

Advances in Applied Probability

The Editorial Board would like to encourage the submission to the *Advances* of review papers summarising and coordinating recent results in any of the fields of applied probability.

In addition to these review papers, *Advances* is also designed to be a medium of publication for (1) longer research papers in applied probability, which may include expository material, (2) expository papers on branches of mathematics of interest to probabilists, (3) papers outlining areas in the biological, physical, social and technological sciences in which probability models can be usefully developed, (4) papers in applied probability presented at conferences which do not publish their proceedings, and finally, (5) letters to the editor on any appropriate topic in applied probability.

In short, the main function of *Advances* is to define areas of recent progress and potential development in applied probability. As with the *Journal of Applied Probability*, *Advances* undertakes to publish papers accepted by the Editors within 15 months of their submission; letters to the editor will normally be published more rapidly.

The Editor-in-Chief is J. Gani; the Coordinating Editors are C. C. Heyde, M. F. Neuts and G. E. H. Reuter; other editors are P. J. Brockwell, V. R. Cane, J. W. Cohen, E. J. Hannan, J. Keilson, D. G. Kendall, J. F. C. Kingman, K. Krickeberg, R. M. Loynes, K. R. Parthasarathy, C. A. B. Smith, and R. L. Tweedie. The Editorial Office of the *Advances* is in the Department of Probability and Statistics, The University, Sheffield S3 7RH, England.

Volume 17 No. 1 of *Advances* contains the following papers:

- FRANK BALL. Deterministic and stochastic epidemics with several kinds of susceptibles
ANTHONY G. PAKES AND A. C. TRAJSTMAN. Some properties of continuous-state branching processes, with applications to Bartoszyński's virus model
P. J. BROCKWELL. The extinction time of a birth, death and catastrophe process and of a related diffusion model
K. B. ATHREYA. Discounted branching random walks
WOLFGANG WOESS. Random walks and periodic continued fractions
H. E. DANIELS AND T. H. R. SKYRME. The maximum of a random walk whose mean path has a maximum
D. McDONALD. An invariance principle for semi-Markov processes
JAGADEESH CHANDRAMOHAN, ROBERT D. FOLEY AND RALPH L. DISNEY. Thinning of point processes — covariance analyses
A. D. BARBOUR AND G. K. EAGLESON. Multiple comparisons and sums of dissociated random variables
J. A. MORRISON AND D. MITRA. Heavy-usage asymptotic expansions for the waiting time in closed processor-sharing systems with multiple classes
J. S. BARAS, A. J. DORSEY AND A. M. MAKOWSKI. Two competing queues with linear costs and geometric service requirements: the μc -rule is often optimal
PETER HALL. On inference in a one-dimensional mosaic and an $M/G/\infty$ queue

Subscription rates (per volume) for the *Advances* in 1985 are the same as for the *Journal* (see inside back cover). A discount of 10% is allowed to subscribers who order current issues of both the *Journal* and *Advances* at the same time direct from the Applied Probability Office. A detailed price list for both current and back issues is available on request.

Cheques made out on U.S., U.K. and Australian banks will be acceptable: they should be made payable to *Applied Probability*, and sent to:

Executive Editor, Applied Probability,
Department of Probability and Statistics,
The University, Sheffield S3 7RH, England.

PERSPECTIVES IN PROBABILITY AND STATISTICS

Papers in honour of M. S. Bartlett on the occasion of his sixty-fifth birthday

Editor: J. GANI

Contributors

P. Armitage	H. Cramér	A. M. Kshirsagar	L. Takács
N. T. J. Bailey	H. E. Daniels	T. Lewis	P. Tautu
G. A. Barnard	J. Gani	P. D. M. Macdonald	D. Vere-Jones
A. Blanc-Lapierre	U. Grenander	P. Meier	P. Whittle
V. R. Cane	J. M. Hammersley	P. A. P. Moran	E. J. Williams
W. G. Cochran	E. J. Hannan	C. R. Rao	H. Wold
J. W. Cohen	D. G. Kendall	C. A. B. Smith	
D. R. Cox	J. F. C. Kingman	H. Solomon	

Pp. viii + 423

This book was published by the Applied Probability Trust in 1975 as a tribute to Professor Bartlett from colleagues throughout the world. Due to difficulties in storing the remaining stock, we are now making copies available to our readers and subscribers at only £3.50 (US\$7.00; \$A.6.00) to cover administrative costs, postage and packing. Please order your copy now from

Applied Probability Office,
Department of Probability and Statistics,
The University,
Sheffield S3 7RH, England.

Remittances to 'Applied Probability', please.

'..... there is variety and imagination in this volume..... Through their enthusiasm and ingenuity these 30 authors have provided a fitting tribute to a master.'

David Hinkley in *Science*

'The text is a delight to read, and several of the papers are gems in their own right..... it contains many stimulating ideas for potential research students.'

Eric Renshaw in *British Book News*

'..... there are substantial original contributions and magisterial summaries of important areas of knowledge..... The volume is a pleasure to browse in. It has benefitted from careful editing and production.'

John Hajnal in *JRSS A*

NOW AVAILABLE

ESSAYS IN STATISTICAL SCIENCE

The Applied Probability Trust has now issued a supplementary volume No. 19A of the *Journal of Applied Probability* (JAP). Entitled *Essays in Statistical Science*, this book consists of a collection of papers on a range of topics including statistical theory, stochastic processes, time series, geometric probability and mathematical genetics. It has been published as a Festschrift in honour of the sixty-fifth birthday of Professor P. A. P. Moran FAA, FRS, of the Department of Statistics, Australian National University, Canberra, an editor of JAP since its first volume in 1964.

This special volume is edited by J. Gani and E. J. Hannan and contains contributions from the following colleagues and students of Professor Moran: M. S. Bartlett, B. Benjamin, V. Cane, H. Cohn, D. J. Daley, H. E. Daniels, A. W. Davis, P. Erdős, W. J. Ewens, P. D. Finch, J. Gani, J. M. Hammersley, E. J. Hannan, A. M. Hasofer, C. R. Heathcote, C. C. Heyde, D. G. Kendall, J. F. C. Kingman, R. McNamee, D. R. McNeil, R. J. Maillardet, R. E. Miles, B. H. Neumann, M. Osborne, D. K. Pickard, D. Pollard, B. C. Rennie, E. L. Scott, E. Seneta, C. A. B. Smith, D. Vere-Jones, I. Vincze, G. S. Watson, G. A. Watterson, M. Westcott, P. Whittle, E. J. Williams and S. R. Wilson.

Essays in Statistical Science is in the usual JAP format (250 × 170 mm), with 434 pages, and has an attractive dust jacket and hard binding. The price is £18.00 (US\$26.00; \$A28.00). Orders should be sent to the Executive Editor, Applied Probability, Department of Probability and Statistics, The University, Sheffield S3 7RH, England.

SUBSCRIPTION RATES

Subscription rates (post free) for the 1985 volume of the *Journal* are as follows:

Subscribers in North, Central and South America, and Australia:

US\$99.00; \$A108.00; £69.00 for libraries and institutions;
US\$33.00; \$A36.00; £23.00 for individuals belonging to a recognised scientific society.

All other subscribers:

£57.00 for libraries and institutions;
£19.00 for individuals belonging to a recognised scientific society.

Members of the London Mathematical Society should apply direct to the Secretary of the Society for copies of the *Journal*.

All enquiries about the *Journal*, as well as other subscriptions, should be sent to the Executive Editor, Miss M. Hitchcock, Department of Probability and Statistics, The University, Sheffield S3 7RH, England. The price of back numbers varies from volume to volume, and enquiries should be sent to the Executive Editor. Cheques, money orders, etc. should be made out to *Applied Probability*; cheques on U.S., U.K. and Australian banks will be acceptable.

NOTES FOR CONTRIBUTORS

Papers published in the *Journal* are of two kinds:

- (1) *research papers* not exceeding 20 printed pages;
- (2) *short communications* of a few printed pages in the nature of notes or brief accounts of work in progress.

Review papers, longer research papers and letters to the editor are published in *Advances in Applied Probability*, a companion journal. (Note: Letters relating specifically to papers which have appeared in the *Journal of Applied Probability* will continue to appear in the *Journal*.)

The editors may publish accepted papers in either journal, according to the space available, in order to meet the 15-month deadline in publication referred to below.

Submission of papers

It is a condition of publication in the *Journal of Applied Probability* that papers shall not previously have appeared elsewhere, and will not be reprinted without the written permission of the Trust. It is the policy of the *Journal* not to accept for publication papers which cannot appear in print within 15 months of the date of receipt of the final version. Authors will receive 50 reprints of their papers free, and joint authors a proportional share of this number. Additional reprints will be provided at cost.

Papers should be written in English or French; papers in other languages may be accepted by the editors, but will appear (subject to the author's agreement) in English or French translation in the *Journal*. Scripts should be typewritten, using double spacing, and at least one copy should be on one side of the paper only. Each paper should be accompanied by

- (i) a short abstract of approximately 4–10 lines giving a non-mathematical description of the subject matter and results;
- (ii) a list of keywords detailing the contents for the purpose of computerised information retrieval.

Authors are advised to consult *The Author's Guide to the Applied Probability Journals* when preparing papers for submission. A copy of this guide may be obtained on application to the Applied Probability Office.

For efficiency in processing, authors are requested to send three copies of all submissions to the Applied Probability Office in Sheffield, rather than to individual editors. Authors overseas are asked to ensure that their submissions are sent by airmail. The Editor-in-Chief and the Applied Probability Office are in regular contact and full details of all papers submitted are available to Professor Gani in Lexington.

Copyright

The copyright of all published papers shall be vested in the Trust. When a paper is accepted for publication, the Trust requests the author(s) to sign a form assigning copyright to the Trust. Failure to do this promptly may delay or prevent publication.

Authorisation to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by the Applied Probability Trust for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$00.50 per copy, plus .10 per page is paid directly to CCC, 21 Congress St., Salem, MA 01970, U.S.A. 0021-9002/85 \$00.50 + .10.

Volume 22 Number 1

Research Papers

- 1 R. CRESSMAN AND A. T. DASH. Evolutionarily stable strategies with two types of player I. Two-species haploid or randomly mating diploid
- 15 RAKESH SHUKLA AND R. C. SRIVASTAVA. The statistical analysis of direct repeats in nucleic acid sequences
- 25 REINHARD HÖPFNER. On some classes of population-size-dependent Galton–Watson processes
- 37 A. JOFFE AND W. A. O’N. WAUGH. The kin number problem in a multitype Galton–Watson population
- 48 F. C. KLEBANER. A limit theorem for population-size-dependent branching processes
- 58 A. J. BRANFORD. A self-excited migration process
- 68 A. M. KELLERER. Counting figures in planar random configurations
- 82 E. B. JENSEN AND H. J. G. GUNDERSEN. The stereological estimation of moments of particle volume
- 99 J. DURBIN. The first-passage density of a continuous Gaussian process to a general boundary
- 123 HIDEO ŌSAWA. Reversibility of Markov chains with applications to storage models
- 138 WOJCIECH SZPANKOWSKI. Some sufficient conditions for non-ergodicity of Markov chains
- 148 E. SENETA AND R. L. TWEEDIE. Moments for stationary and quasi-stationary distributions of Markov chains
- 156 WARD WHITT. The renewal-process stationary-excess operator
- 168 P. WHITTLE. Partial balance and insensitivity
- 177 THEODORE P. HILL AND ARIE HORDIJK. Selection of order of observation in optimal stopping problems
- 185 DAVID ASSAF, MOSHE SHAKED AND J. GEORGE SHANTHIKUMAR. First-passage times with PF, densities
- 197 THOMAS H. SAVITS. A multivariate IFR class
- 205 MICHAEL RUBINOVITCH. The slow server problem
- 214 JOS H. A. DE SMIT. The queue $GI/H_m/s$ in continuous time

Short Communications

- 223 B. GAIL IVANOFF AND E. SENETA. The critical branching process with immigration stopped at zero
- 228 STEPHEN BREEN, MICHAEL S. WATERMAN AND NING ZHANG. Renewal theory for several patterns
- 235 W. DROSTE AND W. WEFELMEYER. A note on strong unimodality and dispersivity
- 240 E. FROSTIG AND I. ADIRI. Stochastic flowshop no-wait scheduling
- 247 DAVID ASSAF AND NAFTALI A. LANGBERG. Presentation of phase-type distributions as proper mixtures
- 251 Acknowledgement