proach, and a more complete treatment of this subject will require filling in of the latter. Also lacking in the book is discussion of other phenomena that may affect long-term orbital evolution, such as the effect of the nonlinear interplay of the secular resonances discovered by Williams with close planetary encounters. In some cases, further work on such phenomena calls into question the validity of some of Öpik's conclusions.

These omissions need not be a problem, provided the reader regards the book as an introduction to the important field that Öpik pioneered. It may be hoped that its availability will result in more scientists' becoming his followers.

G. W. WETHERILL
Department of Terrestrial Magnetism, Carnegie Institution of Washington, Washington, D.C.

Island Biota

Biogeography and Ecology in the Canary Islands. G. G. KUNKEL, Ed. Junk, The Hague, 1976. xvi, 512 pp., illus. + plates. Dfl. 160. Monographiae Biologicae, vol. 30.

Papers giving information about the natural history of the Canary Islands are countless and are scattered through periodicals that are often difficult to obtain. A summary of the subject has long been desired. Considering the difficulties of getting various specialists to write articles that together represent a substantial part of the disciplines included in "biogeography and ecology," the book Kunkel has produced is reasonably well balanced. Beyond the scope of the title, however, are contributions on place names and biochemistry. An analysis of the economic history of the islands from clearing time to tourism time would certainly have been more appreciated. The volume is attractively got up, with good illustrations. Extensive reference lists enhance its value.

The individual islands are introduced at the beginning. Together they form a chain that geographically can be considered a prolongation of the Atlas range. Hypotheses about the origin of the archipelago are numerous. According to one the islands were once part of Africa, later breaking away and drifting westward. According to another they arose as independent volcanoes from the sea bottom. Finds of fossil ostrich eggs and land turtles seem to imply that land bridges to the Continent once existed. Strictly geological facts, on the other hand, irrefutably favor a purely oceanic origin. Relevant data are still insufficient, and in this volume a comprehensive report, mainly stratigraphical and petrographical, on recent progress in the geology of the islands takes a cautious attitude.

Solution of the origin problem would offer the biogeographers a firm base for discussion of the controversial question of how the archipelago received its biota. The uncertainties notwithstanding, it is generally agreed that the islands became refuges for a once widely distributed Tertiary biota which was largely exterminated in the Tethyan area as a result of catastrophes such as the desiccation of the Sahara and the extension of polar ice caps. In a paper on endemic vascular plants paleobotanical and biogeographical arguments are given for this view. For example, certain genera and families common to the Canary Islands and America but now absent from the Mediterranean area are also represented in southeastern Asia. Furthermore, primitive floral features such as higher proportions of diploids and woody forms are typical of the archipelago as compared with the Continent, where survivors had to evolve in response to more drastic climatic changes. The island isolation led to a biota very rich in endemic species and also with many endemic genera.

Indigenous mammals are absent, but a fossil rodent is known. Probably the entire fauna was once richer than it is today. A paper on recent ground beetles of laurel forests, a faunal group extremely rich in endemics, indicates that volcanic activity may have been important for the development of the fauna. The westernmost islands, Hierro and La Palma, with surface rock from relatively recent geological times, are unexpectedly poor in species compared with their next neighbor island, Gomera, which was undisturbed for a long period. On Tenerife, the middlemost island, recent patterns of distribution indicate that the fauna of an intermediate zone was not too long ago exterminated by deposition of volcanic material. Through resulting isolation vicariants evolved in the remaining zones, contributing to an especially great wealth of forms.

Other papers in the volume deal with climate, the laurisilva flora of Hierro, lichen flora and vegetation, fungus flora, bird fauna (rich in species, poor in endemics), amphibian and reptile fauna (poor in species, rich in endemics), and limnetic Crustacea.

The rapidly accelerated influence of man on vegetation and soil is accentuated in an account of introduced floral elements and exemplified by a report on recent developments on Hierro. In these and several of the other papers mentioned it is stressed that certain species of plants and animals are on the point of being exterminated. Nature conservation is young in this part of the world, and the work before ICONA (Instituto Nacional para la Conservación de la Naturaleza) is enormous if the islands are to keep the character of a unique refuge. In the last page of text the pious hope is expressed that leaders of tourist groups could by increasing public interest contribute to the conservation of the biota. Perhaps it would be a good opening to put the present book in their hands.

GUNNAR ISRAELSON
Paradisgatan 4, S-28100 Hässleholm, Sweden

Nonlinear Optics

Quantum Electronics. A Treatise. Vol. 1, Nonlinear Optics. HERBERT RABIN and C. L. TANG, Eds. Academic Press, New York, 1975. In two parts. Part A. xii pp. + pp. 1–472, illus. + index. $35. Part B. x pp. + pp. 473–754, illus. $22.50.

The origins of nonlinear optics are linked to the advent of powerful laser light sources some 15 years ago. This very active and still vigorously growing field is concerned with the interaction of light with matter at high intensities where the material properties, notably the dielectric susceptibilities or optical refractive indices, are themselves functions of the light-field strength. Nonlinear optics has not only led to the discovery of interesting new effects and phenomena, it is providing powerful new spectroscopic tools to study the structure of matter, and it has become the basis for an increasing number of technical applications and practical devices.

Although some of the basic concepts of nonlinear optics have become standard material in textbooks, there remains a need for up-to-date and in-depth reviews of the many research results and important details scattered throughout the primary literature. Volume 1 of *Quantum Electronics*, a well-organized and well-edited collection of reviews of selected topics, meets this need admirably. The emphasis in most of the papers is on the nonlinear optical properties of crystalline solids. Other important developments of much current interest, such as nonlinear high-resolution laser spec-