I am a very poor photographer, but I have devoted much time to bird painting; Charles Vaucher's photographs reveal certain facts about what a human being can hope to see of birds, and these facts may well be discussed here. Please look at the well-composed picture of flying gannets on page 84; here it will be observed that in the uppermost bird the white under side of the body, the part below the nearer wing, is *lost completely* to the eye as a result of shadow plus reflected color. The average bird painter (the word *average* is not intended to be snide) would feel it necessary to show the whole bird in order to give the viewer his money's worth, so to speak; but Nature seems to delight in breaking up shapes, in dissolving edges, and in neutralizing, changing, even destroying "local color." The top surface of a flying crow can flash pure white as the glossy plumage catches the sun; a flock of flying or running wild turkeys can lose their darkness and their gorgeous iridescence entirely in certain lights; the gray of an ordinary catbird (*Dumetella carolinensis*) can become as blue as the blue of an adult male blue grosbeak (*Guiraca caerulea*) on a cloudless summer day. This I know from memorable experience: I once shot a blue grosbeak in a stand of locust saplings; I was dead certain that my bird was of that species; but the dead bird that I picked up was a catbird.

The Swedish artist Bruno Liljefors knew wonderfully well how parts of birds and mammals can disappear as the sun-struck, shadow-marked creatures stand or crouch or move about in their habitat. One of his large oil paintings of a company of curlews is a meaningless mass of daubs at close range, but at a distance the eye finally sees the curlews in the grass, and the mind grasps the all-important fact that the process of finding the bird-shapes on the canvas has been very like that of finding the birds themselves in their actual habitat. It can be argued that more is to be expected of the artist than of the camera; but to my way of thinking the really great artist must fully understand *all* relationships between the viewer and that which is viewed; let him eventually become an abstractionist; let him eventually swing completely away from representation of that which is usually called and thought of as visible; even so, he will—even as did Picasso, who had his academic period—become the greater for having gone through the schooling process, for having first learned, then deliberately, wittingly, intentionally unlearned.

What I am trying to say is that the photographs in such a work as *Sea Birds* can be a guiding force for a bird artist. No honest artist will allow himself to copy a photograph directly; but he will study shapes, edges, highlights, and shadows avidly, hoping to come to a full understanding of them. Especially will he study eyelids and mouth corners and feet—parts of birds which dry up and lose shape badly after preparation as museum specimens.

The ecologist, as well as the artist, will find *Sea Birds* stimulating. Vaucher does not, I rejoice to observe, feel it necessary to employ the complex, hyphenated terms so many ecologists employ. He is, none the less, a sound student of habitats; his presentation as a whole is proof of this. Nowhere in *Sea Birds* is there an element that does not belong in a very real sense to the *oikos* about which the author so clearly speaks through both photographs and text. Here are the cliffs with their masses of guillemots and gannets, the position of each bird so determined by "space requirements" as to give the colony a surprising symmetry and orderliness. Here is the pounding surf, with the rocks it has worn smooth, the chasms and arches it has formed, and the birds that have found nesting places thereon. Here are the flowers known as thrift and sea-campion and the terns that find summer shelter among them. In the so-called "descriptive summaries," which might well have been included in the major writeups, more could have been said about the way in which populations of the several species fit together in occupying available nest sites, in sharing predation pressures, and in competing for food at the height of the nesting season. For example, the lateness of the nesting of the lesser black-backed gull is mentioned, but there is no explanation of the way in which this delay insures protection for the eggs and chicks by the developing vegetation, an important point made in the chapter "Breeding time in the gull colonies" in F. Fraser Darling's remarkable little book, *Wild Country* [Cambridge University Press (1938), pp. 47–55].

Most of the errors in *Sea Birds* are minor. But some of them must be mentioned lest readers be led astray. The lovely "lesser black-backed gull" shown in color on page 117 is actually a great black-backed gull (*Larus marinus*), as careful comparison with specimens will show. The black-and-white photograph of a great black-backed gull on page 132 is correctly identified. The two photographs, though not necessarily of the same individual bird, were taken at the same nest. The lesser black-back (*L. fuscus*) is decidedly more slender of bill and less slaty on the back than the bird shown in either of these two photographs. The statement to the effect that procellariiform birds "can only shuffle slowly and clumsily about on their tarsi" (page 35) does not apply to the albatrosses, a small but important procellariiform family (Diomedeidae). The eye of the adult gannet is not gray (page 68) but pale yellow (see frontispiece). Evidence of very poor translation or of careless proofreading is the phrase "carmine-pink gills" which should read "carmine-pink bills" (page 87).

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Plasma Physics. James E. Drummond. McGraw-Hill, New York, 1961. xiv + 386 pp. Illus. $12.50.

Although the prospects for developing practical sources of thermonuclear energy seem remote, vigorous research programs in the field have excited considerable interest in plasma physics. It is only within the past few years that a full appreciation of the complexity of the plasma state has been achieved and exploited in the laboratory. This volume contains a collection of survey articles on recent advances in the field. All the articles are on a high technical level.

The introductory chapter on plasma oscillations (by Drummond) contains an interesting historical review and an unusually complete list of important publications on the subject. There follows the volume's *pièce de résistance*—a long article by Klimontovich and Silin on the spectra of systems of interacting particles. The authors pay particular attention to quantum mechanical questions and recent statistical mechanical considerations of collective effects; thus, they introduce a more fundamental approach to microscopic phenomena than is usually found in the literature. They also discuss the energy losses of charged particles which are able to excite collective oscillations in passing through a medium. Again, the bibliography is a valuable one.

Other papers include an excellent account of the results of the application of diagrammatic perturbation methods to equilibrium statistical mechanics (written by Meeron) with particular attention to the current status of Debye-Hückel theory; accounts of the classification of amplifying and decaying waves in plasmas (by Sturrock and Buneman); a review of magnetohydrodynamics with a discussion of some aerodynamic problems (by Yoler); and articles written on the Bennett pinch, the stability of relativistic self-focusing streams, and on topics relating to microwave interactions with plasmas.

Space does not allow a complete treatment of all the papers in this volume, but they are all at a uniformly high level. I wish that astrophysical plasma phenomena had been discussed and that the same level of generality had been maintained throughout the book. However, these are minor criticisms of an otherwise well executed venture.

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Developments in Mathematical Psychology. Information, learning, and tracking. R. Duncan Luce, Ed. Free Press, Glencoe, Ill., 1960. 294 pp. $7.50.

This volume surveys three areas of recent emphasis in mathematical psychology: information, learning, and tracking. It should have been published about 5 years ago when most of it was written. Many portions are condensed and fragmentary, in the manner of contemporaneous reporting such as is found in the *Annual Review* series. Fortunately, other portions are more didactic and render the volume useful in spite of the time lapse.

The article on information is by R. Duncan Luce; it is divided about evenly between a section on theory, in the Shannon-Wiener tradition, and a section on applications, addressed to many topics in psychology. The section on theory seems rather advanced for a beginner, yet rather sketchy for a professional. An asset is the inclusion of some interesting developments by G. A. Miller, W. R. Garner, and other behavioral scientists, which appeared in the wake of the famous Shannon and Wiener treatments. The section on applications runs the gamut from studies that are direct consequences of information theory (for example, statistical approximations to English) to studies that show little influence beyond an exchange of digital counts for logarithms to the base 2. There is also a sensible treatment of whether or not information theory really earns its keep in behavioral science.

The article on learning, by R. R. Bush, seems particularly out of date. Unlike the other two topics, learning is a central concern in general experimental psychology and has attracted many new efforts, mathematically oriented and otherwise. Bush himself has done later work that contributes to the obsolescence of his article. The presentation is organized as it should be to point up the substantive content of learning research: acquisition, extinction, generalization, and so forth. Models of the Bush-Mosteller variety receive primary emphasis, with the Estes-Burke approach running a close second. Hull is relegated to an appropriate place in history, but there is little indication of later developments by the Hullian school. The article seems just right for a specializing student of learning, who can profit from its many pertinent observations without depending upon it as an overview of the field.

J. C. R. Licklider did the article on tracking, a slice of engineering psychology in which the engineering is far more conspicuous than the psychology. Studies of tracking generally view the human operator as a component in a man-machine system, whose stimuli are mathematically describable inputs from the system and whose motor responses are similarly describable outputs. The Licklider article does well at placing the results of tracking experiments in their appropriate mathematical context. The context itself is developed from the ground up in the first ten pages only; beyond that there is a too-rapid cascading of much that is standard mathematical background for the engineer but not for the psychologist. Well-educated engineers should find the going easy and the treatment informative.

In spite of the limitations indicated, the volume as a whole will probably serve to acquaint a wider audience with some major developments of the past decade. It is welcome.

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Nuclear Forces and the Few-Nucleon Problem. vol. 1 and vol. 2. T. C. Griffith and E. A. Power, Eds. Pergamon Press, New York, 1960. xx + 712 pp. Illus. $30.

As channels for disseminating scientific information, conference proceedings published in book form, are problem children. A scientific conference itself has, in the order of their importance, three aspects, for it enables participants to discuss their work, to hear about the newest developments in the field, and perhaps to hear some general lectures. Thus the most important aspects of a conference—the private discussions between conference participants and the reports on the latest developments—are either not available for publications (the private discussions) or they should be published quickly while the "recent" developments reported still deserve to be called "the latest" (many papers will be published after the conference in the scientific journals). Conference proceedings should, therefore, be published as rapidly as possible in order to report fully on the newest developments in the field. Unfortunately the proceedings under review are the report of a conference held over 1½ years ago (July 1958). Thus, it is to be expected that their novelty value will be somewhat worn. This cannot be denied. But a considerable amount of information is contained in the volumes, and an appreciable fraction of it is up to date.

A major portion of the conference was devoted to the nuclear two-body problem. There were introductory lectures on the phenomenological description of the forces by phase shifts and by potentials, on the meson theory of the nuclear forces, on the dispersion relation approach to nuclear forces, and on the experimental status of the nucleon-nucleon interaction.

Furthermore, there were several papers summarizing the work of particular groups and an assortment of shorter reports on experimental and theoretical aspects of the two-body problem. The three- and four-body problem is treated in a large number of shorter papers. Also, more or less extensive treatment is given to the scattering of all pairs of particles with mass between two and four. Finally there are a few papers on the binding energy of some nuclei up to O^{16} as well as some other contributions.

Workers in the field, especially new-