technology raises provocative questions about women as consumers, distributors, producers, and creators of print, but his theoretical discussion of feminism, Marxism, and neo-McLuhanism is sketchy and obscure. Anne McKay has unearthed fascinating material on women's early use of microphones for public speaking as well as women on radio, but her paper is flawed by some specious historical reasoning and vague conclusions about the actual impact of microphones on women's public roles and achievement. Leto's review of the literature on household technology fails to mention the work of Joann Vanek, whose "Time spent in housework" (*Scientific American*, November 1974) turned the conventional wisdom about women being liberated from housework on its head. (Leto also cites another leading scholar of housework, Ruth Schwartz Cowan, incorrectly as Ann Cowan.)

Scrutinizing communications and technology from the perspective of women can yield illuminating insights. Lana F. Rakow's very original study of the telephone explores new angles on this much-studied communication technology. Obscene phone calls, cultural stereotypes of females gossiping on the phone or forlorn women waiting for men to call, and the social etiquette that has dictated who (men) may call whom (women) are among the topics Rakow considers. Such subjects have not been covered in traditional studies of communication technology because, Kramarae contends, "Western history of technology has been basically men's history." This volume contributes to a fuller understanding of the history of technology by exploring women's unique experiences with technology.

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South Sea Waters

Ecology of Tropical Oceans. ALAN R. LONGHURST and DANIEL PAULY. Academic Press, Orlando, FL, 1987. xiv, 407 pp., illus. $39.95. International Center for Living Aquatic Resources Management Contribution no. 389.

Ecology of Tropical Oceans is unique in its scope. The tropical oceans occupy almost 50 percent of the total area of all open water and 30 percent of the total area of continental shelves. Yet these areas receive scant or cursory treatment in most textbooks. Perhaps in part this is because so few universities or research institutes are based in the tropics. It is not for lack of publications per se. This book includes almost 800 references. Perhaps the lack of general attention is due to the fact that much of the research has been published in the "gray" literature. No matter how excellent such work or how accessible, it is often ignored or dismissed simply because it does not appear in a "respectable" journal.

This book serves as a comprehensive general introduction to the ecology of tropical oceans, including chapters on geography and geomorphology, physical oceanography (a particularly useful introduction for the ecologist), biological communities, ecosystem trophodynamics, and the population biology of large marine invertebrates (urchins, penaeid shrimps, and squids). The focus, however, is always on the ecology of tropical fishes.

Longhurst and Pauly are both ultimately concerned with improving the management of tropical fisheries. They have rightly perceived that a major impediment to the effective management of tropical fishes is a general lack of knowledge of their life histories and environment. Hence their aim to provide "a simple but comprehensive examination of what is currently known about the structure of all tropical marine habitats and how fish can make a living in them under natural conditions."

Tropical seas are diverse in their environments and community types as well as species. This diversity is reflected in the vast numbers of examples given in the book, detail that may distract readers unfamiliar with the tropics but that is highly stimulating to tropical workers used to battling with North Sea or Northwest Atlantic species in other works. Many of the examples will be new to general reader and specialist alike. Others involve useful reanalysis of information published outside the mainstream literature or of previously unpublished data.

From among this detail the authors have made a valiant attempt to create a synthesis and search for generalizations. Since most theory and experience of fisheries management have come from the higher latitudes, comparisons between tropical and non-tropical systems are inevitable, but such general comparisons would be fatuous if generalizations could not be made within the tropics. Though many may not agree with the authors' final classifications, these provide the stimulation and basis for further studies.

Traditionally tropical environments have been seen as characterized by temporal stability, but a recurring theme throughout this book is the temporal variability of tropical seas. This variability is ascribed primarily to tropical hurricanes or cyclones, meso-scale oceanographic events, seasonal wind patterns and rainfall, and ENSO (El Niño/Southern Oscillation) events. It is suggested that inter-annual variability in particular is considerable in the marine tropics, mediated by ENSO events on the global scale and by regional rainfall patterns and stochastic oceanic circulation at the local scale. Among other data presented, previously unpublished analysis of long-term data sets for catches of two pelagic tropical fishes clearly demonstrates major inter-annual variability in tropical stocks.

Dogmas derived from a belief in intra-annual stability of tropical seas—that tropical fishes do not generally show annual bands on hard parts and therefore cannot be aged in this way, that spawning in the tropics is continuous and therefore analysis of the growth of tropical fishes cannot be achieved by length-frequency analysis, and that tropical fishes do not exhibit seasonal variations in growth rate—are all refuted in a typically provocative chapter by Pauly on the dynamics of tropical fish populations. This considerable section of the book is the presentation of a single metabolic model to describe reproduction, growth, and mortality of fishes in general, based on Pauly's belief that fish growth is limited primarily by the amount of oxygen supplied through the gills and the body surfaces. The following chapter examines the applicability of the same model to some large, motile invertebrates.

Overall, *Ecology of Tropical Oceans* is unique, stimulating and provocative. It is a major contribution to tropical marine science and will be of interest to marine ecologists and fish biologists in general. Most important, the book provides an environmental background and entree into the literature that will stimulate research relevant to the management of tropical fisheries for many years to come.

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The Radio Universe

Galactic and Extragalactic Radio Astronomy. G. L. VERSCHUUR and K. I. KELLERMANN, Eds. Second edition. Springer-Verlag, New York, 1988. xxii, 694 pp., illus. $79.95. Astronomy and Astrophysics Library.

There are several publications that survey the broad field of optical astronomy for the beginning graduate student, but few for one who wishes to learn about the radio universe. The first edition of *Galactic and Extragalactic Radio Astronomy*, edited by G. L. Verschuur and K. I. Kellermann, was a welcome arrival when it appeared in 1974, and most radio astronomers own a copy. The second edition, with the same editors, is

greatly expanded and updated. It is a magnificent compendium of almost the whole field of radio astronomy, from Galactic molecular clouds where stars are forming to the furthest parts of the universe. Each of the 15 chapters is written by one or two astronomers, most of them currently at the National Radio Astronomy Observatory, and contains a historical introduction, some necessary background, and a description of the current status of the topic. All chapters list further recommended reading and include useful references, typically complete to early 1987.

The book is not simply an update of the first edition. Of course, it is much longer, reflecting the enormous growth of the subject in the intervening 14 years, and though some chapters are revised and expanded versions of the earlier ones, other topics or their authors are new. As in the earlier edition, and as implied by the title, the solar system is not included among the topics. All but the final four chapters cover Galactic astronomy, but even an astronomer who works mainly on extragalactic objects cannot ignore our immediate vicinity. Some topics are new to the second edition, for example the Galactic center and astronomical masers. There is also a chapter on the cosmic microwave background, compared with only a brief mention of it in the earlier edition. I missed the interesting cosmological insights by von Hoerner in the first edition, which included a useful table of cosmological equations (albeit with some errors, perhaps left there as a exercise for the inquiring student); however, the new edition has a chapter by Condon on radio sources and cosmology that unites these topics in a practical way. Also missing is the earlier description of interferometric techniques; this is perfectly justifiable since nowadays it is unreasonable to expect most astronomers to know exactly how the Very Large Array works and more relevant for them to be aware of the many important contributions that have been made with the instrument. This book tells us about those contributions. I thoroughly recommend it as a graduate student textbook and as a refresher for older hands, who will find most of modern radio astronomy clearly, competently, and interestingly summarized here.

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