Proceedings of the CAMBRIDGE PHILOSOPHICAL SOCIETY

(MATHEMATICAL AND PHYSICAL SCIENCES)

VOLUME 62 PART 2



CAMBRIDGE UNIVERSITY PRESS

BENTLEY HOUSE, 200 EUSTON ROAD, LONDON, N.W.1
AMERICAN BRANCH: 32 EAST 57TH STREET, NEW YORK, N.Y. 10022

Price Forty-five Shillings Net (U.S.A. \$8.00)
Subscription price per volume £8 net post free (\$28.50 in U.S.A.)

April 1966

CAMBRIDGE PHILOSOPHICAL SOCIETY

FOUNDED 1819; ROYAL CHARTER 1832

Session 1965-1966

President: SIR RUDOLPH PETERS

Vice Presidents: M. RYLE, E. N. WILLMER, O. R. FRISCH

Treasurer: R. C. EVANS

Secretaries: (Mathematical) G. R. ALLAN

(Physical) L. T. CHADDERTON

(Biological) S. SMITH

The publications of the Society consist of the Proceedings and of the Biological Reviews. The

publication of Transactions was suspended at the end of Volume XXIII.

Orders should be sent to: THE MANAGER, CAMBRIDGE UNIVERSITY PRESS, BENTLEY HOUSE, 200 EUSTON ROAD, LONDON, N.W.1. Enquiries from the U.S.A. should be addressed to the Cambridge University Press, American Branch, 32 East 57th Street, New York, N.Y. 10022.

For the purchase of early parts of the *Transactions* and *Proceedings*, application should be made to the Librarian at the Society's office, The Philosophical Library, Bene't Street and Free School Lane, Cambridge, England, and for early parts of *Biological Reviews* to the Cambridge University Press. All parts of the *Proceedings* (including the cumulative index to Vols. 1 to 50) and *Biological Reviews* are available, and prices of sets or single parts will be quoted on application.

Fellows and Associates of the Society are particularly requested to inform the Secretaries of any change of postal address and to send their subscriptions to the Treasurer, at the Society's office.

All correspondence regarding library exchanges and Fellows' copies should be addressed to the Librarian at the Society's office.

PROCEEDINGS of the CAMBRIDGE PHILOSOPHICAL SOCIETY

edited by

G. R. ALLAN

in consultation with

J. W. S. CASSELS H. T. CROFT E. R. LAPWOOD W. B. R. LICKORISH J. M. C. SCOTT A. M. WALKER

P. V. LANDSHOFF

D. W. S. SCIAMA

- 1. Four parts of the *Proceedings* are issued each year, in January, April, July and October. Papers in all branches of mathematics (including applications of mathematics in the natural and biological sciences) are within its scope.
- 2. Contributions for the *Proceedings* should be sent to the Mathematical Secretary at the Society's office (see above). Papers should be communicated directly by the author.
- Papers which (if printed) would occupy more than 20 pages can only rarely be accepted.
 Papers in languages other than English should be accompanied by a brief summary in

English.

5. It is extremely helpful if diagrams are drawn in indian ink on white card, faintly blue or green-lined graph paper, or tracing cloth or paper. Symbols, legends and captions should be given on a transparent overlay. The Society recognizes that many authors do not have the facilities for producing drawings of a sufficiently high standard to be reproduced directly and it is therefore willing to have such diagrams re-drawn, provided they are reasonably clear.

6. References should be listed at the end of each paper. Titles of journals should be abbreviated as in *Mathematical Reviews*. Any systematic method of ordering the list of references is acceptable.

- 7. Authors are particularly requested to prepare their manuscripts in a form suitable for printing, with adequate margins. The Secretary reserves the right to return scarcely legible manuscripts to the author. A pamphlet on the preparation of manuscripts may be obtained on application to the Librarian. If a large number of corrections are required in the proofs, the Council reserves the right to make a charge towards the cost.
- 8. Authors may receive on request 100 free offprints (for each set of authors in the case of a joint paper). Alternatively authors may have 50 free offprints in covers. Further copies may be obtained at reasonable cost. An order form is included with the galley proofs of each paper.

ELECTRONICS LETTERS

AN INTERNATIONAL PUBLICATION

ELECTRONICS LETTERS is a monthly fast-communication periodical published by the IEE. Its contents are letters (about 1000 words in length) on original advances in electronic science and engineering, radio and automatic control. Letters, which are accepted in French, German, Russian and Italian in addition to English, are published within 2 to 6 weeks of receipt

The annual subscription is £2. 10s. Individual copies cost 5s.

Copies and further details may be obtained from the Secretary (Publications Department).

THE INSTITUTION OF ELECTRICAL ENGINEERS SAVOY PLACE, LONDON W.C.2

THE JOURNAL OF THE SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS

VOLUME 13, NUMBER 3, SEPTEMBER 1965

Nonlinear Buckling of Rectangular Plates. LOUIS BAUER and EDWARD L. REISS.

Matrix Riccati Differential Equations. W. J. Coles.

Some Inequalities for the Fundamental Frequency of a Non-homogeneous Membrane. DALLAS O. BANKS. An Analytical Solution to a Class of Nonlinear Differential-Difference Equations. R. HOBART.

A Duality Theorem for a Class of Continuous Linear Programming Problems. WILLIAM F. TYNDALL.

Nonsymmetric Difference Equations. PAUL GORDON.

On the Nonunique Equilibrium States and Buckling Mechanism of Spherical Shells. HERBERT B. KELLER and ANTOINETTE W. WOLFE.

Estimation of Signals Containing Unknown Parameters: Comparison of Linear and Arbitrary Unbiased Estimates.

DAVID J. SAKRISON.

DAVID J. SAKRISON

On the Asymptotic Distribution of the Largest Sample Spacing. LIONEL WEISS. Elliptic Operators with a Purely Continuous Spectrum. Kurt Kreith.

On Certain Relaxation Oscillations: Asymptotic Solutions.
PETER J. PONZO and NELSON WAX.
Integral Inequalities Related to Non-Oscillation Theorems
for Differential Equations. JOHN M. HOLT.
Betting Systems Which Minimize the Probability of Ruin.

THOMAS S. FERGUSON.

Prediction of Time Series From Finite Past, L. D. DAVIS-

SON.
On the Generalized Inverse of an Incidence Matrix.
YUII DIRI.
An Elliptic Eigenvalue Problem for a Reentrant Region.
J. K. Reid and J. E. Walsh.
On the Geometric Shape of Axial-Symmetric Shock Waves
From a Point Source Explosion in a Nonhomogeneous
Medium, G. M. SCHINDLER.
District Only Inviting STANLEY REITER and GORDON R.

Discrete Optimizing. STANLEY REITER and GORDON R. SHERMAN.

On a Problem of Optimum Priority Classification. ROBERT M. OLIVER and GEROLD PESTALOZZI.

Some Periodicity Properties of Transformations on Vector Spaces Over Residue Class Rings. DOROTHY BOLLMAN.

The Journal is published monthly. Subscriptions are \$20.00 per volume Orders should be placed with the

SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS

33 So. 17th St., Philadelphia, Pennsylvania, 19103, U.S.A.

ROYAL STATISTICAL SOCIETY

THE JOURNAL OF THE ROYAL STATISTICAL SOCIETY is published in three series: SERIES A (GENERAL), four issues a year, annual subscription post free £5. 4s. (U.S. \$15), price each part 30s.; Series B (Methodological), three issues a year, annual subscription post free £4. 2s. (U.S. \$12), price each part 35s.; APPLIED STATISTICS (SERIES C), three issues a year, annual subscription post free 30s. (U.S. \$5), price each part 15s.

Contents of Series A (General), Vol. 129, Part 1, 1966

The National Plan. A discussion opened by W. BECKERMAN and K. J. WIGLEY.

The design of investigations into the effects of radio and television programmes and other mass communica-tions (with Discussion). By B. P. EMMETT.

A binary variable multiple regression method of analysing factors affecting peri-natal mortality and other outcomes of pregnancy. By M. S. FELDSTEIN.

A measure of a firm's average share price. By R. MARRIS and A. SINGH.

The measurement of observer disagreement in the recording of signs. By P. Armstage, L. M. Blendis and H. C. Smyllie.

Monte Carlo results for estimation in a stable Markov time series. By J. B. Copas.

Obituary: Corrado Gini.

Reviews; Current Notes; Library Accessions.

Contents of Series B (Methodological), Vol. 28, Part 1, 1966

On allocation rules and their error rates (with Discussion). By M. HILLS.

Estimation by ranking parameters. By J. A. HARTIGAN. On efficient multinomial estimation. By B. R. BHAT and N. V. KULKARNI.

On a fiducial example of C. Stein. By R. S. PINKHAM. Note on the confidence-prior of Welch & Peers. By J. A.

Expected cover and linear-utility tolerance intervals. By J. AITCHISON.

Sequential compound rules for the finite decision problem. By E. SAMUEL.

Asymptotic sequential design of experiments with two random variables. By L. R. ABRAMSON.

experimental study of certain screening processes. By D. J. FINNEY.

The analysis of variance of designs with many non-orthogonal classifications. By D. H. REES.

Classifying Youden rectangles. By D. A. PREECE.

A general class of coefficients of divergence of one dis-tribution from another. By S. M. ALI and S. D. SILVEY.

Characterization theorems for some univariate probability distributions. By M. V. MENON.

A note on the asymptotic efficiency of Bennett's bivariate sign test. By G. K. BHATTACHARYYA.

The chi-square test for heterogeneity of proportions after adjustment for stratification. By P. ARMITAGE.

Alternative analyses of contingency tables. By J. J. GART. A test for 'intrinsic' correlation in the theory of accident proneness. By K. Subrahmaniam.

The ergodic queue length distribution for queuing systems with finite capacity. By J. KEILSON

Delay at traffic intersections. By A. G. HAWKES.

Corrections and comments on the paper 'A branching process allowing immigration'. By C. R. HEATHCOTE.

On streams of events and mixtures of streams. By M. R. LEADBETTER.

Design relations for non-stationary processes. By M. B. PRIESTLEY.

Experimental smoothing for multivariate time series. By R. H. JONES.

Errata—Consistency in statistical inference and decision 1961. By C. A. B. SMITH.

Contents of APPLIED STATISTICS (Series C) Vol. 14, Parts 2 & 3, 1965

Separable programming applied to an ore purchasing problem. By E. M. L. BEALE, P. J. COEN and A. D. J. FLOWERDEW.

Short-term sales forecasting. By P. J. HARRISON.

The effect of some climatological variations on the incidence and spread of fires in buildings in England and Wales from 1951 to 1961. By JANE M. HOGG.

Demand for cars in Great Britain. By C. St J. O'HERLIHY.

The best sub-set in multiple regression analysis. By M. J. GARSIDE.

Miscellanea:

An approximation to the inverse normal function suitable for the generation of random normal deviates on electronic computers. By G. B. WETHERILL.

Goodness of prediction concerning binomial variables. By DAVID S. HUANG.

Transportation problems with additional restrictions. By K. B. HALEY and A. J. SMITH.

Errata: The blood-testing problem. By H. M. FINUCAN.

Obtainable through any bookseller or direct from:

ROYAL STATISTICAL SOCIETY 21 BENTINCK STREET, LONDON, W.1