Book Reviews

New Waves in Geography

Quantitative Geography. Techniques and Theories in Geography. JOHN P. COLE and CUCHLAINE A. M. KING. Wiley, New York, 1969. xii + 692 pp., illus. Cloth, $12.75; paper, $7.50.

Statistical Analysis in Geography. LESLIE J. KING. Prentice-Hall, Englewood Cliffs, N.J., 1969. xiv + 290 pp., illus. $6.95.

Quantification, broadly defined, has been the source of a postwar transformation of the social sciences, with effects probably felt more profoundly in graduate-level academic geography than in any other field. Innovative leadership was provided by American econometricians and psychometricians. The wave then moved to inquisitive followers in sociology and geography, to skeptics feeling bandwagon pressures in political science, and finally to laggards in anthropology and history. *Quantitative Geography* and *Statistical Methods in Geography* are products of this change.

Within geography, quantification also diffused in a spatial sequence from North America and Sweden into the rest of the North Atlantic community, followed later but very rapidly by the Soviet Union, with the rest of the world lagging far behind. This sequence parallels the spread of medium- and large-scale scientific computers.

Rather than one wave within geography, there have been several as the initial effects of quantification bred conceptual and methodological transformation. The first changes involved substitution of descriptive statistics and elementary inferential procedures (significance testing, correlation, regression) for the cartographic procedures that previously had constituted the basic working tools of geographers. The effect of this substitution was to bring home to professional geographers the ruinous effects of three atheoretical decades in which the exceptionalist philosophy of regionalism had dominated, decades in which geography drifted away from the position it had previously occupied on the frontiers of scientific discovery, and to generate a theoretical revolution. The theory, in turn, generated new rounds of technical development by a "new breed" of geographers, development that focused upon the peculiarly geographic problems of inference with spatial series (contiguity and spatial autocorrelation, point processes in the plane, individual vs. ecological correlations) while at the same time identifying conceptual lacunae that have been attacked vigorously by the multivariate data analysis procedures made possible by the very largest scientific computers. (Quite independently, for example, geographers developed procedures of numerical regionalization that paralleled similar advances in numerical taxonomy.)

And now the textbooks have started to appear. J. P. Cole and C. A. M. King have written a book for the first wave. They spell out with care the links between traditional ideas and methods in geography and both modern mathematics and beginning statistics. The book "starts each topic assuming that the reader knows nothing or very little about it . . . [so] that many people will be able to obtain a background that will enable them both to appreciate the so-called 'quantitative' papers now appearing in many geographical periodicals, and also to practise techniques and develop theories in their own work." Accordingly, it is long on how-to-do-it procedures and worked-out examples and short on proofs, the result being substantial oversimplification. Only 65 pages are devoted to mathematics, from set theory through topology, and another 54 to statistics, from elementary probability to multiple correlation. The balance of the book presents case study materials. And even though there is an 18-page chapter on "Theories, tendencies and laws," the book does not discuss modern geographical theory.

Leslie J. King's brief volume is of an entirely different level and caliber. From a good base in probability theory it moves directly to processes generating point patterns in the plane. Regression analysis is presented as the base for analyzing spatial series and is blended with treatment of trend-surface fitting. Factor analysis is presented as a basis-producing procedure to facilitate numerical regionalization. The as yet unsolved problems of spatial autocorrelation are discussed. The book makes no pretense of being comprehensive. Instead, significantly geographic problems of inference are identified and discussed thoroughly, without oversimplification.

It would be easy to conclude that L. J. King's volume is to be preferred to that of Cole and C. A. M. King, particularly because the latter authors deal only with classical descriptive and inferential statistics, whereas L. J. King correctly notes "the increasing evidence that many of the statistical techniques which have been used previously in geography are inappropriate for the particular problems posed in geographic research." But the majority of the profession throughout the world remains theoretically and technically unsophisticated, and may just need a painstaking volume like *Quantitative Geography* to be able to give good advice about course work to students and to be persuaded that they need new kinds of faculty colleagues. These students and faculty, in turn, will be the ones to realize the promise now latent in the revolutionized geography of America's leading graduate schools.

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Sound Generation

Sources of High-Intensity Ultrasound. Vol. 1. L. D. ROZENBERG, Ed. Translated from the Russian edition (Moscow, 1967) by James S. Wood. Plenum, New York, 1969. xx + 316 pp., illus. $25. Ultrasonic Technology.

This book is a collection of three independent articles whose joint purpose is to describe recent progress in the generation of intense sound. Each contribution offers a broad view of its particular subject, with emphasis on the optimal design and application of sound sources.

Part 1, Acoustic Gas-Jet Generators

of the Hartmann Type, by Yu. Ya. Borisov, concerns the radiation of high-intensity sound into gases by devices that utilize the instability of a supersonic gas jet directed into a resonator. This article is a critical analysis of the theoretical and experimental problems encountered in the design of gas-jet generators. It also describes some practical gas-jet generators that have been developed for industrial use. The longest chapter is devoted to stem-jet generators, a modification with a solid core along the jet axis; Borisov considers these to be the practical answer to the high power and stability requirements of industrial applications. The field of gas-jet generators is filled with conflicting reports, and in general Borisov is careful to indicate which results and beliefs are not firmly established. One major subject of dispute is the mechanism by which the sound field is generated—by relaxation or by resonance. Borisov presents both sides of this question. An underlying message throughout the article is that the evaluation of experimental data has been greatly hindered by the lack of adequate standard techniques of acoustic measurement. Borisov is critical of conclusions based on pointwise measurements, and he urges instead the use of integral measurements.

Part 2, Ferrite Magnetostrictive Radiators, by I. P. Golyamina, describes the properties of magnetostrictive ferrite materials and their use in transducers for industrial applications. Golyamina indicates that, opposing their advantages, ferrite radiators have limited durability and a limited intensity output. Of particular interest is her emphasis on the importance, in the selection of a radiator for high-intensity application, of nonlinear effects associated with large amplitudes of elastic stress and of magnetic induction. One reason is that nonlinear effects impose upper limits on the vibration amplitude and radiation intensity. I found some of the general material in part 2 confusing because the author presents many facts but relatively few unifying concepts.

Part 3, Ultrasonic Focusing Radiators, by L. D. Rozenberg, is aimed at the problem of generating acoustic fields of extreme intensity in liquids. The first chapter is a concise summary of theoretical results for the pressure, velocity, and intensity in the focal region of a converging spherical or cylindrical wave front. Rozenberg stresses the conditions for optimal focusing. A chapter on absorption tells how nonlinear absorption sets an upper limit on the intensity. Finally, Rozenberg describes the ultrahigh-intensity radiators that he and his co-workers have used in studies of acoustic cavitation. These radiators are capable of producing intensities of nearly 150 kilowatts per square centimeter, whereas conventional focusing radiators generate intensities of only a few kilowatts per square centimeter.

The book as a whole is clear and well written. It should prove helpful to anyone who seeks a broad view of these subjects, with some guidance toward what the problems are and where more work is needed.

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Explorations in Systematics

Systematic Biology. Proceedings of a conference, Ann Arbor, Mich., 1967. National Academy of Sciences, Washington, D.C., 1969. xiv + 634 pp., illus. $15. NAS Publication 1692.

This book consists of the proceedings of a conference held at the University of Michigan in June 1967. The chairman of the organizing committee, who also prepared the preface and presumably edited the book, is Charles G. Sibley. The book consists of 18 papers on different aspects of methodology and principles of systematic biology. For nearly all of these papers, the remarks of two or more formal discussants have been published, together with edited transcripts of the informal discussion that followed. Although the authors are mostly Americans, a significant number came from other countries so that the conference was justifiably billed as international.

As in any work of this sort there is much diversity in the objectives and presentations of the various authors. The historical review, for example, falls short of the needs of most modern systematists because it scarcely touches upon the post-Darwinian period. Most of the articles are review papers in their various fields. The objective of the conference was clearly not to offer authors an opportunity to report on their original research, and for the most part the papers are not at all like research papers. However, substantial sections of new ideas, as distinguished from new factual material, are included. For example, we find published here W. H. Wagner's account of "The construction of a classification," an account that has been presented orally on various recent occasions and is now printed for the first time.

The greater part of the book is on systematics rather than taxonomy in the narrow sense. The relations of systematics to ecology, evolution, behavior, cytology, and other fields of biology are explored by a variety of authors. There is a substantial section on molecular data and their use in systematics. A summary of the conference by E. O. Wilson terminates the book.

One might have thought that in a book of this sort emphasis would have been almost exclusively on principles and theory and on those aspects of methodology that concern the uses to be made of characters once they have been discovered and recorded. From these standpoints the kinds of characters used would usually make no difference. Actually, nearly half the book consists of chapters placing emphasis on discovery and use of particular kinds of characters. Thus there are four chapters on molecular data and one each on comparative morphology, isolating mechanisms, behavior, and cytology. Some of these kinds of characters provide special evolutionary, functional, or other insight of various sorts, and therefore have value beyond merely additional characters. Nonetheless, the theoretically oriented systematists' need for and use of more characters than have yet been recorded for most groups is evident.

Broad as the book is in its coverage, there are significant areas of modern systematics that are omitted. One is that of numerical taxonomy or numerical phenetics, an omission that is easily justified by the recent extensive treatment of the field in a readily available book and in the pages of such journals as *Systematic Zoology*. Another major field that is inadequately treated is that of cladistics. It is often, and I believe correctly, concluded that cladistics carried to its logical extreme, as by Hennig, does not provide a suitable basis for classifications, but this is no reason for not considering in some detail cladistic methodology for those things that it can do well, that is, for formalizing the methods by which we determine the branching lines of descent of organisms. Finally it may be mentioned that the field of experimental systematics, a field developed largely in botany although useful also in zoology,