

**I.U.T.A.M.**  
**INTERNATIONAL UNION OF**  
**THEORETICAL AND APPLIED MECHANICS**

PRELIMINARY ANNOUNCEMENT

**18th International Congress**  
**of Theoretical and Applied Mechanics**

TECHNION – ISRAEL INSTITUTE OF TECHNOLOGY  
HAIFA, ISRAEL  
AUGUST 22–28, 1992.

The 18th Congress will be held in Haifa, Israel, on the above dates. It will cover the entire field of theoretical and applied mechanics. A number of lectures will be given by invitation of the Congress Committee and up to 480 contributed papers will be presented either as lectures or in poster/discussion sessions.

Within the framework of the Congress, the following three topics will receive special attention as subjects of Mini-Symposia:

Instabilities in Solid and Structural Mechanics  
See Surface Mechanics and Air-Sea Interaction  
Biomechanics.

Participants who wish to contribute a paper to the Congress are asked to submit six copies of an extended Summary (500 words) and six copies of a brief Abstract [100–150 words, single page, double space typing, with full name and full address of the author(s)]. All authors must submit this material directly to the Congress Office to arrive not later than 15 January 1992. For the guidance of the Committee, authors should state their preferred mode of presentation, i.e., as a lecture or within a poster/discussion session. Final decisions on the selection of contributions for presentation at the Congress and their assignment to a lecture or poster/discussion session rest with the Congress Committee on the recommendations of the International Papers Committee.

More detailed announcements of plans and arrangements for the 18th Congress will be issued later in 1990. Those who wish to be placed on the circulation list for subsequent announcements should write to the Congress Office at the following address:

Prof. A. Solan, Secretary ICTAM 1992  
Faculty of Mechanical Engineering  
Technion – Israel Institute of Technology  
Haifa 32000  
ISRAEL

# Cambridge Applied Mathematics

*New textbook*

## Introductory Mathematics through Science Applications

J. BERRY, A. NORCLIFFE and S. HUMBLE

Covering the essential mathematics taught to first year scientists and engineers, this textbook reflects the growing awareness that ancillary mathematics is best taught alongside its applications. Each technique is first illustrated by two or three examples before the mathematics is presented, along with numerous worked examples. The resulting textbook provides both teacher and student with a rich and varied resource for learning mathematics.

£45.00 net Hc 0 521 24119 7 576 pp. 1989  
£15.00 net Pb 0 521 26907 5

## The Kinematics of Mixing

Stretching, Chaos and Transport

J. M. OTTINO

This book presents a unified and systematic account of the kinematics for the mixing of fluids. The work is heavily illustrated to aid the reader in developing an intuitive picture, complementing the more systematic and scientific presentation given in the text itself.

£50.00 net Hc 0 521 36335 7 378 pp. 1989  
£20.00 net Pb 0 521 36878 2  
*Cambridge Texts in Applied Mathematics 4*

## Functional Equations in Several Variables

J. ACZÉL and J. DHOMBRES

This treatise emphasises the applications of functional equations in several variables, keeping the prerequisites to a minimum and including numerous exercises and further results as well as an encyclopedic bibliography. The chapters can be read independently of each other, enabling material to be chosen for both introductory and advanced courses.

£50.00 net Hc 0 521 35276 2 475 pp. 1989  
*Encyclopedia of Mathematics and its Applications 31*

## From Cardinals to Chaos

Reflections on the Life and Legacy of Stanislaw Ulam

Edited by N. G. COOPER

This explorative insight into the life of one of the most fascinating men of modern science will be essential reading for all those working in fields touched by his genius: physics, nonlinear science, mathematics and mathematical biology. It is lavishly illustrated in full colour.

£40.00 net Hc 0 521 36494 9 318 pp. 1989  
£15.00 net Pb 0 521 36734 4

## Decision Making

Edited by DAVID E. BELL, HOWARD RAIFFA and AMOS TVERSKY

Presenting contributions on decision making from economists, mathematicians, operational researchers and psychologists, this book outlines the current state of research and lays the foundation for the integrated analysis of decision making.

£45.00 net Hc 0 521 35149 9 633 pp. 1989  
£20.00 net Pb 0 521 36851 0

## Axioms of Cooperative Decision-Making

HERVE MOULIN

This book provides a comprehensive and unified presentation of the common axioms which link the problems of fair division, equitable cost-sharing, division of joint benefit, or the choice of a truly democratic voting rule.

£40.00 net Hc 0 521 36055 2 348 pp. 1989  
*Econometrics Society Monographs*

## Principles of Earthquake Source Mechanics

B. V. KOSTROV and SHAMITA DAS

This is the only book to provide an in-depth study of earthquake source theory. It reviews continuum and fracture mechanics, discusses the inverse problem of the seismic moment tensor and concludes with a presentation of some current earthquake source models.

£30.00 net Hc 0 521 30345 1 303 pp. 1989  
*Cambridge Monographs on Mechanics and Applied Mathematics*

## Hamiltonian Systems

Chaos and Quantization

A. M. OZORIO DE ALMEIDA

This timely introduction to the theory of Hamiltonian chaos outlines the main results in the field and considers the implications for quantum mechanics. The main focus is on periodic orbits and their neighbourhood.

£35.00 net Hc 0 521 34531 6 256 pp. 1989  
*Cambridge Monographs on Mathematical Physics*

*Reissued in paperback*

## Unsteady Transonic Flow

MARTEN LANDAHL

This classic monograph deals with the analysis of unsteady lift distributions of thin oscillating wings at transonic speeds, putting emphasis on analytical methods of treating the linearised problem for simple wing planforms. It is of value for the physical insight it provides and in the reference 'exact' solutions it supplies for simplified cases.

£10.95 net Pb 0 521 35664 4 144 pp. 1989  
*Cambridge Science Classics Series*

For further information write to Susan Chadwick at the address below.

**Cambridge University Press, The Edinburgh Building, Cambridge, CB2 2RU**

# Cambridge Mathematics

## A Course in Mathematics for Students of Physics

Volumes 1 and 2

**PAUL BAMBERG** and  
**SHLOMO STERNBERG**

'... there is to my knowledge no comparable book, and it is hard to imagine a more inspiring one.'

*Times Higher Education Supplement*

Volume 1: £45.00 net HB 0 521 25017 X 405 pp.

Volume 2: £60.00 net HB 0 521 33245 1 464 pp.

*Now in paperback*

## Symplectic Techniques in Physics

**V. GUILLEMIN** and **S. STERNBERG**

This is the first book to attempt to reconcile mathematical and physical approaches to symplectic geometry.

'... brilliant and fascinating... one of the most important additions in recent years to the mathematical physics literature.'

*Contemporary Physics*

£15.00 net PB 0 521 38990 9 350 pp.

## Perspectives of Nonlinear Dynamics

Volume 2

**E. ATLEE JACKSON**

This two-volume work provides a comprehensive introduction to the field and reflects a wide variety of applications of analytical, topological and computational methods. It will be of interest to a broad readership.

£65.00 net HB 0 521 35458 7 592 pp.

Volume 1 still available:

£60.00 net HB 0 521 34504 9 528 pp.

## Topological Fluid Mechanics

Proceedings of the IUTAM Symposium, Cambridge, August 13–18, 1989

Edited by **H. K. MOFFATT** and  
**A. TSINOBER**

The papers in this book cover the theoretical, computational and experimental approaches to topological aspects of fluid mechanics and magnetohydrodynamics.

£60.00 net HB 0 521 38145 2 805 pp.

## Differential Equations

Their Solution Using Symmetries  
**HANS STEPHANI**

This book provides an introduction to the theory and application of the solution of differential equations using symmetries. The text contains examples and exercises and is suitable for graduates and researchers in mathematics, physics and engineering.

£37.50 net HB 0 521 35531 1 256 pp.

£12.95 net PB 0 521 36689 5

*Now in paperback*

## Differential Geometry, Gauge Theories and Gravity

**M. GÖCKELER** and **T. SCHÜCKER**

This is a self-contained, concise introduction to the concepts of differential geometry.

'... a very beautiful and elegantly written introduction... I highly recommend the book.'

*SIAM Review*

£12.95 net PB 0 521 37821 4 248 pp.

*Cambridge Monographs on Mathematical Physics*

## Statistical Field Theory

**C. ITZYKSON** and **J.-M. DROUFFE**

This work provides a comprehensive survey of the application of the methods of quantum field theory to statistical physics.

Volume 1: *From Brownian Motion to Renormalization and Lattice Gauge Theory*  
£25.00 net HB 0 521 34058 6 432 pp.

Volume 2: *Strong Coupling, Monte Carlo Methods, Conformal Field Theory and Random Systems*

£25.00 net HB 0 521 37012 4 416 pp.

*Cambridge Monographs on Mathematical Physics*

## The Mathematics of Projectiles in Sport

**NEVILLE DE MESTRE**

This book presents an account of techniques applied to projectile motion and their consequent applications to a wide variety of sports including soccer, table-tennis and frisbee throwing.

£12.95 net PB 0 521 39857 6 192 pp.

*Australian Mathematical Society Lecture Series 6*

## Optimization and Stability Theory for Economic Analysis

**BRIAN BEAVIS** and **IAN DOBBS**

This textbook presents a coherent and systematic exposition of the mathematical theory of the problems of optimization and stability, two central topics in economic analysis.

£35.00 net HB 0 521 33307 5 352 pp.

£15.00 net PB 0 521 33605 8

For further information please contact Susan Chadwick at the address below



**Cambridge**  
University Press

The Edinburgh Building, Cambridge CB2 2RU, UK.

A NEW journal in the applications of categorical,  
algebraic and geometric methods in Computer Science

# Mathematical Structures in Computer Science

## Why a new journal?

**Mathematical Structures in Computer Science (MSCS)** is a new journal of theoretical computer science which focuses on the application of ideas from the structural side of mathematics and mathematical logic to computer science. The journal aims to bridge the gap between theoretical contributions and software design, publishing original papers or broad surveys with original perspectives in all areas of computing, provided that ideas or results from algebra, geometry or category theory form a basis for the work. **MSCS** is distinct from existing titles in that it specialises in the art of applying mathematics of genuine interest and general applicability to computer science; its objective is to promote the useful application of high level mathematics to language design and software implementation. The journal will increase the circulation of new results in this fast growing area.

## Editor-in-Chief

G Longo

*Ecole Normale Supérieure, 45 rue d'Ulm, 75230  
Paris (email: longo@earn.frulm63)*

## Associate Editors

P L Curien

*Laboratoire d'Informatique, Ecole Normale  
Supérieure, 45 rue d'Ulm, 75230 Paris*

A M Pitts

*Computer Laboratory, University of Cambridge,  
Pembroke Street, Cambridge*

## Forthcoming articles

From Petri Nets to Linear Logic  
NARCISIO MARTI-OLIET & JOSE MESEGUER

Impredicative Calculi of Dependent Types  
THOMAS STREICHER

Operations on Records  
LUCA CARDELLI & JOHN C MITCHELL

Predicate Transformer Semantics  
ERNIE MANES

Declarative Continuations:  
An Investigation of Duality in  
Programming  
ANDRZEJ FILINSKI

A Category-theoretic Account of Program  
Modules  
EUGENIO MOGGI

What is Functional Programming?  
R F C WALTERS

## Subscription information

Mathematical Structures in Computer  
Science, Vol 1: March, July and November  
1991: £75. Delivery by airmail £11 per year  
extra. ISSN 0960-1295

Send your order to Journals Publicity  
Department, Cambridge University Press,  
FREEPOST\*, The Edinburgh Building,  
Shaftesbury Road, Cambridge CB2 1BR,  
England TEL: (0223) 325806, FAX  
(0223) 315052

\* no postage stamp necessary if posted in UK  
*In US & Canada, write to: Cambridge  
University Press, 40 West 20th Street,  
New York,  
NY 10011,  
USA*

The logo for Cambridge Journals, featuring a stylized crest with a book and a quill, followed by the text "Cambridge Journals" in a serif font.

#### INSTRUCTIONS TO AUTHORS

*Submission of manuscripts* Papers may be submitted to any member of the editorial board. Three copies should be sent; originals of figures should *not* be included until the paper has been accepted. Papers may be submitted electronically by sending a LaTeX file to [EJAM@UK.AC.OX.VAX](mailto:EJAM@UK.AC.OX.VAX); this file should include the figures (line figures only). Electronic communications can also be used for minor corrections and for messages for the editors.

*Layout of manuscripts* Papers should be typewritten in **double spacing throughout**, on one side of the paper. Please avoid footnotes if possible. Papers must begin with an abstract of not more than 300 words, and they should end with a brief concluding section. The SI system of units must be used throughout.

*Illustrations* Figures should be drawn in indian ink on good quality white paper. Wherever possible they will be reproduced *with* the author's lettering. A list of captions for figures should be attached separately.

Where appropriate, articles may be illustrated by photographs: high-quality glossy black and white prints are necessary.

*References* To make alteration easier, we will use the Harvard system of references: papers should be referred to in the text by author's surname and year of publication, and listed in alphabetical order at the end of the main text. Please include the article title in the reference, which should be in the order: author's surname, initials; year in parentheses; article title; journal name, abbreviated in accordance with the *World List of Scientific Periodicals* (4th Edn); volume number (underlined); inclusive page numbers.

The **European Journal of Applied Mathematics** aims to publish papers in all areas of applied mathematics, with especial emphasis on the following.

(i) **The exposition of new mathematical ideas relevant to the modelling and analysis of modern technological processes.**

(ii) **The development of interesting mathematical methods with broad areas of applicability.**

There is no restriction in the areas of applicability or the style of mathematics, although standard mathematical techniques will only be published if they are associated with novel applications or lead to substantial advances in established problem areas.

#### COPYING

This journal is registered with the Copyright Clearance Center, 27 Congress Street, Salem, MA 01970. Organisations in the USA who are also registered with the C.C.C. may therefore copy material (beyond the limits permitted by sections 107 and 108 of US copyright law) subject to payment to C.C.C. of the per-copy fee of \$5.00. This consent does not extend to multiple copying for promotional or commercial purposes. Code 0956-7925/90 \$5.00 + .00.

*ISI Tear Sheet Service*, 3501 Market Street, Philadelphia, Pennsylvania 19104, USA, is authorised to supply single copies of separate articles for private use only.

*For all other use*, permission should be sought from Cambridge or the American branch of Cambridge University Press.

# *European Journal of* **Applied Mathematics**

VOLUME 1 · PART 3 · SEPTEMBER 1990

## CONTENTS

- Symmetry-based algorithms to relate partial differential equations: I. Local symmetries *page* 189  
G. W. BLUMAN and S. KUMEI
- Symmetry-based algorithms to relate partial differential equations: II. Linearization by nonlocal symmetries 217  
G. W. BLUMAN and S. KUMEI
- Models of elastic–perfectly plastic materials 225  
J. M. GREENBERG
- Nonlinear effects of variable conductivities in thermistor-related problems: an explicit example 245  
J. H. YOUNG and G. TENTI
- On a two-phase continuous casting Stefan problem with nonlinear flux 259  
JOSÉ FRANCISCO RODRIHUES and FAHUAI YI
- New exact solutions of the Boussinesq equation 279  
PETER A. CLARKSON

© Cambridge University Press 1990

CAMBRIDGE UNIVERSITY PRESS

The Pitt Building, Trumpington Street, Cambridge CB2 1RP

40 West 20th Street, New York, NY 10011, USA

10 Stamford Road, Oakleigh, Melbourne 3166, Australia

*Printed in Great Britain by the University Press, Cambridge*