
Australian Journal of Physics

Volume 28

Melbourne 1975

Australian Journal of Physics

A medium for the publication of results of original scientific research in all branches of physics.

Compilations of astrophysical data are published at irregular intervals in Astrophysical Supplements to the Journal.

Board of Standards

The Board of Standards for this Journal is appointed by the Commonwealth Scientific and Industrial Research Organization and the Australian Academy of Science and consists of:

D. G. Catcheside (Chairman)

S. J. Angyal

M. J. P. Cannay

H. S. Green

G. A. Horridge

I. G. Jarrett

F. L. Milthorpe

M. G. Pitman

J. P. Quirk

D. J. Rochford

H. R. Wallace

J. P. Wild

B. J. Walby (Editor-in-Chief)

Advisory Committee

Acceptance of papers for this Journal is in the hands of an Advisory Committee consisting of a Chairman appointed by the Executive of CSIRO and the Council of the Australian Academy of Science, and members appointed by the Board of Standards in consultation with the Australian Institute of Physics.

H. S. Green (Chairman)

R. W. Crompton

F. J. Jacka

D. C. Peaslee

J. H. Piddington

B. J. Robinson

B. J. Walby (*ex officio*)

The Australian Journals of Scientific Research

Australian Journal of Agricultural Research	\$A15 per annum
Australian Journal of Biological Sciences	\$A10 per annum
Australian Journal of Botany	\$A10 per annum
Australian Journal of Chemistry	\$A20 per annum
Australian Journal of Marine and Freshwater Research	\$A5 per annum
Australian Journal of Physics	\$A15 per annum
Australian Journal of Plant Physiology	\$A10 per annum
Australian Journal of Soil Research	\$A5 per annum
Australian Journal of Zoology	\$A15 per annum

Australian Journal of Physics

Published by the Commonwealth Scientific and Industrial Research Organization. Issued six times a year.

© CSIRO 1975

All enquiries and manuscripts should be forwarded to:

The Editor-in-Chief
Editorial and Publications Service
CSIRO, 372 Albert Street
East Melbourne, Victoria 3002

Australian Journal of Physics

Contents Volume 28 Number 1 February 1975

- A note on unitarity in resonance theory. *W. K. Bertram and J. L. Cook* 1
- The Wick rotation. *D. M. O'Brien* 7
- The application of the string model of hadrons to the inelastic scattering of electrons. *L. J. Tassie* 15
- Angular correlation measurements in ^{57}Fe . *R. B. Taylor and F. Hille* 21
- Electron diffusion in finite enclosures. *Howard I. Leemon and Kailash Kumar* 25
- Raman processes in the helium atom in intense fields. *R. K. Thareja, Man Mohan, V. Nayak and S. N. Haque* 35
- Measurement of apparent spin-spin relaxation times in nuclear quadrupole resonance using a double pulsed super-regenerative oscillator. *K. R. Doolan and S. Hacobian* 45
- Phonon dispersion relations for chromium and tantalum. *Jyoti Prakash, L. P. Pathak and M. P. Hemkar* 57
- Debye-Waller factors of α -iron and sodium. *Jyoti Prakash, L. P. Pathak and M. P. Hemkar* 63
- A digital method for computation of time-varying power spectra applied to geomagnetic Pi pulsations. *F. F. F. Yuan* 69
- Electron distribution moments and precipitation dependence on anisotropic magnetospheric content. *J. R. Catchpole* 77
- Supersonic neutral winds in an outer atmosphere. III. A two-dimensional model. *N. E. Gilbert* 85
- Three-wave interactions involving one whistler. *D. B. Melrose* 101

Australian Journal of Physics

Contents Volume 28 Number 2 April 1975

- Quantization of fields in accordance with modular statistics. *H. S. Green* 115
- A particle-hole-rotator coupling model for the giant resonance of carbon-12.
Anne McDougall and B. M. Spicer 127
- Upper limits on polarization effects in nuclear collisions. *C. B. O. Mohr* 133
- Total yield measurements in $^{23}\text{Na}(\text{p},\gamma)^{24}\text{Mg}$. *Z. E. Switkowski, R. O'Brien, A. K. Smith and D. G. Sargood* 141
- Total yield measurements in $^{31}\text{P}(\text{p},\gamma)^{32}\text{S}$. *R. O'Brien, Z. E. Switkowski, A. K. Smith and D. G. Sargood* 155
- The nature of *D*-region scattering of vertical incidence radio waves. I. Generalized statistical theory of diversity effects between spaced receiving antennas.
B. C. Lindner 163
- The nature of *D*-region scattering of vertical incidence radio waves. II. Experimental observations using spaced antenna reception. *B. C. Lindner* 171
- Recombination lines near 8.9 GHz of strong sources in the southern Milky Way.
R. X. McGee, Lynette M. Newton and R. A. Batchelor 185
- 5 GHz polarization observations of 33 galactic radio sources. *D. K. Milne and J. R. Dickel* 209
- Short Communications**
- Zero-field mobility for electrons in dry and humid air. *H. B. Milloy, I. D. Reid and R. W. Crompton* 231
- $^6\text{Li}(\text{d}, \text{d}')$: direct breakup effects and parameters of the first 2^+ level of ^6Li .
K. H. Bray, A. D. Frawley, T. R. Ophel and P. B. Treacy 235
- Supplementary Series**
- Abstracts of Astrophysical Supplement Number 34: The Parkes 2700 MHz survey (seventh, eighth, ninth and tenth parts). *J. G. Bolton, A. J. Shimmins, J. V. Wall and P. W. Butler* 239

Australian Journal of Physics

Contents Volume 28 Number 3 June 1975

Radiative decay of the low-lying states of ^{12}C . *Colette M. McKay and B. M. Spicer* 241

Differential cross sections for the $^{13}\text{C}(\text{He}, p_0)$ and $^{15}\text{N}(\text{He}, p_0)$ reactions at 15 MeV. *J. Havloulian, G. Ravalli and B. M. Spicer* 247

Gamma decays, lifetimes and spins of ^{47}V excited states. *J. V. Thompson, R. A. I. Bell, L. E. Carlson and M. R. Najam* 251

$^{50}\text{Cr}(p, \gamma)^{51}\text{Mn}$ reaction from $E_p = 1.45$ to 2.07 MeV. *G. U. Din and A. M. Al-Naser* 263

Fluctuation-generated plasma oscillations. *A. Z. Tirkel, J. L. A. Francey and G. J. Troup* 283

Drift of a charged particle in a static magnetic field having a power law dependence. *M. Headland and P. W. Seymour* 289

The mobility of O_2^+ and O_4^+ ions in oxygen and the equilibrium constant for the reaction $\text{O}_2^+ + 2\text{O}_2 \rightleftharpoons \text{O}_4^+ + \text{O}_2$ at 273 and 294 K. *H. B. Milloy* 307

Molecular dynamics calculation of the thermodynamic properties of methane. *H. J. M. Hanley and R. O. Watts* 315

Measurements of the circular polarization of radio sources at frequencies of 0.63, 1.4, 5.0 and 8.9 GHz. *J. A. Roberts, R. S. Roger, J.-C. Ribes, D. J. Cooke, J. D. Murray, B. F. C. Cooper and F. Biraud* 325

Short Communications

Non-existence of axially symmetric massive complex scalar fields. *J. R. Rao, H. S. Panda and B. K. Nayak* 353

Supplementary Series

Abstract of Astrophysical Supplement Number 35: The linear polarization of radio sources. I. Observations at wavelengths of 6, 11, 18 and 21 cm. *F. F. Gardner, J. B. Whiteoak and D. Morris* 357

Abstract of Astrophysical Supplement Number 36: Culgoora-2 list of radio source measurements at 80 MHz. *O. B. Slee and C. S. Higgins* 357

Australian Journal of Physics

Contents Volume 28 Number 4 August 1975

Dynamical consequences of a photon Regge trajectory. *G. C. Joshi* 359

pp elastic scattering and the pomeron periphery. *Mohammad Saleem, Mohammad Rafique, Khalid L. Mir, J. S. Mirza and S. H. Tirmazi* 365

Accurate branching ratio measurements in $^{23}\text{Na}(\text{p}, \gamma)^{24}\text{Mg}$. *S. G. Boydell and D. G. Sargood* 369

Accurate branching ratio measurements in $^{31}\text{P}(\text{p}, \gamma)^{32}\text{S}$. *S. G. Boydell and D. G. Sargood* 383

Overdriven supersonic heat waves. *J. D. Strachan and B. Ahlborn* 395

Model pseudopotentials and dynamical properties of simple metals.
S. K. Srivastava 403

On a class of exact spherically symmetric solutions to the Einstein gravitational field equations. *M. W. Cook* 413

A relativistic treatment of space-time rays and the Doppler effect in general media. *J. A. Bennett* 423

Finite amplitude convection in a compressible layer with polytropic structure.
R. Van der Borgh 437

Tests of randomness in astronomical objects. I. Along single great circles.
P. S. Wesson 453

Tests of randomness in astronomical objects. II. Along two orthogonal great circles. *P. S. Wesson* 463

Short Communications

Compton scattering of deuterons. *Mohammad Saleem and M. A. Shaukat* 475

Corrigendum to: Parity-nonconserving effects in n-p capture at thermal energies.
Keith R. Lassey and Bruce H. J. McKellar 477

Australian Journal of Physics

Contents Volume 28 Number 5 October 1975

Hadronic electrons? *Stephen Wolfram* 479

Statistics of fission widths for partly open fission channels. *J. L. Cook and E. K. Rose* 489

Quantum-mechanical wave equation for two particles of spin 0.
Kwong-Chuen Tam 495

A study of resonances in the $^{58}\text{Ni}(p,\gamma)^{59}\text{Cu}$ reaction below 2.15 MeV.
G. U. Din and A. M. Al-Naser 503

Nonlinear diffusion of ions in a gas. *R. E. Robson* 523

Anisotropic diffusion in electron swarms. *J. L. A. Francey and D. A. Jones* 533

The use of X-ray interferometry to measure X-ray refractive indices.
D. C. Creagh 543

Downhole induced-polarization detection of ore bodies: conductive overburden effects. *L. J. Gleeson and Y.-C. Thio* 557

On the interpretation of the Doppler spectra of ionospherically propagated ground backscatter echoes. *J. A. Bennett* 575

Static charged dust distribution in the Brans-Dicke theory. *B. K. Nayak* 585

Southern hemisphere meteor stream determinations. *G. Gartrell and W. G. Elford* 591

Intensity distribution of interplanetary scintillation at 408 MHz. *R. G. Milne* 621

5000 MHz flux densities and spectra for 325 small-diameter radio sources at low galactic latitudes. *J. L. Caswell, R. F. Haynes and D. H. Clark* 633

Short Communications

A continuous spectrum analyser for analogue analysis of ULF tape recorded data.
P. W. McNabb and B. J. Fraser 647

Supplementary Series

Abstracts of Astrophysical Supplement Number 37: Molonglo and Parkes supernova remnant observations. *J. L. Caswell, D. H. Clark, D. F. Crawford and Anne J. Green* 651

Australian Journal of Physics

Contents Volume 28 Number 6 December 1975

The inverse scattering problem for static meson fields and nonlocal potentials.

J. L. Cook 653

Shell structure of the even tellurium isotopes and inelastic proton scattering.

P. Nesci, R. Smith, K. Amos and H. V. Geramb 659

Effect of nonlinear level crossing on the output of a gas laser. *B. K. Mohanty and N. Nayak* 665

Experimental observations of the diffusion cooling of electrons in argon.

T. Rhymes and R. W. Crompton 675

Calculation of the static properties of local moment systems by the mean field method. *A. M. Stewart* 685

Magnetization of micron sized magnetite particles. *L. G. Parry* 693

Debye-Waller factors of α -iron and sodium. II. Willis's anharmonic theory.

L. P. Pathak, Jyoti Prakash, V. P. Singh and M. P. Hemkar 707

On the classical theory of equilibrium between matter and radiation.

J. J. Monaghan 715

Deficiencies of the asymptotic solutions commonly found in the quasilinear relaxation theory. *R. J.-M. Grognard* 731

Supplementary Series

Abstract of Astrophysical Supplement Number 38: Accurate spectra of 300 radio sources from the Parkes catalogue: Observational results.

Beverley J. Wills 755

Index to Volume 28 757

