fishery technology, much of which consists of compositional studies of commercial fish and fishery products. The task required a shrewd, discerning, and incredulous approach. Love, rising above infatuation with mere chemical analyses, has ably put together a book that is interesting, informative, and at times fascinating. The reader, depending upon his fancy, will find well-balanced discussions on such subjects as the life cycle, differences between and within species, the influence of environment, and phylogeny.

It is said that fish have a phylogenic history at least three times greater then birds and mammals. The chemistry of aquatic forms, on this basis alone, would be expected to offer new and refreshing perspectives in biology. The discussions in this book support such a conclusion. Students of comparative science may well recognize the wealth of provocative data afforded by oceanic species. Indeed, the relevance of marine biochemistry to humans is well documented by discussions of matters such as hormonal controls in spawning and the fate of various foods. Nutritionists may well enjoy dissecting a discussion of the question "Is it possible to acquire a different composition through a change of diet?" Furthermore, accounts of such phenomena as the fascinating ability of *Salmo gairdnerii* to undergo extensive vascular degeneration during spawning, followed by a *reversal* of this process, should stimulate the student of human diseases to take another look at ocean life.

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Tracing Mathematical Concepts

The Nature and Growth of Modern Mathematics. EDNA E. KRAMER. Hawthorn, New York, 1970. xxvi, 758 pp., illus. $24.95.

The Nature and Growth of Modern Mathematics is a monumental volume of 30 chapters written for the purpose of surveying the entire field of mathematics with particular emphasis upon those ideas that have become popular during the 20th century. An "oscillatory-type" spiral approach is used in which the author moves forward historically but also steps backward frequently as the book develops in order to capture the essence of key mathematical concepts. In this way the concepts are traced from their origins in antiquity to their more modern formulations. The writing is richly interlaced with mathematical lore and interspersed with biographical sketches of prominent mathematicians in an attempt to provide insight into the humanistic motivations for the birth of particular mathematical ideas.

A review of the treatment of game theory and probability will illustrate this approach. Early in chapter 9, the stage is set for contrasting the nature of probability theory with that of scientific determinism by discussing 17th-century Newtonian mechanics with its emphasis upon precisely defined relations between present and future conditions of physical events. In the following chapter, "The elements of strategy in war and peace," chance-dominated game theory is discussed, with emphasis upon the contributions of John von Neumann (a brain as superb as von Neumann's provoked Hans Bethe to fancy the possibility of a species superior to man!). At this point, a detour is taken through probability theory, beginning with the classical, 17th-century, Bernoulli-Laplace definition of probability, giving an axiomatic treatment of a few of the fundamental theorems of probability, and concluding with a mention of the need for measure theory due largely to Emile Borel. Pascal's definition of mathematical expectation is utilized in discussing the solution of certain matrix games. This is followed by a treatment of general games and statistical decision theory as advanced by Abraham Wald. One of the concluding chapters of this sequence, "From dice to quantum theory and quality control," begins with an analysis of games of chance as proposed by the 17th-century gambler Chevalier de Méré, leading to a discussion of conditional probability and the modern use of quality control. In this series of chapters, extensive sections are devoted to biographies of earlier mathematicians, such as Euler, Newton, and Laplace, as well as of more modern ones such as Borel, von Neumann, and Wald, in addition to an enlightening description of the highlights of the mathematical ideas. In a similar manner concepts important to algebra, analysis, geometry, logic and foundations, and topology (angelic geometry) are developed.

This volume was written for an audience of well-educated, highly interested laymen and not primarily for mathematical specialists, although it does seem clear that a specialist will enjoy reading this book, particularly those sections that are beyond his specialty. The author has certainly achieved her purpose of writing a stimulating volume for the general reader, but in so doing she has made some sacrifice of precision and mathematical rigor, which some may feel is a shortcoming.

The Nature and Growth of Modern Mathematics richly deserves a place on any mathematical bookshelf. It appears that it will rank very favorably with the popular and successful classic *What Is Mathematics?* written in 1941 for a similar audience by the mathematical scholars Richard Courant and Herbert Robbins.

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Omnipresent Phenomena

Separation of Flow. PAUL K. CHANG. Pergamon, New York, 1970. xviii, 778 pp., illus. $40. International Series of Monographs in Interdisciplinary and Advanced Topics in Science and Engineering, vol. 3.

As he breathes and moves man generates separated flows. Around him wind and water currents give rise to separated flows with vastly varied scales and shapes which have long intrigued him practically and esthetically (witness Leonardo da Vinci's journal). Man was unable to fly until he learned how to streamline his flows, that is, how to minimize separation effects, but on landing and deceleration he promotes flow separation to achieve his ends. Yet his understanding of the omnipresent separation phenomena remains essentially fragmented and empirical. In the presence of largely unavoidable flow instabilities and turbulence, the well-established governing field equations—the Navier-Stokes equations generalized for compressibility—defy even his most powerful computing machines. The problem of flow separation is a highly nonlinear, multidimensional, singular-perturbation problem in partial differential equations, often with only stochastically defined initial conditions—a problem unlike most others scientists have faced.

The author of *Separation of Flow* undertook "an attempt to compile references . . . in basic physical processes, analyses, and experiments covering the