

# 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in which probability models can be usefully developed, (4) papers in applied probability presented at conferences which do not publish their proceedings, and finally, (5) letters to the editor on any appropriate topic in applied probability.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 15 No. 2 of *Advances* contains the following papers:

IOANNIS KARATZAS. A class of singular stochastic control problems  
GERHARD BECKER AND GÖTZ KERSTING. Design problems for the pure birth process  
ARIE HORDIJK AND FRANK A. VAN DER DUYN SCHOUTEN. Average optimal policies in Markov decision drift processes with applications to a queueing and a replacement model  
RICHARD L. SMITH. Limit theorems and approximations for the reliability of load-sharing systems  
WAGNER DE SOUZA BORGES. On the limiting distribution of the failure time of fibrous materials  
JEFFREY J. HUNTER. Filtering of Markov renewal queues, I: Feedback queues  
JEFFREY J. HUNTER. Filtering of Markov renewal queues, II: Birth–death queues  
JOSH A. DE SMIT. The queue  $GI/M/s$  with customers of different types or the queue  $GI/H_m/s$   
JULIAN KEILSON AND USHIO SUMITA. The depletion time for  $M/G/1$  systems and a related limit theorem  
THOMAS KUCZEK. On the  $GA/G/\infty$  queue

Subscription rates (per volume) for the *Advances* in 1983 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.

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\$43.00; \$A.37.00). 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 1983 volume of the *Journal* are as follows:

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

US\$114.00, \$A102.00, £60.00 for libraries and institutions;

US\$38.00, \$A34.00, £20.00 for individuals belonging to a recognised scientific society.

### All other subscribers:

£51.00 for libraries and institutions;

£17.00 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. 0021-9002/83 \$00.50 + .10.

Volume 20 Number 2

*Research Papers*

- 227 FRANK BALL. The threshold behaviour of epidemic models  
242 F. C. KLEBANER. Population-size-dependent branching process with linear rate of growth  
251 DAVID MANNION. Sequential random displacements of points in an interval  
264 GREGORY F. LAWLER. A connective constant for loop-erased self-avoiding random walk  
277 CHOON-PENG TAN. Coefficients of ergodicity with respect to vector norms  
288 W. HENDERSON. Non-standard insensitivity  
297 BRENT M. TROUTMAN. Weak convergence of the adjusted range of cumulative sums of exchangeable random variables  
305 J. GRASMAN AND D. LUDWIG. The accuracy of the diffusion approximation to the expected time to extinction for some discrete stochastic processes  
322 DAREN B. H. CLINE. Limit theorems for the shifting level process  
338 C. PARK AND J. A. BEEKMAN. Stochastic barriers for the Wiener process  
349 ANTHONY G. PAKES. Remarks on a model of competitive bidding for employment  
358 D. G. HARLOW, R. L. SMITH, H. M. TAYLOR. Lower tail analysis of the distribution of the strength of load-sharing systems  
368 LAM YEY AND L. C. THOMAS. Adaptive control of  $M/M/1$  queues — continuous-time Markov decision process approach  
380 VIDYADHAR G. KULKARNI. On queueing systems with retrials

*Short Communications*

- 390 THOMAS SELLKE. On the asymptotic distribution of the size of a stochastic epidemic  
395 W. G. S. HINES AND D. T. BISHOP. Evolutionarily stable strategies in diploid populations with general inheritance patterns  
400 J. C. TANNER. The proportion of quadrilaterals formed by random lines in a plane  
405 PAUL KABAILA. Parameter values of ARMA models minimising the one-step-ahead prediction error when the true system is not in the model set  
409 R. A. DONEY. A note on conditioned random walk  
413 EHUD D. KARNIN. The first repetition of a pattern in a symmetric Bernoulli sequence  
419 BARRON BRAINERD. A limiting distribution for Bernoulli trials with second-order Markov dependence  
423 G. S. DAVIES. A note on the geometric/probabilistic relationship in a Markov manpower model  
429 S. KALPAKAM AND M. A. SHAHUL HAMEED. Quasi-stationary distribution of a two-unit warm-standby redundant system  
436 WILFRID S. KENDALL. Coupling methods and the storage equation  
442 J. WALRAND. A note on Norton's theorem for queueing networks  
445 R. D. FOLEY AND M. YADIN. On the moments of the cumulative idle time in an  $M/D/\infty$  queue  
448 Acknowledgement