fire the reader's imagination; critical discussions of methods and techniques not only provide drama and entertainment, but give the reader an accurate view of the wonders of this powerful research tool. The specialist will find the book provocative and informative. From study of this text, all students of chemistry and biology should obtain a clear and vivid understanding of the uses of tritium as a research tool.

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Mathematics in Practice

Stochastic Processes. M. GIRAULT. Springer-Verlag, New York, 1966. 138 pp., illus. $7.

Modern mathematical theories not only awe applied scientists by their abstruseness but frustrate them as well by not offering much help for their practical problems. The situation has been well put by a theoretical physicist as follows: Mathematical problems arising from applied sciences are like brush fires which demand simple and quick action, but mathematicians are more interested in building spic-and-span fire stations which are too remote for those little fires. If one looks at the various current books on "stochastic processes," one is amazed at the great discrepancy among them, although some have almost identical titles.

On the one hand, there are those austere volumes of which the perusal is well-nigh impossible without years of intensive study in pure mathematics; on the other hand, there are recipe-book or handbook types just as full of equations and formulas but at a level supposedly (and advertisedly) accessible to readers with only "calculus background." The need to bridge the gap is obvious; bridging it is difficult indeed. Yet one could also easily imagine contemporaries of Newton and Leibniz shaking their heads over those fluxions and exclaiming over the absurdity of teaching that kind of stuff (namely the "calculus" just mentioned) to physicists and engineers!

The present effort by Girault to teach stochastic processes to "practical workers [in] Physics, Chemistry, Biology, Medicine, Population, Economics, Organisation, Operational Research etc." is one in a growing literature and should be viewed in this perspective. It presents a number of relatively simple "models" such as Poisson, additive, Markov, second order, and Laplace (alias Gaussian) processes, illustrates them with figures and numbers, and summarizes some of the relevant theory. Even such abstruse matter as infinitely divisible distributions receives some attention; but in contrast there is no discussion of certain familiar types of integro-differential equations encountered in applications. The explanation of the confusion of notation on page 32—"the sign $+$ in $(X + Y)$ denotes a convolution of two probability laws but in $(a + b)$ it denotes a sum of two numbers"—is outmoded and merely adds to the confusion. Even a practical worker nowadays must be taught that the sum of two random variables is just like the sum of two numerical functions and therefore, *in sum*, just like the sum of two numbers. But the probability law of a random variable (not necessarily a sum as in this instance) is not the same as the random variable itself. Without this truly fundamental understanding much in the rest of the book, such as the meaning of an "additive" process, must be incomprehensible or, worse, misapprehended.

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Freshwater Life

A Treatise on Limnology. Vol. 2, Introduction to Lake Biology and the Limnoplankton. G. EVELYN HUTCHINSON. Wiley, New York, 1967. 1127 pp., illus. $39.

This is the second volume of a monumental three-volume monograph. Although it contains only nine chapters, these are nicely subdivided, and each has a concise and adequate summary. The first chapter, "The nature of the fresh-water biota," accounts for about one-quarter of the text. Perhaps the most unusual feature of this chapter is the inclusion of short comments about a host of rare, atypical, and fortuitous inhabitants of fresh waters from all parts of the world. Few aquatic biologists are familiar with *Aldrovandra* (a floating sundew), *Calpasoma* (a Swiss freshwater hydroid), *Limnostylochus* (freshwater polyclad in Borneo), *Planolineus* (Javanese freshwater nemertine), *Aetheria* (an oyster-like mollusk from African rapid streams), and *Potamocypoda pugil* (a Malaysian freshwater crab), for example. The list of freshwater polychaetes is surprisingly long. Only 18 pages are devoted to vertebrates. There is an excellent discussion of the many facets of the physiology of adaptation to fresh waters, but the reader is judiciously left to draw his own conclusions about genetic mechanisms and precise ecological migratory pathways involved in the colonization of lakes and streams by marine and terrestrial ancestors.

A short chapter on "The structure and terminology of lacustrine biological communities" clarifies ecological concepts that are used in the subsequent portions of this volume (and presumably will be in volume 3). The mathematically minded limnologist will be pleased with the chapter on "The hydromechanics of the plankton." This is a remarkable treatment of sinking rates of phyto- and zooplankton in relation to turbulence, size, density, dispersion, and nutrient uptake, especially from the standpoint of ramifications of Stokes's law. "The nature and distribution of the phytoplankton" is a taxonomic consideration based chiefly on ecological nutrient requirements. "Phytoplankton associations" contains an intriguing mathematical consideration of "conditions for multispecific equilibrium." There is a new "provisional" classification of 13 different phytoplankton communities of the euphotic zone, including such associations as oligotrophic desmid plankton, oligotrophic chlorococcal plankton, eutrophic diatom plankton, and myxophycean plankton. Undoubtedly Hutchinson's simple classification will spark a good deal of controversy among phytoplankton specialists. In view of his extensive and complicated classification of lake types in volume 1 of this monograph, I am disappointed and surprised with his oversimplified concept of phytoplankton communities.

"The seasonal succession of the phytoplankton" is a thorough discussion of the frustrating problems of algal population irregularities with respect to physical, chemical, and biological agencies. The literature on antibiosis and biochemical growth stimulators is brought together in a complete and critical fashion. It is notable, however, that "grazing" effects by zooplankton are given only passing attention. I trust volume 3 will elabo-