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Registered for posting as a periodical — Category B
As part of its activities designed to foster research in Telecommunications and Radio Science in the universities and other appropriate organisations, the Radio Research Board has established a Fellowship scheme. Under this scheme one fellowship may be awarded each year for full-time research by young scientists or engineers of exceptional promise and proven merit. These are postdoctoral awards tenable for a period of two or three years in an Australian university, approved research institute or industrial laboratory as determined by negotiation between the successful candidate and the Board. Tenure of a fellowship is expected to commence within nine months of the advice of the award.

QUALIFICATIONS: Radio Research Board Fellows will not be restricted in nationality, but it is hoped that they would remain in Australia for several years after completion of fellowship. They should have a Ph.D., or equivalent qualifications, in a pertinent discipline.

Awards will, in general, be restricted to applicants who are not more than 30 years of age on the date on which applications close.

APPLICATIONS: Persons interested in applying for the above fellowships should obtain application forms and a statement of the conditions of the award from the Secretary, Radio Research Board, P.O. Box 225, Dickson, A.C.T. 2602, Australia.

Applications close on 31st October, 1975.

Science Policy Committee

The third meeting of the AIP Science Policy Committee (held in Melbourne on 22 August 1975) tackled some of the important questions facing physicists in Australia today. Many of these questions cannot be answered solely by argument in the Committee room and it is hoped that members of the AIP will join in the debates and actions which have been initiated (write to: Science Policy Committee, AIP, Box 52 Parkville, 3052).

Uranium

In accordance with Council resolutions, the services of the AIP have been offered to the public inquiries into proposals to mine Australian uranium. However, the manner in which such inquiries are conducted requires that submissions should specifically support or oppose the proposals. It has been decided not to make such a submission.

The Science Policy Committee noted that many AIP members oppose the mining of uranium whilst others support it. They also noted the reports in recent issues of the Australian Physicist posing questions as to how the AIP should proceed on controversial social issues. It has therefore decided to prepare a paper on this topic and contributions from members will be welcome.

Funding Large Projects

The Science Policy Committee wishes to encourage the discussion of proposals for large physics projects and a number of articles are being sought for the Australian Physicist. It has also commenced consideration of the problem of establishing priorities for such large projects.

Employment

The AIP has urged the Department of Labor to undertake another of the series of surveys of the employment of physicists which have been conducted each 9 years. Information is also being sought on possible new areas for the employment of physicists. Since these could include high technology industries the Science Policy Committee noted with concern that tariff policies have led to the demise of several such industries. It is felt that greater publicity for Australian achievements in advanced technology may help to establish greater support.

Prices for Physics Equipment

Writing in the August Australian Physicist, Dr J. Jenkins of La Trobe University has called upon the AIP to compile information on prices, procedures, reliability and other factors which may be a source of difficulty to Australians purchasing scientific equipment. James C. Marshall of the American Consulate General has offered cooperation in such an enterprise. Do many physicists think that a useful service could be provided in this way? Would they be willing to help? Read John Jenkins’s article and let us know your reactions.

Women in Physics

Dr Gillian Robertson’s report in the September Australian Physicist points to the need for more publicity on the kinds of work available to women who study physics — so as to stimulate the interest of those who have the aptitude. Plans are afoot to provide more information to senior secondary students on the attractions of physics.
SCIENCE AND THE BUDGET

J.S. Dryden

Much of the information about how science and technology has fared in the recent Budget is contained in the section headed “General and Scientific Research NEC” in the Budget Paper No. 1 1975–6 (NEC – not elsewhere considered).

Table 1 gives the comparison between budgeted expenditure and figures for the two previous years tabulated in this section. The remainder of this section is quoted in full below.

Table 1
Budgeted General and Scientific Research Expenditure for 1975–76 (Millions of Dollars)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Atomic Energy Commission</td>
<td>15.6</td>
<td>18.2</td>
<td>20.1</td>
<td>+ 1.9</td>
</tr>
<tr>
<td>Commonwealth Scientific and Industrial Research Organisation</td>
<td>81.3</td>
<td>102.3</td>
<td>111.7</td>
<td>+ 9.3</td>
</tr>
<tr>
<td>Antarctic Division</td>
<td>3.7</td>
<td>4.7</td>
<td>5.8</td>
<td>+ 1.1</td>
</tr>
<tr>
<td>Research Grants</td>
<td>6.6</td>
<td>8.5</td>
<td>6.7</td>
<td>– 1.7</td>
</tr>
<tr>
<td>Australian Institute of Marine Science</td>
<td>0.5</td>
<td>2.7</td>
<td>6.3</td>
<td>+ 3.7</td>
</tr>
<tr>
<td>Anglo-Australian Telescope Board</td>
<td>1.6</td>
<td>0.9</td>
<td>0.8</td>
<td>–</td>
</tr>
<tr>
<td>Australian Institute of Aboriginal Studies</td>
<td>1.5</td>
<td>1.6</td>
<td>1.9</td>
<td>+ 0.3</td>
</tr>
<tr>
<td>Minerals and Solar Energy Research</td>
<td>–</td>
<td>–</td>
<td>8.3</td>
<td>+ 8.3</td>
</tr>
<tr>
<td>Other Research and Science NEC</td>
<td>0.6</td>
<td>1.5</td>
<td>1.8</td>
<td>+ 0.3</td>
</tr>
<tr>
<td>Less Recoveries</td>
<td>–</td>
<td>–</td>
<td>0.1</td>
<td>+ 0.1</td>
</tr>
<tr>
<td>Total General and Scientific Research NEC</td>
<td>111.4</td>
<td>140.4</td>
<td>163.6</td>
<td>+ 23.2</td>
</tr>
</tbody>
</table>

“Australian Atomic Energy Commission

The Commission’s functions include research and investigation into matters associated with uranium and atomic energy and the production and sale of radioisotopes. In addition the Commission has been given responsibility for the Government’s participation in uranium exploration and development. Outlays relating to that role are included under ‘Industry Assistance and Development’.

Commonwealth Scientific and Industrial Research Organisation

Expenditure by CSIRO relates to the Organization’s activities in the fields of agriculture, biological, industrial and physical research, together with the provision of research services and facilities and support for research associations.

The increase of $9.3 million in the provision for CSIRO in 1975–76 includes additional salary and wage costs of $4.4 million and an increase of $5.0 million for capital works. Partly offsetting these and other smaller increases is a reduction of $8.3 million resulting from the transfer of the financing of minerals and solar energy research to the Department of Minerals and Energy.

Research Grants

Assistance is provided through the Australian Research Grants Committee, the Queen Elizabeth II Fellowship Scheme and the Queen’s Fellowship Scheme for research projects by individuals in the humanities and social sciences, physical, chemical, biological and earth sciences, engineering and applied sciences and marine science. The reduction in the provision under this heading reflects the decision to provide $20.0 million for the Australian Research Grants Committee triennial program in 1976–78. The provision for this purpose in 1973–75 was $22.8 million.

Australian Institute of Marine Science

The Australian Institute of Marine Science was established in 1972 to conduct studies in marine science and to co-ordinate and develop marine science in Australia. Initially, the work of the Institute is being directed to studies of the Great Barrier Reef, the Coral Sea and the coast and adjacent waters of North Queensland. The Institute will occupy temporary premises in Townsville pending the construction of a laboratory at Cape Ferguson.

The provision in 1975–76 of $6.3 million reflects expansion of the Institute’s research program and progress with the construction of the permanent laboratory.
Anglo-Australian Telescope Board

This item covers the Australian Government’s share of the cost of constructing and operating a 3.9 metre optical telescope near Coonabarabran in New South Wales; the total capital cost of the project, estimated at $15.9 million, is being shared equally between Australia and the United Kingdom.

The construction of the telescope was completed in 1974–75. The cost of operating the facility in 1975–76 is estimated at $1.7 million, one-half of which will be met by Australia.

Australian Institute of Aboriginal Studies

The Australian Institute of Aboriginal Studies was established in 1964 to promote, encourage and assist studies and research in relation to the Australian Aboriginal people.

The grant to the Institute of $1.9 million in 1975–76 will enable the Institute to maintain the level of activity achieved in 1974–75. Work will continue on the identification, recording and preservation of sites that are of special significance to Aborigines, on the collection of Aboriginal music, folklore and language and on research into the interaction between Aborigines and Europeans.

Minerals and Solar Energy Research

As already mentioned, responsibility for minerals and solar energy research has been transferred from the Minister for Science and Consumer Affairs to the Minister for Minerals and Energy. The costs of these activities in previous years are included in the figures for the CSIRO.

Other Research and Science NEC

Items under this heading include support for the Academies of Science, the Social Sciences and the Humanities, the Australian and New Zealand Association for the Advancement of Science and other minor support for scientific and research activities. In addition funds are provided for activities under several agreements for scientific and technological co-operation with other countries.

Also included are amounts for the support and development of major scientific facilities such as the Balloon Launching Station at Mildura, the Nuclear Magnetic Resonance Spectrometer and the facilities operated under arrangement with US agencies*.

(End of quotation)

Discussion

The 1975–6 estimate represents a 16.5% increase over 1974–5 compared with an increase of 26% in the expenditure during 1974–5 over that in 1973–4. The estimated expenditure is therefore below the rate of inflation but not by much. Only one item has a decrease from last year and that a large one, the estimated outlay on Research Grants. Allowing for an inflation rate of 17%, this item is effectively down to 67% of the 1974–5 expenditure.

The Australian Research Grants Committee claim (The Australian, 4 September) that the combination of the fact that research grants to the total of 9 million dollars have already been approved for the calendar year 1975 with this decrease in the estimated expenditure for the financial year 1975–76 and “the operation of normal financial procedures” means that the situation is worse than one would expect and only 3 million dollars will be available in the calendar year 1976. This very large decrease means that some jobs may be lost.

Industrial Research and Development Grants

The estimate under this item is 17.4 million dollars (0.4 million dollars for administration) a decrease of 0.4 million dollars from last year’s expenditure. A review of this scheme, which is aimed at encouraging research and development expenditure by Australian companies, will be completed shortly.

Other Research Expenditure

In the section headed “Industry Assistance and Development” there are several entries which include some research expenditure but these are not separately detailed and usually appear, industry by industry, under the entry “Research, Promotion and Other Expenditure”. In one instance, the Wheat Industry, research is separately itemised, the estimated expenditure is 15% higher than last year. The estimated expenditure of the Bureau of Mineral Resources is unchanged (11.3 million dollars) from last year’s expenditure.

Defence Establishments

The outlay on the Defence Science and Technology Establishments was 59.8 million dollars in 1973–4, and 79.6 million dollars in 1974–5. The estimated 1975–6 outlay is only 6% higher at 84.7 million dollars.

Medical Research

There has been much criticism of cutbacks in Australian Government funds for medical research. The relevant part of the Treasurer’s speech reads “The Government will increase by 39 per cent, to 24 million dollars, its support in the 1976–78 triennium for medical research under the auspices of the National Health and Medical Research Council. Expenditure in 1975–6 is estimated at 4.0 million dollars. Additional payments totalling 1 million dollars will be made to the Florey, and Walter and Eliza Hall research institutes”.

An amount of 1.1 million dollars is included in the 1975–6 Budget for the continuation of the National Parks & Wildlife Research Program which commenced in 1974–5.

Comparison with previous ten years

The Budget Paper No. 1 contains tables of Receipts and Outlay of the Australian Government Sector for each year from 1965–6 for which we have extracted the figures in table 2.
Table 2
General and Scientific Research Expenditure from 1965–66 to 1975–76 (millions of dollars)

<table>
<thead>
<tr>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>42</td>
<td>47</td>
<td>53</td>
<td>58</td>
<td>65</td>
<td>76</td>
<td>81</td>
<td>91</td>
<td>111</td>
<td>140</td>
<td>164</td>
</tr>
<tr>
<td>Defence Science and Technology</td>
<td>40</td>
<td>41</td>
<td>41</td>
<td>45</td>
<td>46</td>
<td>46</td>
<td>49</td>
<td>56</td>
<td>60</td>
<td>80</td>
<td>85</td>
</tr>
</tbody>
</table>

It is interesting to see how the amount spent on the items grouped together in the Budget as general and scientific research has varied during this ten year period. In table 3 this outlay is calculated (1) as a percentage of the Gross Domestic Product, (2) as a percentage of the total Australian government outlay, (3) as a ratio to the Consumer Price Index and (4) as a ratio to the average weekly earnings (capital cities average). In the latter two cases the ratios are normalized to 1.00 for the year 1965–66.

References


Table 3
Relationship Between Research Outlay and Economic Indicators

<table>
<thead>
<tr>
<th>Year</th>
<th>Outlay or Estimate MS</th>
<th>Percent GDP</th>
<th>Percent total government outlay</th>
<th>Ratio to CPI</th>
<th>Ratio to AWE</th>
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</thead>
<tbody>
<tr>
<td>1965–6</td>
<td>42</td>
<td>0.205</td>
<td>0.84</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>1966–7</td>
<td>47</td>
<td>0.21</td>
<td>0.83</td>
<td>1.09</td>
<td>1.02</td>
</tr>
<tr>
<td>1967–8</td>
<td>53</td>
<td>0.22</td>
<td>0.85</td>
<td>1.19</td>
<td>1.09</td>
</tr>
<tr>
<td>1968–9</td>
<td>58</td>
<td>0.22</td>
<td>0.88</td>
<td>1.27</td>
<td>1.11</td>
</tr>
<tr>
<td>1969–70</td>
<td>65</td>
<td>0.22</td>
<td>0.88</td>
<td>1.38</td>
<td>1.14</td>
</tr>
<tr>
<td>1970–1</td>
<td>76</td>
<td>0.23</td>
<td>0.94</td>
<td>1.54</td>
<td>1.20</td>
</tr>
<tr>
<td>1971–2</td>
<td>81</td>
<td>0.22</td>
<td>0.90</td>
<td>1.54</td>
<td>1.16</td>
</tr>
<tr>
<td>1972–3</td>
<td>91</td>
<td>0.22</td>
<td>0.89</td>
<td>1.63</td>
<td>1.19</td>
</tr>
<tr>
<td>1973–4</td>
<td>111</td>
<td>0.22</td>
<td>0.91</td>
<td>1.76</td>
<td>1.30</td>
</tr>
<tr>
<td>1974–5</td>
<td>140</td>
<td>0.24</td>
<td>0.79</td>
<td>1.80</td>
<td>1.30</td>
</tr>
<tr>
<td>1975–6</td>
<td>164</td>
<td>—</td>
<td>0.75</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

NEWS

11th Pawsey Memorial Lecture

The 11th Pawsey Memorial Lecture will be delivered in Canberra on Tuesday, 21 October 1975 at 8.15 p.m. in the Becker Hall of the Australian Academy of Science by John G. Bolton, F.R.S., Chief Research Scientist, CSIRO Division of Radiophysics. The subject will be, The Changing Universe. The last 30 years of astronomical research have shown that energy sources and processes other than the hydrogen and its fusion in stars play a major role in the universe. The basic discoveries have been brought about by major advances in technology and the extension of the previous visual range of observations to the radio, infra-red, X-ray and gamma ray ranges—the last three involving 'observatories' outside the earth's atmosphere.

The 'changing universe' has also become a 'rapidly changing universe'. Significant variations occur in some stars on a scale of millions of a second, and in some galaxies on a scale of hours.

People and Institutions

Students' Working Week

A survey, over seven weeks, of the working hours of students at the University of Queensland shows that BSc students spend an average of 18.2 hours per week in class and an average of 18.4 hours per week in private study. These figures were close to the mean for all courses but individual students recorded from 0 to 93.5 hours in a week. — University News, 25 August 1975.
Alternative sources of power

Two schemes for extracting power from the temperature difference between surface waters and depths of about 300 metres were described at a conference in Houston earlier this year.

In the Gulf Stream off the US coast, differences of up to 20°C are available. Stations of 160–400 MW capacity have been proposed by the Lockheed Corporation and the University of Massachusetts. (Search, August 1975).

A team at the ANU Department of Engineering Physics is investigating a sun-tracking mirror system and an ammonia-dissociation scheme. Recombination of the hydrogen and nitrogen can produce temperatures of 450–500°C, suitable for conventional generating plants. Centralized control of up to 1000 mirrors of a few metres diameter should be easily handled by a medium priced time-sharing computer. (Search, August 1975).

Australia – hotter and drier?

Australia has warmed up by 1°C over the last decade or so, and, except for 1973–74, has had less rainfall. G.B. Tucker of CSIRO Division of Atmospheric Physics, discusses our climate in Search (August 1975). Existing data are inadequate to determine whether these changes are part of a universal and extended trend.

Medical X-rays – beneficial or harmful?

Strong arguments against compulsory chest x-rays and the excessive use of dental x-rays are presented in an article by M. Diesendorff (ANU Department of Applied Mathematics) in Search (August 1975). Diesendorff claims that more deaths from cancer are induced by chest x-rays than are avoided by the diagnosis of tuberculosis. He also argues in favour of more careful collimation of dental x-ray machines, and the provision of eye-shields and aprons for patients.

Mildura Balloon Launching Station

Under an agreement signed by the Minister for Science and Consumer Affairs and the US Director of the National Science Foundation, the Australian Government will contribute about $150 000 and the American National Science Foundation about $75 000 to the operation of a balloon launching station near Mildura. US and Australian scientists will be provided facilities and service without charge and investigators from other countries will be able to use the facilities with the payment of a user fee. The principal studies to be made from the site will be in meteorology, upper atmosphere physics and astronomy.

Satellite Information Receiver

During his visit to the USA in August the Minister for Science and Consumer Affairs (Clyde R. Cameron) called for an urgent assessment by ASTEC of the need for a LANDSAT satellite information receiving station, possibly at Alice Springs. Designed for remote sensing of the environment, the LANDSAT information is useful for surveying mineral and water resources, forestry and crop surveys, land use, pollution and urban studies. Receiving sites are in operation in USA, Canada, Brazil, Italy and are being developed or considered in Chile, Iran, Zaire, Japan, Norway, France and India.

A SEASAT satellite is to be launched in 1977 to provide information on sea surface temperatures, surface winds, wave heights and tidal movements.

Inventors – information wanted

The Australian Innovation Corporation Ltd is collecting information for a book on Australian inventions and inventors. Any information on inventions, patented, successful, or otherwise, will be welcomed. The address of the Corporation is 150 Queen Street, Melbourne, Vic. 3000.

Ultrasonics Institute

The Australian Department of Health has established a new institute to pursue the work in ultrasonics formerly performed at the National Acoustic Laboratories. Mr G. Kossoff, formerly chief physicist at NAL, will head the new group.

The ultrasonic echoscope which was developed by Mr Kossoff’s team at NAL will be marketed throughout the world by Nucleus Holdings Pty Ltd. The prototype echoscope has been highly successful in diagnostic work at the Royal Hospital for Women, in Sydney.

Conferences and Exhibitions

“Exploring the Universe”

Visitors to the Siding Spring Observatory in NSW may view a permanent exhibition of photographs, diagrams, audio-visual displays, and working models. All aspects of contemporary astronomy are covered, including a model of the Anglo-Australian Telescope.
Course in cryogenic technology

A third one-week introductory course in cryogenic (low temperature) technology will be held at the National Measurement Laboratory, Sydney, from 2–6 February 1976. The decision to hold this course follows from the response to previous courses held in March 1973 and May 1974. Each of these courses was attended by over thirty-five scientists, engineers and technicians. The course will aim to train engineers, scientists and technicians who need to operate, design or maintain cryogenic equipment.

Lectures will include production and measurement of low temperatures, storage and transfer of liquefied gases, introduction to the properties of materials, heat transfer, superconductors and cryobiology. Practical work will include the handling of cryogenic liquids, temperature measurement, leak detection and fabrication techniques for low temperatures.

Further information about the course may be obtained from Mr J. Birch, National Measurement Laboratory, University Grounds, City Road, Chippendale, NSW 2008, telephone (02) 660-0566.

One Day Conference on Surfaces

The Solid State Division of the Royal Australian Chemical Institute is holding a One Day Conference on Surfaces. The meeting will include all aspects of surfaces including surfaces in industry and technology and topical applications such as solar energy and pollution control. The date is Tuesday 2 December 1975, at the Burrows Theatre, University of New South Wales. A wide range of contributions is invited. Abstracts should be sent before the end of October to Professor D. Haneman, School of Physics University of New South Wales, PO Box 1, Kensington 2033, from whom further information is available.

Radioisotope Course for Non-Graduates

Course number 19 is to be held at the AAECRE, Lucas Heights, NSW from 2 to 20 February 1976. Information can be obtained from The Principal, Australian School of Nuclear Technology, Private Mailbag, Sutherland, NSW 2232.

Physics in Industry

The first International Conference on this topic is to be held in Dublin from 9 to 13 March 1976. The conference is sponsored by IUPAP and the Irish National Committee for Physics and further information can be obtained from the Royal Irish Academy, 19 Dawson St, Dublin 2, Ireland.

Gas Discharges

The 4th International Conference on Gas Discharges is to be held at the University College of Swansea from 7 to 9 September 1976. Further information can be obtained from Prof. D.E. Davies, Department of Physics, La Trobe University, Bundoora 3083.

LETTERS

Membership or Fellowship

SIR:—I recently received in the mail an application form and letter suggesting that I may wish to transfer to Membership or Fellowship of the Institute if qualified to do so.

In contemplating this matter I must ask myself the question, "In what way would a transfer of this nature be of any benefit to me?"

Examination of the booklet supplied indicates that the qualifications for membership are based on university degrees or equivalent standards in knowledge of physics and general education and experience.

Again, I must ask, "Is this "equivalence" of any real worth?" For example, would I receive support from the Institute of Physics in using the new status of Membership or Fellowship in the Institute as suitable grounds for any claims to a reclassification in my job? If not, the transfer is of no financial gain to me and in fact would become a loss.

I would appreciate any information on this matter and if any sound reason can be advanced as to why I should transfer my membership I will be happy to do so.

—James I. Godling
National Measurement Laboratory

Subscription Rates

SIR:—I refer to the decision of the 26th Council Meeting in May this year to raise subscription rates substantially. Results of a survey of 8% of members (55% response) on financial policies, carried out in January this year, and published in the May issue of AP, indicated majority concordance with fee increases to match inflation rates. I wonder whether this response of about 4% of the membership is an accurate guide for Council. The changes (50% increase) are sufficiently significant to suggest that Council should take stronger steps to obtain views of more AIP members. The decision to adjust subscriptions henceforth in accordance with changes in the Average Weekly Earnings and Consumer Price Index means that subscriptions are likely to continue to rise, with a possibly more adverse effect on membership and recruitment. I suggest that a questionnaire printed on a page of the Australian Physicist might not be too costly and would enable members at large to state their wishes.

—D. Haneman
UNSW

The Australian Physicist, October 1975
A BUILD-IT-YOURSELF HOLOGRAPHY SYSTEM

B.S.K. Chow
Research Laboratory, Kodak (Australasia) Pty Ltd, Coburg, Vic 3058

Introduction

Intensive interest in holography has occurred in many research institutes during recent years. The high cost of a good holography system may be a barrier to more widespread use. Inexpensive holography systems have been suggested [Stong, 1967 and Taylor, 1971]. Most of these systems, however, eliminate some components to cut the cost and the quality of the resulting hologram is harder to guarantee. Attempts have been made in this laboratory to build a dependable system using lower cost components instead of eliminating them. The basic approach is to use low-cost mass-produced substitutes, if available, or to modify components in a simple manner.

The Spatial Filter

A spatial filter is often omitted in a low cost holography system. Although it is not an essential optical component in holography, it is very useful. It can filter imperfections out of beams transmitted or reflected from imperfect optical components, and thus reduce the stringent requirement for good quality optics.

A conventional spatial filter consists of a micrometer mechanism allowing a microscope objective and a pinhole to be translated in the X, Y and Z directions relative to each other, so that the pinhole may be located at the focus of the objective lens. A small school microscope is used to provide an objective lens, as well as the Z-direction movement through its focusing mechanism (figure 1). The microscope stage is modified to hold the pinhole and to provide the X, Y movement of the pinhole. The lens in the eye-piece is removed so that the incident laser beam can travel along the microscope tube to the objective lens.

The plastic stage of this microscope is replaced by a steel plate of similar size with a hole of 10 mm diameter drilled at its centre. Pinholes of different sizes are glued to the top end of the cored hole of special magnets. A piece of Teflon is glued to the base of the magnet or to the stage surface to provide a smooth movement.

The pinhole is located in the X, Y direction on the stage plane by smooth screw adjustments applied to the magnet (figure 2). Two screws at right angles to each other are supported by two nuts glued to the steel stage with Araldite. To reduce the jerky movement of an ordinary screw, a large plastic button is fixed to the

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Figure 1

A small school microscope modified to provide an objective lens as well as X, Y, Z direction movements between the lens and the pinhole. The pinhole–magnet unit is also shown in the foreground.

Figure 2


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head of each screw. A spring mechanism, which may be a pin pushed by a coil spring is fixed in a position along the bisector of the screws. The surfaces of most of the parts were painted matt black to reduce light scattering. The aligning and adjusting procedures of this spatial filter system are similar to those for a conventional system.

A pinhole can be made by pressing a sharp needle into a sheet of aluminium, such as chocolate wrapping foil, backed by a piece of plate glass [Strong, 1967]. Consistent results have been obtained when the needle is sharpened with very fine emery paper. However, a chemical method also provides good results.

A drop of 10N NaOH solution is placed on each of several locations on a 0.025 mm thick aluminium foil and left for about 30 minutes. The foil is then washed under running water and each of the etched sites is inspected over a bright light source for the presence of pinholes. When a pinhole is found, it is further inspected under a 60X microscope to examine its suitability in terms of roundness and size. If there are no suitable pinholes in a site, a drop of NaOH solution is again placed at that site for 2 to 3 minutes. The aluminium foil is then washed and each site is again examined. This procedure is repeated until there is at least one pinhole at each site. If a site has more than one pinhole, all except the suitable one are painted over with black paint using a fine brush. A pinhole of 10 μm diameter matched with a 20X objective lens is suitable for general experimental conditions.

The Mirrors and Beam Splitters

Front-surface mirrors of good quality are always preferable in holographic experiments. However, if a spatial filter is used at the final stage of the optical path, any effects caused by dust or imperfections in the mirrors will be reduced. Thus, even a rear-surface mirror may be used as long as the weaker reflected beam from the front surface has been blocked by a piece of black cardboard.

A fixed-ratio beam splitter may be made by using a piece of uncoated plate glass or a small angle prism. A more versatile variable-ratio beam splitter as well as front-surface mirrors, may be made by using chemical silvering processes described by Tétreau [1957].

Plate Holder and Optical Stands

Optical components should be mounted to be as close as practicable to the table to obtain best stability. However, some components can be fitted to a metal stem to make them adjustable in height. Simple machinist's table vices are used to hold the metal stems of our optical components. This type of vice is also used to hold a 100 mm x 125 mm photographic plate by its lower edge for holographic recording. A camera body can be adapted in order to use photographic film.

The Light Meter

It is desirable to have a light-meter to measure the light intensity falling on the holographic plate during hologram recording so that both the optimum exposure time and ratio of reference beam to object beam can be easily estimated. When the laser beam is expanded to illuminate an ordinary object about 150 mm diameter, the intensity level of the reflected light falling on the holographic plate will usually be reduced more than 100 000 times. Detectors capable of measuring these light intensity levels from a 1 mW laser are generally fairly expensive. Considering that human eyes are very sensitive detectors, a low cost light meter was designed based on a principle similar to that of a comparison photometer.

The construction of this photometer is shown in figure 3. It consists of a piece of perspex of 130 mm x 90 mm x 6 mm. One side of the perspex facing the light source is made diffuse by grinding it with very fine powder. It is then cut about 40 mm from the top (along CF as in figure 3). The diffuse surface of ACFH is first painted with white paint and then with black paint so as to give good internal reflection. The other side of A'C'F'H' was painted black in the area A'B'G'H', where B'G' is about 10 mm from the edge C'F'. Four holes equally spaced are drilled on top of this section and fitted with light-emitting-diodes. The LED's are connected in series, with the current flowing through them being adjusted with a potentiometer and monitored by a microammeter. The section ACFH is glued back to the rest of the perspex. The border CFF'C' serves as a reference line so that the illumination in the two different sections can be compared visually.

When this light-meter is used for measurement, the perspex is placed at the site where the holographic plate is to be put. The diffuse side faces the light beam to be measured. The illumination falling on the diffuse surface is viewed approximately at right angles from the clear side of the perspex C'D'E'F'. The LED's are switched on and their illumination in the area B'C'F'G' is adjusted to match that of the area CDEF.

![Figure 3](image)

*Figure 3*

*A low cost light meter*
by adjusting the current through them. The reading on
the microammeter gives a relative value for the intensity
to be measured.

**Recording of a Hologram**

In principle holograms should be easy to make, but in
practice they are not. Failure to observe any aspect of
the stringent requirement of stability is the most common
cause of difficulty. The high stability may only be
obtained with the following conditions: a stable laser,
stable optical components lying in a stable optical table,
a rigid object, no air current movement to cause
vibration of components, no air refractive index change
along the optical path, etc.

**The Optical Table**

The basic feature of a stable optical table is a heavy
table top lying on some sort of air cushion. A simple
travelling air-bed is very suitable for air cushioning. The
table top may be a granite slab, sheet iron plate, concrete
or solid wooden board. Satisfactory results can be
obtained if three particle boards are put on the air-bed
and also if heavy objects other than the optical
components are placed at various positions on the boards.
Modifications have to be tailored according to the
environment. In the most difficult conditions, the
optical table should be on the lowest floor of a building,
all the optical components should be clamped to the
table top, and extra mass should be added to the table.

It is advisable to test the stability of the whole system
with an arrangement similar to a Michelson — Twyman
Green interferometer before a hologram recording is
made. The system is considered suitable for hologram
recording if fringe movements are less than 1/8 of

the fringe spacing within the interval of the expected
exposure. In general, the system has better stability
after waiting for half an hour after setting up.

**Summary**

A photograph of the assembled holography apparatus
used in the present experiment is shown in figure 4.
The items used by us are as follows:

2 "Dia Scope" microscopes.
2 "Eclipse" shallow-pot magnets (catalogue No.
C2007/827B).
5 "Record" machinist's table vices.
4 "National" semiconductors (NSL 5027)
I "Sinohara" microammeter (100 μA, SW-55).
3 Chipboards (1500 mm x 600 mm x 20 mm).
I Airbed.

The total cost of this system (not including a laser) is
about $100 at the time of writing. The price of a suitable
laser is around $150.

**Acknowledgments**

The author wishes to thank Kodak (Australasia)
Pty Ltd for permission to publish this paper, Dr C.F.S.
Malseed for his useful comments on the manuscript and
Mr. J. Fusca for his experimental assistance and active
participation in this project.

**References**

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STUDENT STATISTICS IN PHYSICS IN AUSTRALIAN TERTIARY INSTITUTIONS

J.R. de Laeter  
Western Australian Institute of Technology  
and  
C.N. Watson-Munro  
University of Sydney


This paper brings together the statistics on physics students in all Australian tertiary institutions up to 1975. It is intended to update this information from time to time so that an accurate assessment of the production of physicists is available on a continuing basis.

Tables 1 and 2 list the numbers of third year physics students at Australian Universities and CAE’s respectively. There has been no significant variation in the total university number over the past decade, but the CAE numbers have shown a dramatic increase since 1972.

Prior to 1972 the CAE figures were virtually constant at 50 per year, but in 1973 and 1974 there was a two-fold increase, and the 1975 figures show a three-fold increase over the base year statistics. In 1972 for example the CAE’s only produced 11% of the total number of Australian third year physics students, but in 1975 this proportion has increased to 26.5% of the total. However it is unlikely that this trend will continue, and we would not expect any significant increases in third year student numbers to occur in the CAE’s in the immediate future. Figure 1 shows the trend in third year physics students for universities and CAE’s with reference to the Australian output.

Table 3 lists the numbers in fourth year physics in the universities. It is to be noted that in addition to the normal honours students, there is in general a smaller component of MSc qualifying students. Watson-Munro [1974] noted that the fourth year honours enrolments

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*The smaller numbers in 1969 in the State of N.S.W. result from the additional year in High School in 1967 under the Wyndham Scheme.
Table 2
Numbers in Third Year Physics at CAE's

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*Includes graduates in Geophysics from 1970–1975

had dropped by 20%, but the 1974 and 1975 figures indicate that the total number is now approximately the same as it was before the decline in numbers took place in 1972–1973.

The situation with respect to post graduate training in the CAE’s is almost identical to that described by de Laeter [1974]. Queensland Institute of Technology is now offering a MApSc in Medical Physics and has an initial

intake of 8 students, whilst Ballarat Institute of Advanced Education has enrolled its first Masters’ student (see table 4). Numbers at NSIT and WAIT continue to grow and display a larger proportion of full-time students than previously. This is presumably due to the recent introduction of Post Graduate Scholarships within the CAE sector.

The physics department in some of the major CAE’s are also responsible for the training of radiography students. The level of the award differs between the States; Victoria and Western Australia offer a Diploma (UG2) course, whilst Queensland and South Australia have an Associate Diploma (UG3) programme. Table 5 lists the number of final year radiography students produced by QIT, RMIT, SAIT and WAIT. The large number at RMIT reflect the fact that external students from Tasmania and New South Wales are also enrolled in this course. The numbers listed in table 5 include both diagnostic and therapeutic radiography students, and in the case of Victoria, radiography numbers as well. It is to be noted that the total number of final year radiography students is greater than the total number of final year physics students despite the fact that only four CAE’s are involved with radiography programmes.

We are indebted to our colleagues in the various tertiary institutions who have supplied us with the information on which this article is based.

References
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<td>17</td>
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<td>Melbourne</td>
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<td>14</td>
<td>20</td>
<td>20^3</td>
<td>23^7</td>
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<tr>
<td>Total Vic.</td>
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<td>43</td>
<td>42</td>
<td>43</td>
<td>50</td>
<td>41</td>
<td>50</td>
<td>42</td>
<td>53</td>
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<tr>
<td>Total Tas.</td>
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<td>5</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>11</td>
<td>13</td>
<td>11</td>
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<tr>
<td>Adelaide</td>
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<td>21</td>
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<td>22</td>
<td>17</td>
<td>12</td>
<td>15</td>
<td>11</td>
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<tr>
<td>Flinders</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>11</td>
<td></td>
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<td>Total S.A.</td>
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<td>21</td>
<td>21</td>
<td>13</td>
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<td>30</td>
<td>22</td>
<td>19</td>
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<td>22</td>
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<td>Total W.A.</td>
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<td>17</td>
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<td>8</td>
<td>11</td>
<td>12</td>
<td>12</td>
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<tr>
<td>Total Australia</td>
<td>108</td>
<td>146</td>
<td>169</td>
<td>148</td>
<td>153</td>
<td>112</td>
<td>151</td>
<td>118</td>
<td>122</td>
<td>149</td>
<td>159</td>
</tr>
</tbody>
</table>

*Wyndham Year

1. Includes 2 MSc Qualifying students
2. Includes 20 MSc Qualifying students
3. Includes MSc Qualifying students
4. + 8 Diploma of Electronics
5. Includes MSc Qualifying students
6. Includes 10 MSc Qualifying students
7. Includes 1 MSc Qualifying student
8. Includes 3 MSc Qualifying students
9. Includes 2 MSc Qualifying students
10. Includes 5 Diploma of Electronics

### Table 4

**Number of Master of Applied Science Students in CAE’s**

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<tr>
<th>Year</th>
<th>1974</th>
<th>1975</th>
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<tr>
<td></td>
<td>full time</td>
<td>part time</td>
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<tr>
<td>Queensland Institute of Technology (Brisbane)</td>
<td>8</td>
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</tr>
<tr>
<td>New South Wales Institute of Technology</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Ballarat Institute of Advanced Education</td>
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<td>1</td>
</tr>
<tr>
<td>Western Australian Institute of Technology</td>
<td>2</td>
<td>29</td>
</tr>
<tr>
<td>Total Australia</td>
<td>3</td>
<td>31</td>
</tr>
</tbody>
</table>

### Table 5

**Number of Final Year Radiography Students in CAE’s**

<table>
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<th></th>
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<tbody>
<tr>
<td>Queensland Institute of Technology</td>
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<tr>
<td>Royal Melbourne Institute of Technology</td>
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<td>62</td>
<td>71</td>
<td>106</td>
<td>95</td>
<td>106</td>
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<td>South Australian Institute of Technology</td>
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<td>24</td>
<td>27</td>
<td></td>
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<tr>
<td>Western Australian Institute of Technology</td>
<td>18</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>93</td>
<td>62</td>
<td>91</td>
<td>135</td>
<td>137</td>
<td>181</td>
</tr>
</tbody>
</table>

---

The Australian Physicist, October 1976

Reviewed by Members of the 1975 Physics 33 Class, University of Western Australia.

A review of this book from a different viewpoint appeared in the July issue of The Australian Physicist.

We have just concluded a lecture series on quantum mechanics as part of a three year terminal course in physics. Quantum Physics was used as the basic text for these lectures and we found it to be well suited to our needs.

In the preface the author states that "this book is intended to serve as an introduction to quantum physics" and generally we agree that from our point of view he has achieved this aim. He has been successful in introducing us to the basic concepts of quantum mechanics in a systematic logical manner which has given us a reasonable understanding of the non-relativistic aspects of the topic and indicated how we could proceed to more sophisticated studies in this field if we so desired. Each chapter systematically develops the theme of quantum mechanics without introducing trivial and unnecessary details. (This is important for students seriously coming to grips with quantum mechanics for the first time.)

In general we found the mathematics used to be relatively uncomplicated and adequate for our purposes but that our mathematical background was such that we could perhaps have been introduced to the matrix formalism a little earlier and that more use could have been made of the Dirac notation. Although the examples provided are generally relevant to the text material we would have preferred answers to be given so that we could work outside our group situation. There are also some errors in cross referencing between chapters.

To summarize, we found this book presented quantum mechanics to us in an interesting manner which we could appreciate and which appeared to us to be well suited to our needs. We recommend it as a useful intermediate level text.


Reviewed by G.K. White, National Measurement Laboratory, Sydney.

To many people the region below 1 K must seem like a featureless desert (or perhaps a frozen tundra). Certainly the crystal lattice is rather quiet at these temperatures with little energy but its zero point energy. However spins, electron and nuclear, can still present a fascinating and temperature-dependent pattern of behaviour. Debye and Giauque realised this in 1926 and suggested that the random orientation of electron spins in some salt crystals was a source of entropy which could be tapped and used for cooling below 1 K, the limit using liquid helium at that time. The resulting process of isothermal magnetization and adiabatic demagnetization opened up a new world extending down to a few millikelvins, a word in which experiments could be done on electron spins, superconductors, nuclear orientation, etc. Later attempts were made to open up the microkelvin world by the demagnetization of nuclear spins and these experiments are still going on, fraught with difficulties of thermal contact.

A fascinating new spin system which became available in the 1950s was the rare isotope $^3$He. It allowed the construction of circulation refrigerators reaching 0.25 K, then $^3$He/$^4$He dilution refrigerators capable of reaching 10 mK, and recently the Pomeranchuk process of solidifying $^3$He under pressure to reach 1 or 2 mK.

The present book discusses the principles and details of all these methods of cooling, the problems of thermometry at these temperatures, thermal isolation and thermal contact, and that important and very sensitive magnetic detector, the SQUID.

The author, Professor Lounasmaa of the Helsinki University of Technology, had his early training in low temperatures at Oxford, then spent some years at Argonne working on the nuclear heat capacity of rare earths. During the past ten years in Finland he has made most notable contributions to millikelvin refrigeration techniques as well as doing basic research on hyperfine interactions and $^3$He itself. This is a first-class book of value to every laboratory where low temperatures, either above or below 1 K, are used.


Reviewed by H.C. Bolton, Physics Department, Monash University, Clayton, Vic.

This is an interesting book; it was written as a result of lectures to staff and students in several departments of the Indian Institute of Science, Bangalore and it treats a wide variety of topics. It invites comparison with other books used at honours level in Australia namely those by K. Huang, C.J. Thompson, and G.H. Wannier. There are three main sections, Equilibrium Phenomena, Non-Equilibrium Theory and Some Applications, and the middle section is most welcome.
in a book aimed at students. The first chapter of the book is called Phase Space and Ensembles and in 23 pages covers the basic ideas of classical and quantal ensemble theory ending with the grand canonical ensemble. This is a breathless pace and I doubt if undergraduates would be able to learn and appreciate the basic theory needed to explore the applications which follow in the other chapters. However, each chapter has a good set of problems including many which use real materials, measurements and numbers. I found this a refreshing counterweight to the current attention paid to idealized models, and a reminder that statistical mechanics can be aimed at understanding the properties of real condensed matter. Good discussions of the answers to all problems are given in the back of the book. Each chapter contains the dates of a few key papers and at the end of each chapter a few general references in the field are given but I would have preferred more original references throughout the text if the book were to be a serious consideration for honours students. I have read the book as a substantial contribution to the literature of applied statistical mechanics in which the meanings of the basic ideas are explored in the context of their applications to a very wide variety of topics, and in this sense I recommend it. Certainly teachers of the subject will find it a fruitful source of problems. The price is high but perhaps this is what we will have to pay for a well-produced hardcover book.

THE BEAUTY OF PHYSICS

"Basic physics is a work of art and success — such as in the setting up of the equations of the atom — has come from people who have been striving to create beauty. Tell the young people that there is a lot of beauty in physics and we are striving to increase it". — P.A.M. Dirac

A visit to Australia by Professor P.A.M. Dirac afforded an opportunity to see and hear one of the greatest men of modern physics.

At his first public lecture in Sydney on 25 August, 1975, an audience of 450—500 packed the Burrows Theatre (UNSW) to hear The Development of Quantum Mechanics. The quietly-spoken, rather frail figure, seemingly dazzled by the array of arc lamps, TV cameras and tape recorders, held his listeners for 1½ hours by the strength and simplicity of his words. He spoke of his lifetime in physics, and attributed his success partly to his having been born at the right time (1902). "Then it was easy for second-rate physicists to do first-rate work. There hasn't been such a glorious time since. Nowadays, it is hard for a first-rate physicist to do second-rate work".

Dirac told how Heisenberg, pursuing his philosophy (at that time revolutionary) that physical theory should be based entirely on observable quantities, became quite despondent when it led him to the conclusion that physical quantities would not in all cases obey the commutation law of multiplication. Dirac was able to accept this apparent blemish, and showed that it was actually the dominant feature of Heisenberg's new theory.

Dirac also realized that the classical work of Hamilton a century before could incorporate non-commutation, and he published his formulation of quantum mechanics based on these ideas at the age of 23. His later work predicted the magnetic moment and spin of the electron, and the existence of anti-particles. The reluctance of physicists in the 1930's to believe in more than 2 or 3 fundamental particles was contrasted with the present situation. Dirac barely mentioned his prediction of the magnetic monopole, despite the excitement raised by recent claims for its possible discovery. He regards it as an outcome of some beautiful mathematics, and would not be upset if its existence were never proved.

The lecture was more than a personal account of the history of quantum mechanics. Dirac went on to point out its shortcomings and expressed the belief that its foundations are incorrect. New ideas are required which could trigger off a period of rapid development like the golden age following 1925. "Einstein believed that 'the good God does not play dice' and I think he will ultimately turn out to be right. It is quite likely that, at some time, there will be a new quantum mechanics with a return to determinism — but only by giving up some of the basic ideas which are accepted at present".

Professor Dirac gave two more lectures at the University of NSW, one on the Relativistic Equations of the Electron, and the other on Cosmology and the Gravitational Constant. Both attracted very large audiences, and again the listener was deeply impressed by the quiet, direct, lucid presentation of profound ideas. The third lecture was outstanding — deducing from the purely mathematical Large Numbers Hypothesis that $G$ must decrease as the universe ages and that there must in consequence be continuous creation of matter. These ideas are now, with modern astronomical techniques, able to be tested and recent observations at the US Naval Observatory of the angular velocity and acceleration of the Moon have provided numerical agreement with Dirac's latest prediction.

From Sydney, Professor Dirac flew to Adelaide, where he stayed as the guest of Sir Mark Oliphant. He then visited the Australian National University and left Australia on 10 September to visit the University of Canterbury, Christchurch, NZ. Before coming to Australia he had revisited his native England, and Cambridge University where much of his work was done. Professor Dirac now lives and works in the USA, at the Florida State University.

His visit to Australia was sponsored by the University of NSW, the Australian National University, and the Australian Institute of Physics (NSW Branch). It is planned that the text of his Sydney lectures will be published and that tapes and videotapes of his major Sydney lectures will be available on loan, from the University of NSW, School of Physics. — J. Macfarlane

The Australian Physicist, October 1975 141
AUSTRALIAN Ph.D THESES – 1974

This list contains details of Ph.D theses in physics and related subjects accepted by Australian universities since the last list was prepared (see AP August 1974 and January 1975). No relevant degrees were awarded by Griffith, Murdoch, or Papua New Guinea.

Adelaide

Physics

R.R. Bohn – Experimental electron scattering from atomic molecular hydrogen, helium, neon, argon, and krypton.

N.E. Holmes – An ultrasonic image-forming system for ionospheric studies.


Mathematical Physics

P.A. Bell – A study of the zero rest-mass fields in general relativity.

Janice M. Gaffney – An algebraic formulation of quantum electrodynamics.

R.D. Irvine – The approach to equilibrium of Ising models.

M.A. Lohe – Application of group theory to physics.

Applied Mathematics

P.J. Walsh – Long-wave wind effects on closed lakes, with special application to the Murray Mouth Lakes, SA.

Australian National University

Research School of Physical Sciences

B.W. Borcham – Gas acceleration by travelling conduction waves.

M. Borsaru – One- and two-neutron pick-up reactions in the f-p shell.

H.R. Butcher – Observational aspects of nucleosynthesis.

M.H. Doobov – The Stark effect on the hydrogen beam-foil source.

G.S. Foote – Alpha capture to the giant dipole and quadropole resonances.

P.R. Gardner – Nuclear spectroscopy in the 2s – 1d shell.

G.R. Hovey – Software correction of astronomical telescope pointing errors.

D.W. King – Automation of the reduction of seismic data.

I.C. Maclean – Nuclear direct reactions and intermediate structure.

D.M. Parkinton – Heavy-ion induced neutron transfer reactions.


C.J. Sofield – The Stark effect on helium in the beam-foil source.

K. Wilson – An ultrasonic array technique for the examination of deep-seated defects in steel.

Wong Kin Yip – Magneto-optical studies of transition metal ions in crystals.

Research School of Earth Sciences

D.J. Morrison-Smith – A mechanical and microstructural investigation of the deformation of synthetic quartz crystals.

J.C.M. Roddick – Responses of strontium isotopes to some crustal processes.

Faculty of Science

L.R. Brown – Nuclear magnetic resonance studies of biological macromolecules.

M.J. Robey – Rotational and vibronic effects in molecular electronic spectra.

M.S.A. Sastroamidjojo – Diffusion of germanium and silver in silica glass.

Flinders

Physics

A.S. Clark – Gas breakdown in crossed electric and magnetic fields.


S.T. Hood – The (e, 2e) reaction on atoms and molecules.

D.L. Jolly – The anomalous skin effect in plasmas.

Lila M. Marzec – Electron transport phenomena.

J.M. Read – The unitary pole expansion and its application to the three nucleon bound state.

A.W. Thomas – A study of the π system at low energy.

James Cook

Physics

R.F. Hille – Directional correlation of γ-rays from 56Fe, 64Cu, and single-particle effects in neutron capture γ-rays.

R.M. Leigh – Analyses of tropospheric water vapour and cloudiness for the Western Pacific and Australian tropical regions from Nimbus 3 medium resolution infrared observations.

La Trobe

Physics

N.E. Gilbert – Models of supersonic neutral winds in a planet’s atmosphere.

A. Glikson – Certain problems of the kinetic theory of dilute and rarefied gases.


P.C. Kemery – Measurements of subshell photo–ionization cross-sections by photoelectron spectroscopy.

A.D. McLachlan – Photoelectron spectroscopic studies of some transition metals and alloys.

R.T. Poole – Photoelectron spectroscopic studies of the electronic structure of some metals and ionic solids.

R.P. Rodgers – Digital group height measurement of the daytime E-region.

Macquarie

Mathematics and Physics

J.J. Borejsa – Light diffraction studies of contractile processes in striated muscle.

J. Unsworth – A physical study of the dynamic behaviour of tendon and muscle.
Melbourne

Physics

K.J.F. Allen — Isospin effects in some photonuclear reactions.

Sylvia L. Mair — Anharmonic thermal vibrations in simple inorganic materials.

R.A. O'Sullivan — Relativistic theory of electromagnetic susceptibility and its application to plasmas.

B.J. Read — Reaction mechanisms of $^{27}$Al (p, n) $^{27}$Si and related reactions.

P.J. Saunders — Instrumentation of neutron detection in three-body reactions.

G.A.M. Sussex — SCITE — A variable-high-voltage scanning transmission electron microscope.

D.F. Ward-Smith — A particle-hole quartet coupling model of the dipole giant resonance in $^{12}$C.

Physics — RAAF Academy

J.L. Gras — Investigation of the lower stratospheric ion-aerosol interaction.

A.G. Kerr — Studies of mid-to-high-latitude micropulsation phenomena.

K.B. Parcell — Irregularities in the topside ionosphere.

G. Robinson — Observation and interpretation of the infrared spectrum of some southern sources.

Electrical Engineering

D.A.H. Johnson — Pattern recognizing receivers for data communications.

Geology

A.H.W. Gladow — Fission track dating and the interpretation of thermal and tectonic histories.

Monash

Physics

N. Ahmed — Polarization analysis of neutron scattering from dilute magnetic alloys.

R.P. Canterford — Laser studies in Raman spectroscopy.


G.P. Haberkern — Theory of spin resonance in dilute magnetic alloys.

P.C. Ling — Giant moments in Ni$_3$Al.

J.W.L. Miller — A study of critical behaviour

Chemistry

J.A. Cugley — Infrared spectra of some small matrix isolated molecules.

I.R. Gillard — The microwave spectrum of NF$_2$.

Chemical Engineering

S. Bhattacharya — Flow of non-Newtonian fluids in the entrance region of annul.

A.L. Halmos — The flow of viscous and viscoelastic fluids, through an abrupt expansion.

Electrical Engineering

D.C. Wynn — Wave propagation on helices.

Mechanical Engineering

T.F. Bercrea — On the relative trajectories of a probe ejected from an orbiting space station.

Newcastle

Physics

P.F. Goldsborough — Electromagnetic studies of the ionosphere and the Earth's surface.

J.E. Butler — The detection and digital processing of weak radar metro echoes.

New England

Physics

W.D. King — Freezing and thermal stresses in ice.

D.R. Mills — Electronic properties of GaAs and the effect of cation disorder on the band structure.

Chemistry

M.B. Ewing — Excess Gibbs free energies, excess enthalpies, and isothermal compressibilities of approximately spherical molecules.

New South Wales

Physics

R.L. Dalglish — The behaviour of high energy electron beams.

J.L. Schoderer — The effects of substructure on diffusion and conductivity in alkali halide crystals.

Chemical Engineering


Metallurgy

M.A. Thompson — The sintering and electrical conductivity of 12 mole percent. Y$_2$O$_3$ — ZrO$_2$.

B.L. Wills — A study of gas metal reaction kinetics in arc plasma.

Chemistry

M.J. Lacey — Ion structure in electron ionization and chemical ionization spectrometry.

Mathematics


Electrical Engineering

W.J. Dewar — Microwave transistor oscillators.

M.W. Lawrence — Some device applications of surface elastic waves.

A.T. Michaelides — The behaviour of waveguide Gunn oscillators under conditions of frequency synchronization and modulation.

Nuclear Engineering

P. Yo Pin Chen — Thermo-mechanical modelling of reactor fuel elements.

Queensland

Physics

G.D. Brownlie — The use of a pencil-beam radar to study ionospheres.

P.L. Hewitt — A systematic study of the quantum-number dependence of pressure-induced widths and shifts of microwave spectral lines in gases at low pressure.

Sydney

Physics

L. Bighel — Experimental studies of the structure of plasma shock waves.

D.W.E. Blatt — Three-, four-, and many-body forces in nuclear matter.


R.C. McPhedran – The diffraction properties of plane reflection gratings.

Helen L. Northey – Hydrogen ion mobility in normal and heavy water solutions of electrolytes.

Ta-Trung-Quang – Cosmic ray studies with a low-multiplicity neutron monitor.

Western Australia

Physics

K.J. Bottcher – Photoneutron reactions in praseodymium and holmium.

R.B. Roberts – Thermoelectric power and thermal conductivity in alloys of silver with cadmium and zinc.

J.N. Varghese – Charge density and thermal motion studies in molecular crystals.

Mathematics

G.F. Fitz-Gerald – Some problems in gravity waves.

Wollongong

Science

A.G. Morris – Eigenvalues by numerical methods.

Mechanical Engineering

J.G. Symons – Nucleate pool boiling – the influence of heated surface inclination on heat transfer and vapour bubble dynamics.

AUSTRALIAN ACADEMY OF SCIENCE – NATIONAL COMMITTEES, 1975–8


The Australian Physicist, October 1975
The Australian Physicist

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References—are to be cited in the text thus:
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They should be arranged alphabetically at the end of the article and be presented thus:

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by Simmons Limited, 32 Parramatta Road, Glebe—1975