EDITORIAL FILE COPY

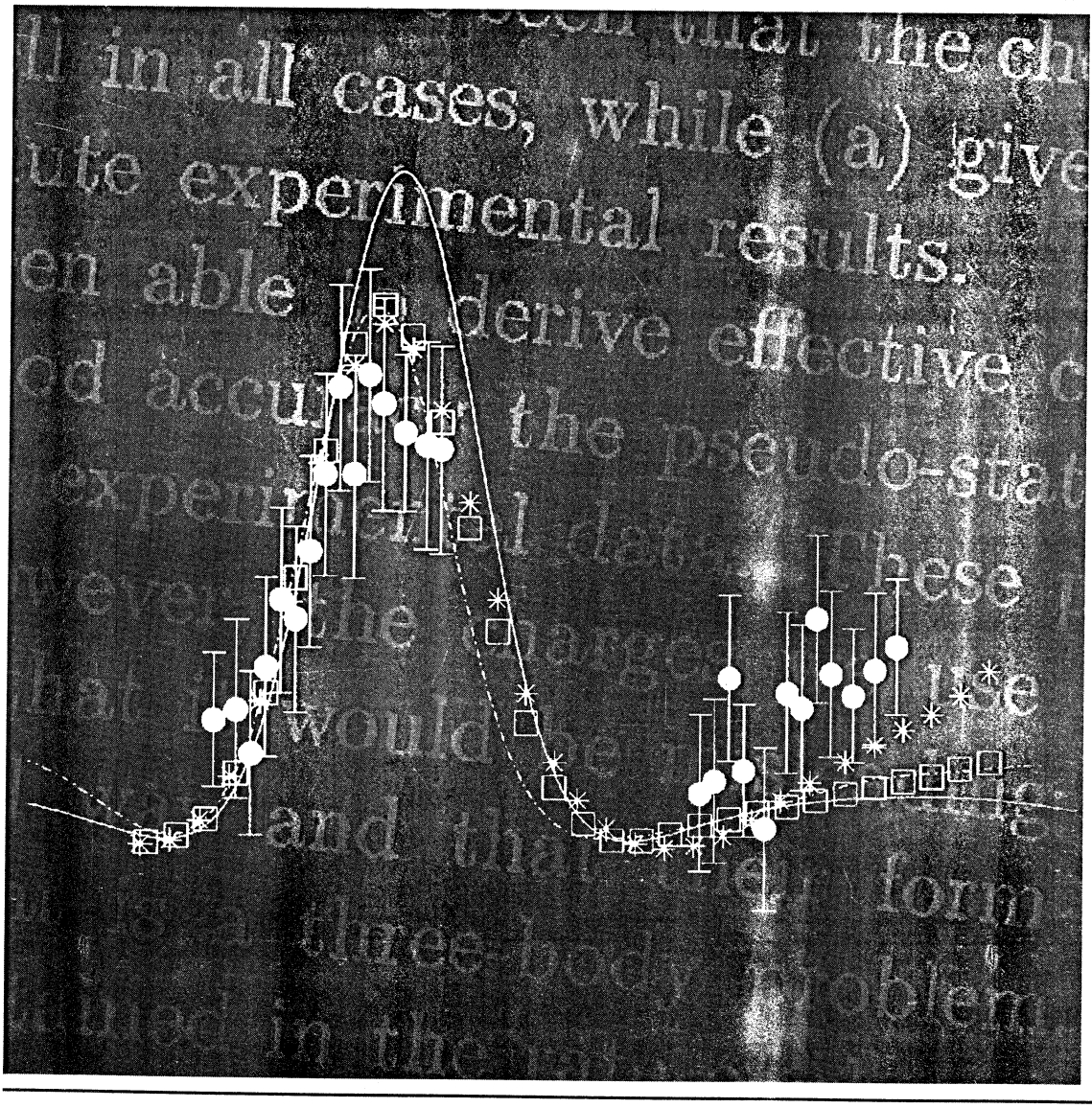
Australian Journal of Physics

Volume 47

1994

47

ISSN 0004-9506



Australian Journal of Physics

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

Contents Volume 47 Number 1 1994

Review Article

Studies involving the resonant interaction of laser light with atoms.
W. R. MacGillivray and M. C. Standage 1

General Physics

A cyclic symmetry principle in physics. *H. S. Green* 25

Elementary Particles and Fields

The sigma term: Leading non-analytic behaviour of decuplet contributions.
I. Jameson, A. A. Rawlinson and A. W. Thomas 45

Atomic and Molecular Physics

Multiple scattering calculation for ionisation of helium atoms by electrons at intermediate energies. *S. Seal and J. N. Das* 49

Fluids, Plasmas and Electric Discharges

Effect of streaming electrons on the propagation of electromagnetic waves in a magnetised relativistic plasma. *S. N. Paul, S. Chakraborty and A. Roy Chowdhury* 59

Condensed Matter

Envelope function theory for direct-gap semiconductor superlattices of arbitrary grading profile. *K. J. Duff* 77

The three phases of solid deuterated methane.
M. K. Kansal and S. K. Trikha 97

Lattice dynamics of the high T_c superconductor $ErBa_2Cu_3O_7$.
S. Mohan and R. Kannan 103

Australian Journal of Physics

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

Contents Volume 47 Number 2 1994

General Physics

Statistical symmetries in physics.
H. S. Green 109

Atomic and Molecular Physics

Calculation of electron impact ionisation of atomic hydrogen with the exact final-state boundary conditions. *Dmitry A. Konovalov and Ian E. McCarthy* 123

Fundamental Phenomenology

Inequalities for isothermal linear response.
A. M. Stewart 129

Condensed Matter

Staggered magnetisation in the Heisenberg antiferromagnet.
Lloyd C. Hollenberg and Michael J. Tomlinson 137

Astronomy and Astrophysics

A VLA survey of rich clusters of galaxies. II. The stronger sources: Maps, polarisations and identifications. *O. B. Slee, A. L. Roy and Ann Savage* 145

Australian Journal of Physics

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

Contents Volume 47 Number 3 1994

General Physics

An experiment to test the gravitational Aharonov–Bohm effect.
Vu B. Ho and Michael J. Morgan 245

Atomic and Molecular Physics

Drift velocity and D_T/μ ratio for electrons in a 0·5% hydrogen–xenon mixture at 295 K. *M. T. Elford, S. Sasaki and K. F. Ness* 253

Positronium formation cross sections for scattering of positrons from potassium and rubidium. *N. Ranjit Singh, N. C. Deb, Th. Subodh Chandra Singh, M. Babuyaima Singh and P. S. Mazumdar* 265

Near-threshold behaviour of generalised oscillator strengths for 2p ionisation.
R. Padma and P. C. Deshmukh 271

Fluids, Plasmas and Electric Discharges

Approximate formulas for ion and electron transport coefficients in crossed electric and magnetic fields. *R. E. Robson* 279

Transport coefficients and velocity distribution function of an ion swarm in an a.c. electric field obtained from the BGK kinetic equation.
R. E. Robson and T. Makabe 305

Variations of helicon wave-induced radial plasma transport in different experimental conditions. *V. Petržílka* 315

Condensed Matter

Spectroscopic and piezospectroscopic studies of the energy states of boron in silicon. *R. A. Lewis, P. Fisher and N. A. McLean* 329

Astronomy and Astrophysics

Cross-field current closure below the solar photosphere.
M. S. Wheatland and D. B. Melrose 361

Australian Journal of Physics

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

Contents Volume 47 Number 4 1994

Feature Article

Modulational interactions of two monochromatic waves and packets of random waves. *S. V. Vladimirov and S. I. Popel* 375

General Physics

The physics of tachyons. III. Tachyon electromagnetism. *Ross L. Dawe and Kenneth C. Hines* 431

Elementary Particles and Fields

Induced parity violation in odd dimensions. *R. Delbourgo and A. B. Waites* 465

Condensed Matter

A nuclear orientation study of terbium ethyl sulphate. *P. J. Back, B. Bleaney, G. J. Bowden and N. J. Stone* 475

Influence of metal–glass contact on the dynamic response of $0{\cdot}40Ag_2O:0{\cdot}60P_2O_5$. *N. U. Haque, R. A. Hashmi and M. K. Anis* 487

Australian Journal of Physics

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

Contents Volume 47 Number 5 1994

Pioneering a New Astronomy

Papers presented at the John G. Bolton Memorial Symposium, Parkes Observatory, 9–10 December 1993

Introduction. *Dorothy E. Goddard and Raymond F. Haynes* 495

Eulogy. *J. P. Wild* 496

Reminiscences

Contributions by J. P. Wild, Marcus Price, R. N. Manchester, Michael J. Dinn and S. C. B. Gascoigne 497

Historical Contributions

Recollections of John G. Bolton at Dover Heights and Caltech. *Gordon J. Stanley* 507

Some memories of the Dover Heights field station, 1946–1954. *Bruce Slee* 517

John Bolton—some early memories. *K. C. Westfold* 535

John Bolton, discrete sources, and the New Zealand field-trip of 1948. *Wayne Orchiston* 541

John Bolton and the rainmakers. *D. K. Milne* 549

The early years of radio astronomy at Caltech. *Jesse L. Greenstein* 555

Some memories of John Bolton from Caltech and early years at Parkes. *J. A. Roberts* 561

John Bolton's variable-baseline interferometer and the structure of radio galaxies. *R. D. Ekers* 569

John Bolton as a pioneer of OH spectroscopy. *J. B. Whiteoak* 577

Continued overleaf

From the Parkes Catalogue to COMRAD. *A. E. Wright* 585

Wild, Woolley and Savage—or how John Bolton and I went hunting for quasars and QSOs. *Ann Savage* 589

Research Contributions

Compact radio sources, quasars and active galactic nuclei. *K. I. Kellermann* 599

Cygnus A—John Bolton's first cosmic source. *D. E. Harris* 615

Centaurus A, the core of the problem. *Steven J. Tingay for the SHEVE team* 619

Populations of extragalactic radio sources. *J. V. Wall* 625

Accurate optical positions for radio source identifications. *Richard W. Hunstead* 657

Extragalactic radio sources and the role of relativistic jets. *Geoffrey V. Bicknell* 669

Australian Journal of Physics

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

Contents Volume 47 Number 6 1994

Nuclear Physics

Mott–Schwinger effect in the elastic scattering of neutrons from ^{209}Bi. *N. Alexander, K. Amos and L. Berge* 681

Atomic and Molecular Physics

Electron impact excitation–autoionisation of the $(2s^2)^1S$, $(2p^2)^1D$ and $(2s2p)^1P$ autoionising states of helium. *O. Samardzic, J.-A. Hurn, E. Weigold and M. J. Brunger* 703

Close coupling theory of positron scattering from alkali atoms. *Jim Mitroy and Kurunathan Ratnavelu* 721

Partial wave expansion of three-particle continuum states in hyperspherical coordinates: Application to ionisation problems. *J. N. Das* 743

Schwinger variational calculation for ionisation of hydrogen atoms by electrons. *J. N. Das, A. Dey and K. Chakrabarti* 751

Fluids, Plasmas and Electric Discharges

Solitary magnetosonic waves in a relativistic plasma. *Joydeep Mukherjee and A. Roy Chowdhury* 757

Self-focussing of nonlinear waves in a relativistic plasma with positive and negative ions. *Joydeep Mukherjee and A. Roy Chowdhury* 773

Effect of electron inertia on double layers in a relativistic hot plasma. *K. Roy Chowdhury, S. N. Paul and A. Roy Chowdhury* 785

Condensed Matter

Elastic behaviour of terbium metaphosphate glasses under high pressures. *H. B. Senin, H. A. Sidek and G. A. Saunders* 795

Astronomy and Astrophysics

Estimation of magnetic field strength from enhanced solar radio emission. *S. B. S. S. Sarma* 811

Solar flare surges in relation to active prominences and sunspots. *T. K. Das, T. N. Chatterjee and A. K. Sen* 817

Author Index to Volume 47 821

Notice to Authors Australian Journal of Physics

Papers will be considered for publication if they make an original and significant contribution to any branch of physics. All papers are refereed.

Submission of a paper implies that the results reported have not been published or submitted for publication elsewhere. The journal uses its best endeavours to ensure work published is that of the named authors except where acknowledged, and through its reviewing procedures, that any published results and conclusions are consistent with the primary data. It takes no responsibility for fraud or inaccuracy on the part of the contributors.

General Presentation. The work should be presented concisely and clearly in English. Authors have a responsibility to make their papers, where possible, accessible to the non-specialist. In particular, the Introduction should give a brief background to the work and provide a clear statement of the aims of the paper; similarly, the Conclusions should summarise in general terms the major findings of the paper.

Authors are advised to note the typographical conventions and layout of headings, tables and illustrations exemplified in recent issues of the Journal. Strict observance of these and the following requirements will shorten the interval between submission and publication. The Managing Editor reserves the right to return poorly presented material to authors for revision.

Review Papers. Preference is given to reviews directed at developments in physics which have taken place largely in Australia, but this should not necessarily be seen as a limitation on their nature or scope. Authors interested in publishing a review are encouraged to discuss the topic with the Managing Editor or an appropriate member of the Editorial Board.

Manuscripts. The original and two copies of the manuscript should be typed double spaced throughout on good quality A4 paper. The margin on the left-hand side should not be less than 40 mm. All pages of the manuscript must be numbered consecutively, including those containing references, appendices, tables and captions to illustrations, which are to be placed after the text.

Title. This should be concise and appropriately informative for retrieval by modern searching techniques. If the paper is one of a numbered series, a reference to the previous part should be given as a footnote on the first page. If it is necessary to consult an as yet unpublished part for a proper understanding of the paper, a copy of the manuscript should be supplied to assist the referees.

Abstract. This should state concisely the scope of the work and the principal findings, and should be suitable for direct use by abstracting journals; this will seldom require more than 200 words.

Footnotes within the text should be used only when essential. They should be placed within horizontal rules immediately under the lines to which they refer.

References are cited in the text by the author(s) and year and are not numbered. Authors are referred to recent issues for the style used for citing references to books, journals and other literature. References with three or more authors should be cited as First Author *et al.* in the text. Titles of published papers are not included, but the reference must include the title for (i) a paper accepted for publication but not yet published or (ii) a preprint or internal report issued by a university or research institution. No editorial responsibility can be

taken for the accuracy of the references; authors are requested to check these with special care. All references in the text must be listed, with the names of authors arranged alphabetically; all entries in this list must correspond to references in the text. Abbreviations of journal titles should conform to the international standard—see e.g. the 'Bibliographic Guide for Editors and Authors' (American Chem. Society: Washington, DC, 1974).

Units. Authors are encouraged to use the International System of Units (Système International d'Unités). These units should be used for exact measurements of physical quantities and as far as practical elsewhere. Units which are not SI should be defined by their equivalent in SI units (in parentheses) on their first appearance in the manuscript.

Mathematical formulae should be carefully presented with symbols in correct alignment and adequately spaced. At least two clear lines should be left above and below all displayed equations. If special symbols must be hand-written, they should be inserted with care and identified by pencilled notes in the margin. Use should be made of the solidus to avoid two-line mathematical expressions in the running text. All long formulae should be displayed, and numbered sequentially throughout the paper, *not* section by section. Vectors should be indicated by single underlinings (not overhead arrows) and tensors by double underlinings. In formulae the $\exp(x+y)$ form is preferred to e^{x+y}. Similarly the square root sign $\surd$ should be avoided in favour of a one-half power.

Tables should be numbered with arabic numerals and be accompanied by a title. They should be arranged having regard to the dimensions of the printed page, and the number of columns should be kept to a minimum. Long headings to columns should be avoided by the use of explanatory footnotes. Each table must be referred to in the text. Presentation of essentially the same data in tabular and graphical form must be avoided; where adequate, the latter form should be used.

Illustrations. The originals and three copies are required. Half-tone illustrations and line drawings are to be numbered in a common sequence. Each illustration must be referred to in the text. Captions must be listed on a separate page at the end of the manuscript. Lettered original line drawings and photographs suitable for direct reproduction should be submitted. A detailed guide for the preparation of illustrations is available from the Managing Editor. If facilities are not available to the author for lettering of illustrations to a suitable standard, unlettered illustrations may be submitted with copies lettered by hand. However, authors intending to submit lettered originals must comply with the following instructions. Unsatisfactory figures will be returned for correction. Please note that *coloured* illustrations are welcome but, because of the high printing costs involved, the costs must be met separately by the authors.

Line Drawings must be produced with black ink on white or tracing paper, and with regard to the size of the printed page (12·5 by 20 cm). The dimensions must not exceed 30 by 50 cm; if originals are larger than this they should be photographically reduced and high-quality bromide prints used as originals. Lettering should be in the typeface 'Helvetica' with only the first letter of the first word and of any proper names capitalised. The typesize after reduction should be 8pt. Thus, for the preferred reductions of figures to 40, 50, 65 or 80% of original linear dimensions, the initial typesize of lettering should be 20, 16, 12 or 10pt respectively. Symbols and grid marks should be the same respective sizes, and curves and axes should be at least 0·3 mm thick after reduction. Grid

marks should point inwards; legends of axes should state the quantity being plotted and be followed by the appropriate SI units in parentheses.

Photographs must be of the highest quality with a full range of tones and good contrast. Before being mounted, photographs must be trimmed squarely to exclude features not relevant to the paper and be separated from neighbouring photographs by uniform spaces that will be 2 mm wide after reduction. Lettering should be in a transfer 'Helvetica' type and contrast with its background; thus white lettering should be used on darker backgrounds. The size of lettering should follow the same guidelines given above for line drawings.

Electronic Publishing

The *Australian Journal of Physics* is published using the AJSR-TeX typesetting system. AJSR-TeX is a powerful and versatile system especially developed by CSIRO for the publication of mathematical and technical material in the physical sciences. The system has been optimised for production keyboarding, and is not recommended for document creation by authors. Authors submitting papers are encouraged to prepare their material in electronic form and to carefully observe the following guidelines.

Preparation. AJSR-TeX accepts papers prepared in plain TeX, LaTeX or AMS-TeX (American Mathematical Society). Although designed for the TeX language, AJSR-TeX can accept papers prepared in packages such as WordPerfect, Word for Windows or Word (versions 4·0 or later). The conversion works best for papers that are straight text. Avoid these packages for papers that contain a substantial amount of mathematics or technical notation. In general, avoid unnecessary embellishments—papers are best handled as 'bare' files.

Format. When preparing your paper, observe the same style and format specified elsewhere in these guidelines for conventional manuscripts. For example, use bold roman headings, follow the exact reference style, etc. The paper copy should be presented in the usual manuscript style. The text should be double-spaced on A4, with generous margins. Tables, figure captions and figures (one per page) are to appear at the end of the manuscript. Do *not* attempt to format your paper into the precise layout used by the journal—this will be done by AJSR-TeX.

Figures can be accepted as Encapsulated PostScript (EPS) files, preferably with the corresponding Macintosh screen images included. PICTeX files are also acceptable. Otherwise, original drawings should be submitted with the paper copy for reproduction in the conventional way.

Delivery. The electronic file of your paper should not be dispatched until your paper has been formally accepted for publication. Your file can be sent by disk—either a Macintosh diskette ($3\frac{1}{2}$ inch) or an IBM floppy ($5\frac{1}{4}$ or $3\frac{1}{2}$ inch) is acceptable. Your file can also be sent by email to peter.robertson@isb.csiro.au via AARNET. Make sure that your file is not part of the email message, but is sent as a separate enclosure. Where possible, input files should be consolidated into the main file. LaTeX files must be accompanied by any non-standard style file used.

For further information contact the Managing Editor, *Australian Journal of Physics*, P.O. Box 89, East Melbourne, Vic. 3002, Australia.