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The editors will appreciate the authors' cooperation in taking note of the following directions for the preparation of manuscripts. These directions have been drawn up with a view toward eliminating unnecessary correspondence, avoiding the return of papers for changes, and reducing the charges made for "author's corrections."

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The papers should be submitted in final form. Only typographical errors should be corrected in proof; composition charges for any major deviations from the manuscript will be passed on to the author.

Titles: The title should be brief but express adequately the subject of the paper. The name and initials of the author should be written as he/she prefers; all titles and degrees or honors will be omitted. The name of the organization with which the author is associated should be given in a separate line following his/her name.

Mathematical Work: As far as possible, formulas should be typewritten; Greek letters and other symbols not available on the average typewriter should be inserted using either instant lettering or by careful insertion in ink. Manuscripts containing pencilled material other than marginal instructions to the typesetter will not be accepted.

The difference between capital and lower-case letters should be clearly shown; care should be taken to avoid confusion between zero (0) and the letter O, between the numeral one (1), the letter l and the prime ($'$), between alpha and a, kappa and k, mu and u, nu and v, eta and n.

The level of subscripts, exponents, subscripts to subscripts, and exponents to exponents should be clearly indicated.

Single embellishments over individual letters are allowed; the only embellishment allowed above groups of letters is the overbar.

Double embellishments are not allowed. These may be replaced by superscripts following the symbols.

Complicated exponents and subscripts should be avoided. Any complicated expression that recurs frequently should be represented by a special symbol.

For exponentials with lengthy or complicated exponents the symbol exp should be used, particularly if such exponentials appear in the body of the text. Thus,

$$\exp[(a^2+b^2)^{1/2}] \text{ is preferable to } e^{[a^2+b^2]^{1/2}}.$$

Fractions in the body of the text and fractions occurring in the numerators or denominators of fractions should be written with the solidus. Thus,

$$\frac{\cos(x/2b)}{\cos(a/2b)} \text{ is preferable to } \frac{\cos\frac{x}{2b}}{\cos\frac{a}{2b}}.$$

In many instances the use of negative exponents permits saving of space. Thus,

$$\int u^{-1}\sin u\,du \text{ is preferable to } \int \frac{\sin u}{u}\,du.$$

Whereas the intended grouping of symbols in handwritten formulas can be made clear by slight variations in spacing, this procedure is not acceptable in typeset formulas. To avoid misunderstanding, the order of symbols should therefore be carefully considered. Thus,

$$(a+bx)\cos t \text{ is preferable to } \cos t(a+bx).$$

Figures: Figures should be drawn in black ink with clean, unbroken lines; do not use ball point pen. The paper should be of a nonabsorbant quality so that the ink does not spread and produce fuzzy lines. If the figures are intended for reduction, they should be drawn with heavy enough lines so that they do not become flimsy at the desired reduction. The notation should be of professional quality and in proportion for the expected reduction size. Figures which are unsuitable for reproduction will be returned to the author for redrawing. Legends accompanying figures should be written on a separate sheet.

Bibliography: References should be grouped together in a Bibliography at the end of the manuscript. References in text to the Bibliography should be made by numerals between square brackets.

The following examples show the desired arrangements: (*for books*—S. Timoshenko, *Strength of materials*, vol. 2, Macmillan and Co., London, 1931, p. 237; *for periodicals*—Lord Rayleigh, *On the flow of viscous liquids, especially in three dimensions*, Phil. Mag. (5) 36, 354–372 (1893)). Note that the number of the series is not separated by commas from the name of the periodical or the number of the volume.

Authors' initials should precede their names rather than follow them.

In quoted titles of books or papers, capital letters should be used only where the language requires this. Thus, *On the flow of viscous fluids* is preferable to *On the Flow of Viscous Fluids*, but the corresponding German title would have to be rendered as *Über die Stromung zaher Flüssigkeiten*.

Titles of books or papers should be quoted in the original language (with an English translation added in parentheses, if this seems desirable), but only English abbreviations should be used for bibliographical details such as ed., vol., no., chap., p.

Footnotes: As far as possible, footnotes should be avoided. Footnotes containing mathematical formulas are not acceptable.

Abbreviations: Much space can be saved by the use of standard abbreviations such as Eq., Eqs., Fig., Sec., Art., etc. These should be used, however, only if they are followed by a reference number. Thus, "Eq. (25)" is acceptable but not "the preceding Eq." Moreover, if any one of these terms occurs as the first word of a sentence, it should be spelled out.

Special abbreviations should be avoided. Thus "boundary conditions" should always be spelled out and not be abbreviated as "b.c." even if this special abbreviation is defined somewhere in the text.

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Vol. XLVI, No. 3 **September 1988**

Mathematical Programming: Theory and Algorithms. By M. Minoux. John Wiley & Sons, New York, 1986. pp. xxviii + 489. $66.95.

This is a translation by Steven Vajda of a French text first published in 1983. It aims to cover the whole field of mathematical programming, including linear programming, unconstrained and constrained nonlinear programming, nondifferentiable (or nonsmooth) optimization, integer programming, large scale systems optimizations, dynamic programming, and optimization in infinite dimensions. Special emphasis is placed on unifying concepts such as point-set maps, saddle points and perturbation functions, duality theory and its extensions. Chapter headings: 1. Fundamental concepts. 2. Linear programming. 3. One-dimensional optimization. 4. Nonlinear, unconstrained optimization. 5. Nonlinear optimization with constraints: I. Direct (or primal) methods. 6. Nonlinear constrained optimization: II. Dual methods. 7. Integer programming. 8. Solutions of large-scale programming problems. Generalized linear programming and decomposition techniques. 9. Dynamic programming. 10. Optimization in infinite dimension and applications.

Small Area Statistics: An International Symposium. Edited by R. Platek, J. N. K. Rao, C. E. Särndal, and M. P. Singh. Springer-Verlag, New York, 1987. pp. xiv + 278. $39.95.

This is a volume in the Wiley Series in Probability and Mathematical Statistics. It contains the invited papers presented at a symposium in Ottawa, Canada, in May 1985. The contents are organized into five parts: 1. Policy issues. 2. Population estimation for small areas. 3. Theoretical developments. 4. Organizational experiences with small area estimation techniques. 5. Panel discussion.

New Perspectives in Theoretical and Applied Statistics. Edited by Madan Lal Puri, José Pérez Vilaplana and Wolfgang Wertz. John Wiley & Sons, New York, 1987. pp. xxiii + 544. $59.95.

This is a volume in the Wiley Series in Probability and Mathematical Statistics. The chapters cover a wide range of topics of current interest in applied as well as theoretical statistics and probability. They include some aspects of the design of experiments in which there are current developments, data analysis, sampling theory, growth curves analysis, theoretical as well as applied aspects of time-series analysis, nonparametric theory, the Edgeworth expansions in statistics and probability, the bootstrap and randomization methods, density estimation, hypothesis testing, pseudorandom numbers, and sequential estimation. Also included are chapters on some aspects of probability theory that, apart from their intrinsic mathematical interest, have significant applications in statistics.

Renormalization. By John Collins. Cambridge University Press, New York, 1986. pp. x + 380. $69.50 Hardcover, $24.95 Paperback.

This is a volume of the Cambridge Monographs on Mathematical Physics. It is subtitled: An introduction to renormalization, the renormalization group, and the operator-product expansion. It provides a coherent exposition of the techniques underlying the numerical prediction of experimental phenomena concerning the interaction of elementary particles based on recent quantum field theories. These predictions have been made possible by the discovery and exploitation of the simplifications that happen when phenomena are investigated on short distance and time scales. After exposition of some basic properties of field theories, examples are used to explain the problems to be treated. Then the technique of dimensional regularization is explained in depth. This is followed by a treatment of renormalization and renormalization group. Finally, a number of key applications are treated, culminating in the treatment of deeply inelastic scattering. Many worked examples are included to illuminate the workings of the mathematical apparatus used. New treatments are given to particular areas of the subject—notably to dimensional regularization, renormalization in coordinate space and the derivation of the "axial anomaly".

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Probability and Analysis. Edited by A. Dold, and B. Eckmann. Springer-Verlag, New York, 1986. pp. viii + 283.

This is volume 1206 of Lecture Notes in Mathematics, being the lectures given at the first 1985 session of the Centro Internazionale Matematico Estivo held at Varenna, Italy, May 1–June 8, 1985. There are six papers by Bismult, Burkholder, Chalterji, Pisier, Schachermayer, and Sion.

Mathematics and Optimal Form. By Stefan Hildebrandt and Anthony Tromba. Scientific American Books Inc., New York, 1986. pp. 1 + 215. $29.95.

This beautifully printed and illustrated book examines attempts by scientists and mathematicians throughout history to find answers to questions such as: Are there simple universal laws that allow us to comprehend the symmetry and regularity of nature's forms and patterns? Why are celestial bodies spherical rather than square and pyramidal? Can the sharp polyhedral structures we see in crystalline formations be explained by the same underlying principle that explains the shape of a perfectly round and symmetric soap bubble? This book is an account of the calculus of variations, which deals with optimal forms in geometry and nature. It does not, however, use mathematical formulas and symbols, but demonstrates in its historical sections that a large part of the development of mathematics was the result of the desire to understand nature. Chapter headings: Prologue: On Form and Shape. 1. The grand scheme of the world. 2. The heritage of ancient science. 3. Shortest and quickest connections. 4. A miracle and not a miracle. 5. Soap films. 6. Optimal design.

Adaptive Signal Processing: Theory and Applications. By S. Thomas Alexander. Springer-Verlag, New York, 1986. pp. ix + 179. $36.00.

This is a volume in the series Texts and Monographs in Computer Science. The main distinction between this text and others that have appeared on the subject is the inclusion in this text of the subject of vector space approaches to fast adaptive filtering. It develops the vector space approach through the use of geometrical analogies, which encompasses Chapters 9–11. In so doing, the vector space approach becomes easy to understand and possesses a great deal of simple elegance. Chapter headings: 1. Introduction. 2. The mean square error (MSE) performance criteria. 3. Linear prediction and the lattice structure. 4. The method of steepest descent. 5. The least mean squares (LMS) algorithm. 6. Applications of the LMS algorithm. 7. Gradient adaptive lattice methods. 8. Recursive least squares signal processing. 9. Vector spaces for RLS filters. 10. The least squares lattice algorithm. 11. Fast transversal filters.

Asymptotic Theory of Statistical Inference. By B. L. S. Prakasa Rao, John Wiley & Sons, New York, 1987. pp. xiv + 438. $49.95.

This is a volume in the Wiley Series in Probability and Mathematical Statistics. It is a modern treatment exploring the applications of recent advances in the theory of semi-martingales, stochastic differential equations and others to theoretical statistics. Among its features are: a rigorous derivation of asymptotic properties of maximum likelihood and Bayes estimators both in regular and nonregular cases; classical results in tests for goodness-of-fit, inference for counting processes and inference from censored data discussed from a modern point of view via martingale and semi-martingale theory; asymptotic theory of least squares estimator in nonlinear regression studied via weak convergence of least squares random fields; asymptotic theory of estimation of parameters for stable laws via the empirical characteristic process. A brief introduction to results in probability and stochastic processes opens the text. This touches on semi-martingales, stochastic differential equations, probability measures on metric spaces, and a discussion on continuity and separability and absolute continuity and singularity. Chapter headings: 1. Probability and stochastic processes. 2. Limit theorems for some statistics. 3. Asymptotic theory of estimation. 4. Linear parametric inference. 5. Martingale approach to inference. 6. Inference in nonlinear regression. 7. Von Mises functionals. 8. Empirical characteristic function and its applications.

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Recursive Source Coding: A Theory for the Practice of Waveform Coding. By G. Gabor and Z. Györfi. Springer-Verlag, New York, 1986. pp. x + 98. $28.00.

This book is concerned with data compression methods in digital technology. It is its purpose to present a thorough criticism of the field of differential-predictive coding by creating a general method of recursive coding. Chapter headings: 1. The Fine-McMillan recursive quantizer model. 2. Structural and design problems of a recursive quantizer. 3. Differential predictive quantizers. 4. Design examples—Speech compression.

Empirical Model-Building and Response Surfaces. By George E. P. Box and Norman R. Draper. John Wiley & Sons, New York, 1987. pp. xiv + 669. $45.00.

This is a volume in the Wiley Series in Probability and Mathematical Statistics. It contains 15 chapters. Chapters 1 and 2 are concerned with the general philosophy of response surface methodology. Chapter 3 provides a summary of important results in least squares with the geometry necessary to provide intuitive understanding. First-order experimental designs derived from two-level factorials and fractionals are discussed in Chapters 4 and 5 and their application to steepest ascent is developed in Chapter 6. Chapter 7 introduces the fitting and checking of second-order models and Chapter 8 is concerned with the uses of transformation and with associated estimation problems. Chapter 9 introduces the exploration of maxima with second-order designs and Chapters 10 and 11 deal with elucidation of ridge systems. The manner in which such systems can be used to form a link between empirical and theoretical models is discussed in Chapter 12. Theoretical aspects of the choice of experimental designs are explored in Chapters 13 and 14. In Chapter 13, the influence of variance, bias, lack of fit, and other factors in the choice of experimental designs is discussed and the alphabetic optimality approach is critically considered. Chapter 15 presents designs that provide useful compromises for various practical situations.

Multivariate Statistical Simulation. By Mark E. Johnson. John Wiley & Sons, New York, 1987. pp. ix + 230. $34.95.

This is a volume in the Wiley Series in Probability and Mathematical Statistics. It concerns the computer generation of multivariate probability distributions. Generation is used in a broader context than solely algorithm development. An important aspect of generating multivariate probability distributions is what should be generated. This viewpoint necessitated an examination of distributional properties and of potential payoffs of including particular distributions in simulation studies. Generation algorithms are presented in tandem with many graphic aids (three-dimensional and contour plots) that highlight distributional properties. These plots reveal features of distributions that rarely emerge from preliminary algebraic manipulations.

Model Selection. By H. Linhart, and W. Zucchini. John Wiley & Sons, New York, 1986, pp. xii + 301. $34.95.

This is a volume in the Wiley Series on Probability and Mathematical Statistics. It is the first text to deal exclusively with objective criteria for comparing statistical models. Using a simple framework, it outlines the general strategy for selecting a model and applies this strategy to develop methods useful for solving specific selection problems. The treatment focuses on the development of specific selection criteria in a variety of application areas in statistics, indicated by the chapter headings: 1. The basic ideas. 2. An outline of general methods. 3. Histograms. 4. Univariate distributions. 5. Simple regression, one replication only. 6. Simple regression, replicated observations. 7. Multiple regression. 8. Analysis of variance. 9. Analysis of covariance. 10. The analysis of proportions: the binomial case. 11. The analysis of proportions: contingency tables. 12. Time series. 13. Spectral analysis.

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The Preditor-Prey Model: Do We Live in a Volterra World? By Manfred Peschel and Werner Mende. Springer-Verlag, New York, 1986. pp. xi + 251.

This monograph is an amalgam of system philosophy in which the phenomena of the real world are considered from an ecological viewpoint, and system methodology transforming given systems of ordinary differential equations into the Lotka–Volterra equations, with practical consequences on data analysis, modeling of growth phenomena and structure-building. Chapter headings: 1. Phenomenon evolution: Growth and structure building. 2. Dynamic behavior of chains. 3. Structure design for nonlinear instationary processes. 4. Systematization and unification of growth models with Lotka–Volterra equations. 5. Equivalence transformations for the Lotka–Volterra representations. 6. The Riccati representation and its applications. 7. Structure-building and Lotka–Volterra equations. 8. Some qualitative properties of nonlinear systems in Lotka–Volterra representation, Riccati representation or replicator form. 9. Some large scale applications of the Lotka–Volterra concept. 10. Simulation studies of evolutionary systems with a microcomputer.

Templets and the Explanation of Complex Patterns. By Michael J. Katz. Cambridge University Press, New York, 1986. pp. x + 127. $24.95.

This monograph aims to provide a natural language for analyzing questions such as where the particular form or configuration of a pattern comes from and how it is propagated from pattern to pattern. Using this language, the organizational forces that underlie the fabrication of any pattern can be divided into two classes. First, there are the "universal laws" of pattern assembly—the configuration rules and constraints inherent within the fabric of the pattern elements themselves. Second, there are the "templets"—external, situational constraints imposed on the pattern elements. Templets are blueprints, pattern-assembly instructions that can be more specific and more limiting than the applicable universal laws. From the perspective of templeting, simple patterns can be directly contrasted with complex patterns: simple patterns are completely determined by their universal laws, whereas complex patterns also require extensive templets. Natural patterns range along the entire spectrum from simple to complex, and the most complex of these patterns include both the random patterns and many of the biological patterns. Virus coats, which autonomously self-assemble, are good examples of relatively simple natural patterns; and viral DNA sequences, which are built from templets, are good examples of complex natural patterns. Complex patterns cannot be fully explained by universal laws alone; to understand complex patterns, one cannot stop with an understanding of their components, one also has to understand their templets. Chapter headings: 1. Scientific abstractions. 2. The nature of explanation. 3. Configurational explanations. 4. Templeting. 5. Self-assembly. 6. Rules for configurational explanations. 7. Simple, complex, and random patterns. 8. Reductionism.

Theory of Holors: A Generalization of Tensors. By Parry Moon, and Domina Eberle Spencer. Cambridge University Press, New York, 1986. pp. xix + 392. $69.50.

The word "holor" indicates a mathematical entity that is made up of one or more independent quantities. Examples of holors are complex numbers, vectors, matrices, tensors, and other hypernumbers. The idea of representing a collection of quantities by a single symbol apparently originated in 1673, when John Wallis represented a complex number as a point in 2-space. More complex holors were developed by Hamilton (1843), Grassman (1844), Gibbs (1881), Ricci (1884), Heaviside (1892), Levi-Civita (1901), Einstein (1916), and many others. The authors use a single notation that applies to all holors, be they tensors or nontensors. Part I (Holors) comprises chapters 1–3; Part II (Transformations), chapters 4–6; Part III (Holor calculations), chapters 7–8; Part IV (Space structure), chapters 9–11. The headings of individual chapters are : 0. Historical introduction. 1. Index notation. 2. Holor algebra. 3. Gamma products. 4. Tensors. 5. Akinetors. 6. Geometric spaces. 7. The linear connection. 8. The Riemann-Christoffel tensors. 9. Non-Riemannian spaces. 10. Riemannian spaces. 11. Euclidean space.

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Order with Chaos: *Towards a Deterministic Approach to Turbulence.* By Pierre Bergé, Yves Pomeau, Christian Vidal. John Wiley & Sons, New York, 1984. pp. xv + 329.

This is a translation from the French by Laurette Tuckermann and has a preface by David Ruelle. Chapters 1–5 are grouped into part I: From Order..., and chapters 6–9 into part II: ... to Chaos. The book is an introduction to the study of dissipative dynamical systems, and leads, in the later chapters, to the discussion of "strange attractors" and "deterministic chaos"—an attempt to explain turbulence by the behavior of dynamical systems. Chapter headings: Introduction to part I. 1. Free oscillator-Damped oscillator. 2. Forced oscillator-Parametric oscillator. 3. The Fourier transform. 4. Poincaré sections. 5. Three examples of dynamical systems. Introduction to part II. 6. Strange attractors. 7. Quasiperiodicity. 8. The subharmonic cascade. 9. Intermittency.

An Atlas of Functions. By Jerome Spanier and Keith B. Oldham. Hemisphere Publishing Company, New York, 1987. pp. ix + 700. $149.50.

This magnificently produced book provides algorithms for fast, accurate calculation of most functions to more than seven figure precision. It does much more than that, however. Over 180 full-colour computer-generated maps offer unparalleled insight into the behavior of nearly 400 functions. The book is divided into 64 chapters, each of which is devoted to one function or a number of closely related functions. A standardized format and consistent notation has been adopted for each chapter. For every function, formulas are grouped under the chapter subheading "interrelationships" and the authors also include the function's expansions as a series, products or continued fractions. A typical chapter might have the following subheadings: 1. Notation. 2. Behavior (with coloured maps). 3. Definitions. 4. Special cases. 5. Interrelationships. 6. Expansions. 7. Particular values. 8. Numerical values (with algorithms). 9. Approximations. 10. Operations of the calculus. 11. Complex argument. 12. Generalizations. 13. Cognate functions. 14. Related topics.

Software System Design Methods: *The Challenge of Advanced Computing Technology.* Edited by Jozef K. Skwirzynski. Springer-Verlag, New York, 1986. pp. xiii + 747. $115.00.

This is volume 22 in the NATO Advanced Science Institute Series F: Computer and Systems Sciences. It is the proceedings of an Institute held at Grey College, University of Durham, U.K., July 29–August 10, 1985. The 32 papers are divided into five parts: 1. The development of low-fault and fault-tolerant software. 2. Human factors in development and use of software. 3. The development and status of empirical/statistical reliability models for software and their relation to reality. 4. The economics of computing and methods of cost assessment. 5. Security, safety, privacy, and integrity, in developing and in using computer communication and computer data storage retrieval.

Probability and Random Variables. By. G. P. Beaumont. John Wiley & Sons, New York, 1986. pp. 1 + 345. $69.95.

This is a volume in the Ellis Horwood Series in Mathematics and its Applications. It is intended for first year college students. Chapter headings: 1. Introduction. 2. Probability. 3. Conditional probability and independence. 4. Random variables. 5. Continuous distributions. 6. Distribution functions. 7. Functions of random variables. 8. Bivariate distributions. 9. Expectation of a random variable. 10. Variance of a random variable. 11. Moment generating functions. 12. Moments of bivariate distributions. 13. Probability generating functions. 14. Sums of random variables. 15. Unbiased estimators. 16. Sampling finite populations. 17. Generating random variables.