are to be used to demonstrate mathematical models of selection and predator-prey interaction. The authors encourage students to design similar "experiments" since "designing such exercises helps to solidify one's knowledge of population biology." The only mention of real organisms in this appendix occurs in the sentence "Whenever possible [the bead exercises] should be supplemented by field trips in which real organisms rather than imitations are studied," but no suggestions for this study are provided. This strange gap between theory and organisms pervades the book so that those sections which relate to actual organisms and their environments are inserted as if by afterthought.

Much of the book consists of abstract models. Some of these are the standard population models (for example, those of Volterra and Fisher and of Wright). Many, however, are taken from very recent papers by MacArthur and his collaborators. These are characterized by heavy reliance on plausible analogy rather than empirical predictions and tests. The words "effectiveness," "simplicity," "efficiency," and "need" are used in oddly nonoperational contexts. Communities of animals are likened to libraries full of books, and a contrast is made between "jack of all trades" and more "specialized" species, but these remain metaphors rather than being developed into theories. Perhaps the authors were aiming at simplicity of presentation, for the freshman text market. The distinction between simplification and caricature has not been maintained.

The pattern of citing references is a little surprising and, on occasion, highly misleading (for example, the impression is given that Hutchinson developed the process of carbon-14 dating!). Occasionally material is taken from some source without being adapted to this text.

I regretfully conclude that this book, although clever in spots, is neither profound nor complete nor carefully prepared. It does not do justice to the field of population biology or to the reputation of its authors. It is not appropriate either as a text or as supplementary reading.

LAWRENCE B. SLOBODKIN
Department of Zoology, University of Michigan, Ann Arbor

Radiation Problem

Dipole Radiation in the Presence of a Conducting Half-Space, by Alfredo Baños, Jr. (Pergamon, New York, 1966. 263 pp., illus. $11), is a systematic and unified treatment of an electromagnetic radiation problem that has been studied by many investigators during the past 60 years. The author gives a detailed historical account of the numerous investigations and of the controversies that have arisen. In addition, he has given a mathematical treatment of the problem sufficiently general in scope that he is able to obtain the solutions of previous investigators as special cases. This enables him to make detailed comparisons of the work of those investigators and to evaluate their contributions critically.

The problem considered is that of finding the radiation from an elemental dipole, assuming that space is divided into two parts separated by a plane interface. On one side of the interface is air, and on the other side is a medium having a finite electrical conductivity. It is assumed that the radiating dipole can be either perpendicular or parallel to the interface and on either side of it; furthermore, it can be either an electric or a magnetic dipole. The formulation of the problem for all eight of the configurations is given in chapter 1, and the solutions in terms of integrals are given in chapter 2. The remainder of the book is devoted to the asymptotic expansions of these solutions.

Chapter 3 is a discussion of the saddle-point method of integration. This method is then applied in chapter 4 to obtain asymptotic expansions valid in the vicinity of the interface when the dipole is in the air. These expansions are carried out to three and sometimes four terms; and, in addition, the errors involved in using the expansions are evaluated. This has not been done previously and is a significant contribution to the theory.

The same configurations are treated in chapter 5, but the asymptotic expansions obtained are valid in the vicinity of the axis of the radiating dipole. In chapter 6 asymptotic expansions are obtained which are valid over an entire hemisphere. These chapters contain a substantial amount of original material.

Finally, chapter 7 treats the case of the dipole in the conducting medium, by the same general methods used in the preceding chapters.

The extensively debated error in sign that occurred in the first analysis of the dipole radiation problem by Sommerfeld in 1909 is discussed in chapter 4. This error caused some persons to doubt the validity of Sommerfeld's formulation of the problem and even to question the existence of the Sommerfeld surface wave. The author reviews this controversy from its inception to the present and concludes that there can no longer be any doubt that Sommerfeld's formulation was correct and that the Sommerfeld surface wave does exist.

S. W. MALEY
Department of Electrical Engineering, University of Colorado, Boulder