A journal for the publication of original research in all branches of physics

This journal is one of the twelve Australian Journals of Scientific Research published by the Commonwealth Scientific and Industrial Research Organisation with the cooperation of the Australian Academy of Science. Editorial policy for the AJSR series is developed by a Board appointed jointly by CSIRO and the Academy of Science.

Editorial Board

Acceptance of papers for this journal is supervised by an Editorial Board appointed by CSIRO and the Academy of Science after consultation with the Australian Institute of Physics. All papers are refereed. The journal assumes that all the authors of a multi-authored paper agree to its submission. Editorial Board members advise the managing editor on the selection of referees and adjudicate in the case of conflicting or adverse reports.

Chair
D. B. Melrose University of Sydney (AIP)

Members
J. L. Caswell CSIRO Radiophysics
J. G. Collins CSIRO Applied Physics
R. H. Dalitz University of Oxford
R. Delbourgo University of Tasmania
S. M. Hamberger Australian National University
P. Hannaford CSIRO Materials Science & Technology
B. S. Liley University of Waikato
M. A. Morrison University of Oklahoma
J. Oitmaa University of New South Wales
G. G. Shute University of Melbourne
E. Weigold Flinders University

Managing Editor
R. P. Robertson

Annual subscription
Australia and New Zealand
$A180 (surface)

Other countries:
$US180 (surface-air-lifted)

Personal: $A60 or $US60

Back issues: $A30

Issued six times a year

© CSIRO Australia 1989

The Notice to Authors is published in the first issue of each volume. Copies are available on request.

All inquiries and manuscripts should be forwarded to the
Managing Editor,
Australian Journal of Physics,
314 Albert Street,
East Melbourne, Vic. 3002, Australia.

Telephone (03) 418 7333
Telex AA 30236
Fax: Australia (03) 419 4096
International (613) 419 4096

Permission to photocopy items from this journal is granted by CSIRO to libraries and other users registered with the Copyright Clearance Center (CCC), provided that the stated fee for each copy is paid directly to the CCC, 27 Congress Street, Salem, MA 01970, U.S.A. Special requests should be addressed to the Managing Editor, Australian Journal of Physics, at the address above.

Cover: Fractal of a Julia set at a point just outside the Mandelbrot set for quadratic mapping. The fractal illustrates the complexity and beauty of the boundary between order and disorder typical in chaotic systems. Courtesy of Dr Bruce Henry, Department of Theoretical Physics, Australian National University.
Contents

Volume 42 Number 1 1989

Editorial announcement: New AJSR-TeX typesetting system

General Physics
Painlevé test and discrete Boltzmann equations. N. Euler and W.-H. Steeb 1

Elementary Particles & Fields
Constructing large-basis meson wavefunctions from perturbative cavity dynamics. Lloyd C. L. Hollenburg and Bruce H. J. McKellar 11

Nuclear Physics
Delayed alpha spectra from the beta decay of $^8$Li and $^8$B. F. C. Barker 25

Measurement of reduced electric octupole transition probabilities, $B(E3; 0^+_1 \rightarrow 3^+_1)$, for $^{118,120,122}$Sn. R. H. Spear, A. M. Baxter, S. M. Burnett and C. L. Miller 41

Atomic & Molecular Physics
A CEPA2 study of the $\text{H}_2-\text{H}_2$ isotropic potential function. U. E. Senff and P. G. Burton 47

Fluids, Plasmas and Electric Discharges


Observation of spatial variations in the energy distribution function for steady-state Townsend discharges. A. B. Wedding and L. J. Kelly 101
### Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Physics</td>
<td>Characteristic features of vector chaos.</td>
<td><em>R. Delbourgo and R. B. Zhang</em></td>
<td>113</td>
</tr>
<tr>
<td>Elementary Particles and Fields</td>
<td>Baryon structure and QCD.</td>
<td><em>R. T. Cahill, C. D. Roberts and J. Praschifka</em></td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>Baryon structure and QCD: Nucleon calculations.</td>
<td><em>C. J. Burden, R. T. Cahill and J. Praschifka</em></td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>Diquarks and the bosonisation of QCD.</td>
<td><em>R. T. Cahill, J. Praschifka and C. J. Burden</em></td>
<td>161</td>
</tr>
<tr>
<td>Hadronisation of QCD.</td>
<td></td>
<td><em>R. T. Cahill</em></td>
<td>171</td>
</tr>
<tr>
<td>Atomic and Molecular Physics</td>
<td>Computer simulation of positron annihilation and diffusion characteristics in Kr and Xe.</td>
<td><em>Vikram Singh</em></td>
<td>187</td>
</tr>
<tr>
<td>Fundamental Areas of Phenomenology</td>
<td>An improved scheme using the shooting method to solve degenerate four-wave mixing equations.</td>
<td><em>Y. H. Ja</em></td>
<td>197</td>
</tr>
<tr>
<td>Condensed Matter: Electronic Structure etc.</td>
<td>Infrared absorption and reflection spectra of crystalline TCNQ salts.</td>
<td><em>Ajay T. Oza</em></td>
<td>203</td>
</tr>
</tbody>
</table>
Contents    Volume 42  Number 3  1989

General Physics

Motion of charged particles in a homogeneous reacting medium with a one-dimensional geometry.  Russell K. Standish  223

Nuclear Physics

Investigation of E1 strength in Coulomb excitation of light nuclei.  F. C. Barker and C. L. Woods  233


Fundamental Areas of Phenomenology

Time-dependent studies of optical bistability in atomic sodium.  W. E. Schulz, W. R. MacGillivray and M. C. Standage  267

Condensed Matter: Structure etc.

Neutron Kikuchi effect and practical problems associated with its observation.  S. L. Town, T. F. Smith and M. M. Elcombe  289

Structural differences between RbMnCl₃ and RbMnBr₃.  E. M. Ali and A. A. Felimban  307

Geophysics, Astronomy and Astrophysics

Linear force-free magnetic fields and coronal models.  C. J. Durrant  317

H₂O maser in the galactic plane. II Longitudes 260° to 326°.  J. L. Caswell, R. A. Batchelor, J. R. Forster and K. J. Wellington  331
Contents

Volume 42  Number 4  1989

Nuclear Physics
Coulomb excitation of $^{142}$Ce and $^{144}$Nd.  R. H. Spear, W. J. Vermeer, S. M. Burnett, G. J. Gyapong and C. S. Lim  345

Fluids, Plasmas and Electric Discharges
Cathode region of a steady-state Townsend discharge in nitrogen.  L. J. Kelly, M. J. Brennan and A. B. Wedding  365
Effect of a rotating magnetic field on the tilting instability of a prolate rotamak.  W. K. Bertram  379

Condensed Matter: Electronic Structure etc.
Raman spectrum of rubidium thiocyanate at 37 K and room temperature.  M. J. Joyce and F. Ninio  389

High Temperature Superconductivity
Flux penetration effects in high-$T_c$ SQUIDs.  G. J. Sloggett, I. K. Harvey, L. Wieczorek, R. E. Binks and R. Driver  401
Role of flux pinning in high temperature superconductors.  K.-H. Müller, J. C. Macfarlane, B. W. Ricketts and R. Driver  413
High pressure studies of the superconducting transition in (Bi,Pb)$_2$Sr$_2$Ca$_2$Cu$_3$O$_{10}$.  J. Lusk, T. E. Freeman, D. A. Erdman, R. Driver and J. C. Macfarlane  425
Field enhanced intrinsic fluctuations in highly oriented high $T_c$ thin films.  G. B. Smith, J. M. Bell, N. Savvides, S. Filipczuk and C. Andrikidis  431

Geophysics, Astronomy and Astrophysics
Lunisolar atmospheric tides. II.  R. Brahde  439
Ionospheric $E_s$ in the southern hemisphere temperate zone. I. Seasonal characteristics of $f_0E_s$.  W. J. Baggaley  451
Cosmic ray anisotropy below $10^{15}$ eV.  D. J. Bird, R. W. Clay and P. G. Edwards  465
Elementary Particles and Fields
Meson mass spectrum from first order static cavity wavefunctions. 
*Lloyd C. L. Hollenberg and Bruce H. J. McKellar* 471

Atomic and Molecular Physics

Fluids, Plasmas and Electric Discharges
Double-cyclotron absorption: A semiclassical formulation. *L. T. Ball and D. B. Melrose* 481
Heavy ion acceleration by double-cyclotron absorption: Some analytic approximations. *Lewis T. Ball* 493
Effect of small-scale inhomogeneities on the dispersive properties of a plasma. *D. B. Melrose and D. J. Percival* 519

High Temperature Superconductivity
A dielectric approach to high temperature superconductivity. *J. Mahanty and M. P. Das* 541
Structure of four families of layered copper-oxide high $T_c$ superconductors. *Peter Norman* 545
Preparation and microstructural investigation of the high-$T_c$ superconductor Pb$_2$Sr$_2$Y$_{0.5}$Ca$_{0.5}$Cu$_3$O$_8$. *T. J. White, Z. Barnea, P. Goodman and D. G. Jensen* 551

[Continued overleaf]
Condensed Matter: Electronic Structure etc.
Correlation effects of third-order perturbation in the extended Hubbard model. 
G. Z. Wei, H. Q. Nie, L. Li and K. Y. Zhang 565

Geophysics, Astronomy and Astrophysics
Measurements of the radio refractive index structure parameter $C_n^2$ with a microwave refractometer in tropical latitudes. S. B. S. S. Sarma and P. K. Pasricha 573

Contents

Volume 42 Number 6 1989

Nuclear Physics
Deformation and spin 1 effects. K. Amos and J. Raynal 591
Static and dynamic moments of the $^7$Li nucleus. F. C. Barker, Y. Kondô and R. H. Spear 597

Atomic and Molecular Physics

Fundamental Phenomenology
Slowing of sound waves in powdered media. J. M. Brettel 627

Astronomy and Astrophysics

Corrigenda to: Acquisition of powder diffraction data with synchrotron radiation. D. E. Cox, B. H. Toby and M. M. Eddy 735
Thermosolutal instability of a Hall plasma. R. C. Sharma and K. N. Sharma 735

Author Index to Volume 42 737