Book Reviews

Population Genetics from France

The Genetic Structure of Populations. ALBERT JACQUARD. Translated from the French edition (Paris, 1970) by D. and B. Charlesworth. Springer-Verlag, New York, 1974. xviii, 570 pp., illus. $39.40. Biomathematics, vol. 5.

The long domination of population genetics by its three founders has resulted in a high degree of international homogeneity. Although there are some national differences of style, differences on matters of substance have cut across national boundaries. In population genetics, Madison is closer to Mishima than either is to Davis or Nottingham. A few nations are apparent exceptions. To Anglophones, the greatest engima by far has been France. Although the French literature is not often read by outsiders, most of us are at least vaguely aware of the school founded by Malécot and devoted to the study of inbreeding and consanguinity measures. It seems to embody a different approach, perhaps fundamentally different.

The publication in English of Jacquard's fine textbook of population genetics now demonstrates clearly that this has been an illusion. At its best, the book is clear and elegant in its presentation. At its worst, it shares the faults of other major texts, notably Crow and Kimura's *An Introduction to Population Genetics Theory*. It should take its place as a major reference work. But it does not seem to embody any fundamentally different approach to population genetics.

Of course, to those who like to infer basic difference in philosophy from the relative lengths of chapters Jacquard's book will seem quite distinct. He concentrates much attention on inbreeding and assortative mating. An interesting notation called the "trimat" is used. This is a triangular array of genotype frequencies, represented by a symbol. Many of the expressions that in other texts require long strings of summation signs can be represented economically in this notation. Jacquard introduces operations called "contraction" and "genetic product" to go from genotype to gene frequencies and vice versa. But since these operations are not stated in terms of standard matrix operations, the trimat notation enables no new breakthroughs.

The trimat notation also replaces the standard inbreeding coefficient, F. Although the book is implicitly Wrightian in inspiration (Fisher and Haldane get short shrift), Jacquard makes little use of F, preferring trimats and a set of no fewer than nine coefficients that give much more information than is contained in F. This gain in information is achieved at the expense of comprehensibility to the casual reader. The absence of F from many derivations may also leave the reader ignorant of the wide range of applicability of this quantity.

Jacquard's emphasis is on that part of population genetics which can be applied to studies of human population structure. Two chapters treat genetic distance measures in some detail. A short chapter on overlapping generations was contributed by Brian Charlesworth. Conversely, Jacquard pays less attention to theories whose application is evolutionary (multilocus selection theory, the theory of natural selection in finite populations), medical (statistical methods in medical genetics), or agricultural (quantitative genetics).

The book may therefore be compared to Cavalli-Sforza and Bodmer's *The Genetics of Human Populations*. In that work, studies of human populations were carefully integrated with the results of theory, but with a corresponding sparseness of derivation of the theory. Jacquard's work does the opposite: although examples from human populations are described frequently, and the final chapter describes four studies of human population structure in some detail, the book is too heavily theoretical for many teaching purposes. The same difficulty afflicts Crow and Kimura's book. We still lack a textbook that teaches the theory integrally with its applications.

Jacquard has made an effort to keep the mathematics from getting out of hand: there are appendices on difference equations and matrix methods. The choice of translators is fortunate, and has probably increased the clarity of the presentation: Deborah and Brian Charlesworth are both active in population genetics, the latter having worked extensively on the interface between population genetics and demography, which is one of Jacquard's greatest interests.

It seems likely that the shortcomings of all the major textbooks of population genetics reflect the weakness in the integration of theory and observation in this field. Until someone manages to bridge this gap, we must make do with the existing texts, to which *The Genetic Structure of Populations* is a welcome addition.

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Faunal Areas

Marine Zoogeography. JOHN C. BRIGGS. McGraw-Hill, New York, 1974. xiv, 476 pp., illus. $25. McGraw-Hill Series in Population Biology.

As the author of this book points out, the last attempt to synthesize the entire field of marine zoogeography was Ekman's classic *Zoogeography of the Sea*, first published in English in 1953. Although Briggs's book updates that work, there is room for doubt that it supersedes it. The author's emphasis is clear from the table of contents. Nine of the 12 chapters are devoted to a description of shallow-water faunas by geographic region. The pelagic and the deep benthic are treated as habitats, but again most of the discussion is an attempt to document geographic subdivisions. The last section (one long chapter) is the author's evolutionary synthesis. As an ichthyologist, the author gives most attention to fishes in his discussions, but his literature lists contain abundant citations to works on other groups.

Throughout the book the main emphasis is on the establishment of regions, provinces, and boundaries. Nowhere, however, is there an explicit statement of criteria to be used in establishing such entities, other than "good evidence in the form of endemism." One therefore has no way of comparing regions and provinces. Thus the Indo-West Pacific Region includes a high percentage of endemic species and families (p. 13) and is clearly a major center of evolution. On the other hand, the small mixed warm-temperate fauna of eastern South Amer-

ica also constitutes a region, apparently coordinate with the Indo-Pacific. The emphasis on endemism at the species level also leads to a multiplicity of island provinces. For example, the tiny south Indian Ocean islands of Amsterdam and St. Paul constitute a province, presumably because four of the 14 known fish species (or about 28 percent) appear to be endemic.

The faunas themselves are described sketchily, and relationships are not emphasized. Often the percentage endemism is almost the only information offered. This is particularly conspicuous in the case of Hawaii, with its intensively studied fauna. Nothing is said of the distribution of endemics among the fish families there, of the lack of certain characteristic Indo-Pacific groups, or of the history of recent introductions, successful or unsuccessful. I have emphasized the matter of endemism because a preoccupation with species counting is one of the weaknesses of the approach utilized here. It breaks patterns into mosaics and obscures relationships between faunas. It has, for example, led Briggs to misinterpret (p. 106) Ekman's emphasis on the East Pacific barrier as responsible for the most pronounced break in the circumtropical shelf fauna. Briggs is correct that there are few species common to the Atlantic and the Pacific in the New World tropics, and there is a larger number of species common to the two sides of the Pacific. (Land is indeed an effective barrier to gene flow between marine populations.) However, this obscures for him the importance of the number of amphi-American higher taxa and long common evolutionary history of the faunas of the New World tropics. It is ironic that one family cited as having no amphi-American species is one that is found only in the New World tropics, exemplifying the close relationships between the faunas of the two sides of tropical America.

Another point on which I believe many will disagree with Briggs is his designation of a warm-temperate California region to contain the Californian fauna between Point Conception and Magdalena Bay, Lower California (San Diego Province), and that of the Gulf of California (Cortez Province). These faunas are almost completely dissimilar. Most of the nonendemic species of the Gulf of California are tropical, and the endemic species belong to tropical genera. Yet because winter temperatures may fall below 20°C the tropical fauna of the gulf is to be considered warm-temperate and must be placed in the same faunal region as the very different California coast. Zoogeography would be a much simpler art if it could indeed be practiced with a thermometer.

One of the weakest parts of Ekman's treatment was his account of the pelagic, for which reliable studies were lacking. Briggs's extensive literature list, although ending in the 1960's, is indicative of the recent information explosion concerning that environment. The classification presented here, paralleling that adopted for the shelf, is less than completely successful. The influence of surface currents, water masses, and surface productivity, which are much more important than latitudinality, is given little attention, and I can find no mention of the central oceanic gyres or of the presence of oxygen minimum layers in the North Pacific and Indian oceans.

The illustrations are mainly full-page depictions of species, usually fishes. They are decorative but do not contribute much to understanding. The remaining illustrations are small-scale maps with shaded-in provinces and diagrammatic current arrows. It is curious that nowhere in a treatise on distributions is there a map with the distribution of a taxon plotted.

Marine Zoogeography is a valuable book in that it brings together much of the literature published in the field in the past 20 years and presents descriptions (necessarily brief) of the physical environments and faunas of the coastal waters. As a compendium it will be much used. As an ecological and evolutionary synthesis, however, it leaves the field open.

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Cyclic Nucleotides

Cyclic AMP, Cell Growth, and the Immune Response. Proceedings of a symposium, Marco Island, Fla., Jan. 1973. WERNER BRAUN, LAWRENCE M. LICHTENSTEIN, and CHARLES W. PARKER, Eds. Springer-Verlag, New York, 1974. xviii, 416 pp., illus. $23.80.

This book, the proceedings of a symposium conceived and organized by the late Werner Braun, focuses mainly upon the involvement of cyclic nucleotides in the immune response and in inflammation and cell proliferation. It contains a nice chapter by Joel Hardman, Günter Schultz, and the late Earl Sutherland that is a probing analysis of the possible role of cyclic GMP (guanosine 3′,5′-monophosphate) as an intracellular messenger. Along the same lines, Nelson Goldberg and his associates clearly set forth the dualistic or yin-yang hypothesis of biological control, according to which cyclic AMP (adenosine 3′,5′-monophosphate) and cyclic GMP are the key regulatory agents. In addition, they suggest that insulin-induced mitogenesis is mediated by cyclic GMP.

Braun presents a strong case for the involvement of cyclic AMP in the immune response and in tumor development. He reviews data on the stimulation of the immune system by polynucleotides and presents evidence that immunocompetent cells respond to polynucleotides by increasing cyclic AMP. He suggests that the antitumor activity of interferon preparations could be due to an adenylate-cyclase-stimulating factor in the interferon preparations. Barry Bloom follows with a well-written and easily understood description of the cellular basis of the immune response. Charles Parker describes immunofluorescent studies which indicate that elevations in lymphocyte cyclic AMP stimulated by prostaglandin E_1, isoproterenol, and PHA (phytohemagglutinin) show different localization patterns of cellular cyclic AMP and suggest that each agent might activate different cellular adenylate cyclases. He demonstrates that mitogens can either raise or lower cyclic AMP and concludes that the relationship between cyclic AMP and mitogenesis is still not clear unless cell compartmentation of cyclic AMP is brought into the picture. In later discussions with Gerald Weissman, however, it is apparent that he believes that the fall in cyclic AMP is related to PHA-induced cell proliferation since elevations in cellular cyclic AMP shown by Rochelle Hirschhorn inhibited PHA- and concanavalin-A-induced lymphocyte proliferation.

Three chapters from the clinical pharmacology group at San Francisco (Kenneth Melmon, Henry Bourne, and Yacob Weinstein), with Eugene Shearer at the National Institutes of Health, critically review: evidence that cyclic AMP mediates the inhibitory actions of vasoactive amines and the actions of other agents upon lymphocyte cytolytic activity; the isolation of leukocytes with specific catecholamine, histamine,