The Australian Physicist

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Non-members: $9.00 per annum (Australia), $10.00 per annum (Overseas).
Single issues: $0.90 (Australia), $1.00 (Overseas).

All enquiries and correspondence concerning subscriptions to: Australian Institute of Physics, PO Box 52, Parkville, VIC. 3052.

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Manuscripts (original plus one copy) should deal with topics of interest to physicists in Australia, such as developments in the teaching or practice of physics and reports on lectures, conferences, Australian facilities, Institute Affairs, etc. They should be double-space typed on one side of the paper only, with margins 40 mm wide, and should follow the style used in this journal. The recommended length is up to 4 pages for articles (as printed with figures), up to 500 words for letters, and up to 250 words for Notes and Correspondence.

Deadline—6th of month prior to month of issue.

Figures—High contrast originals, 80 mm wide (or if essential, 168 mm wide) and minimum necessary height are required for printing. Larger originals can be used but authors are asked to pay for preparation costs with the purchase of reprints.

References—are to be cited in the text thus:
[Bresl, 1947] and [Brown (1971)].

They should be arranged alphabetically at the end of the article and be presented thus:

Standards—Concise Oxford Dictionary; Metric Units (SI); Symbols, Units and Nomenclature in Physics, IUPAP Document UIP II (SUN 65-3), 1965; World List of Scientific Periodicals.

Copies—Two kinds of copies of items published are available to authors:
Extracts—the relevant pages as they are printed in the journal;
Reprints—printed separately, with any extra requirements by authors such as covers, special headings, etc.

Due for publication in 1975, approx. 650 pages, 950 illustrations in the text of which more than 700 are printed in several colours, 48 monochrome plates and 6 coloured plates, size 163 x 230 mms, bound in cloth with jacket cover. Key reference for orders:
576-035-3, Mathematics.

This book is an English version of the highly successful “Concise Mathematical Encyclopedia”, which in its several German editions has sold over 700,000 copies.

The aim of the book is to provide an easy-to-grasp overall picture of the achievements of mathematics. Part I deals with the traditional branches of elementary mathematics. Part II introduces the reader to the diverse aspects of higher mathematics, and Part III contains brief surveys of several chapters of contemporary mathematics.

There is much emphasis on applications in various areas of science and technology. A special feature is the extensive use of colour as background in formulae and definitions (yellow), examples (blue), and theorems (red). The book is lavishly equipped with illustrations, diagrams, and plates, which enlighten the text.

This book will be available from leading booksellers or direct from:

VEB BIBLIOGRAPHISCHES INSTITUT
DDR-701 LEIPZIG
Gerichtsweg 26
German Democratic Republic.
THE MECHANICS OF RUNNING

Report of a special meeting of the NSW Branch, 10 September, 1974, Keith Burrows Theatre, UNSW.

Introduction

The Randwick Botany Club has recently installed a ‘Tartan’ running track and a forum was arranged by the NSW Branch following speculation on how the physical properties of the track and running shoes would affect a runner’s performance.

In the introduction, Dr Bill Hunter, a physicist from the RAN Research Laboratory said that he had found such inconsistencies in the literature on the physics of running that any attempt by him at finesses would be fruitless. However, he hoped that a few crude observations would set the scene for the discussion.

He started with an energy budget. The energy supply consists roughly of two parts:

(a) a fixed initial energy, stored in the muscles, which decays exponentially on demand — with a half life of the order of half a minute;

(b) energy resulting from oxidation which builds up exponentially over a couple of minutes to a roughly constant level.

On the consumption side of the budget there were several terms:

(a) rest metabolism — 1.2 W/kg of body mass;

(b) other internal losses of motion — this term is the largest in steady running and is affected by style;

(c) drag — wind resistance (80 — 280 W depending on speed);

(d) track friction;

(e) change of momentum during acceleration — for a sprinter this amounts to 3.4 kW during the first 1½ s but it is insignificant over a long run;

(f) work against gravity — this costs a middle distance runner about 200 W when running up a 5 per cent. slope.

Biochemistry and Mechanical Sequence

Dr Tony Miller, physician and sports medicine expert, explained the biochemistry of the energy supply. The necessary oxygen is stored in various places — 370 ml in the lungs, 280 ml in the arterial blood supply, 600 ml in venous blood and 240 ml in muscles.

The energy for running is developed in the muscle cells as a result of a stimulus along a motor nerve. This causes depolarization of the cell membrane and a transfer of potassium out of the cell and the initial breakdown of adenosine triphosphate (ATP) which causes the release of energy and a contraction. The ATP is broken down to diphosphate (ADP) which accepts a further phosphate molecule from creatine phosphate to reform ATP and the cycle restarts.

A continuance of this process needs an energy source. At rest, fat is consumed in the presence of oxygen. When activity starts the percentage of fat consumed rapidly falls and glucose, either from the blood or glycogen stores, is the main source of energy. As activity continues, the percentage of glucose burnt falls and that of fat rises — the gap widening after 30 minutes effort.

Running consists of a series of jumps. From a take-off position the leg travels backwards and knee flexion occurs along with hip extension. Lumbar extension is maximal at this time, the shoulder on this side is well forward and upper trunk rotation is maximal. Knee flexion proceeds along with hip flexion to bring the foot forward to prepare for foot strike. Knee flexion is full when the thigh passes just forward of the mid-line. During these movements the upper trunk rotates backwards and the pelvis forward, thus lengthening the stride.

When hip flexion is complete, knee extension occurs and the foot drops to the ground. When foot strike occurs the support phase begins and the body passes over the foot, which, relatively, moves backwards. The knee never really fully extends and this aids in reducing the fluctuation of the centre of gravity.

The Tartan Running Track

The next speaker was Mr Greg Lewis, Australian record holder for 100 metres. Greg described Tartan as a polyurethane multi-layered material, originally developed for all-weather horse-racing tracks. The physical properties of Tartan do not change over the full range of normal environmental conditions, with the exception that the surface is a bit slippery when wet. Although there are other synthetic tracks with a high
coefficient of restitution, most of the present world records are held by Tartan tracks. The chief attribute of Tartan is its resiliency; it has a resonance time well suited to returning elastic energy to the athlete in the explosive events. Ground contact time varies from 0.08 s for the sprinter to 0.11 s for the long jumper and 0.23 s for the high jumper. Thrust is directed backwards for about half of the ground contact time. A representative of Adidas, the running-shoe manufacturer, added some comments on the adaptation of shoes to suit new track materials and mentioned in particular the development of shorter spikes.

Aerodynamics

Bill Hunter then returned to present a few diverse observations. Firstly he noted that although each leg reaches about twice body speed during each step, one is not conscious of a drag pressure on the lower leg of four times that on the body — rather the reverse. After listing a number of contributing factors, including greater heat loss in the region of the face and chest, there still remained the likelihood that the runner operates in a region of critical Reynolds number \( R \) where drag coefficient is falling rapidly with \( R \). The race-walker is operating below the critical value of \( R \), which explains why he is acutely aware of the effort needed to push his lower leg into the wind.

Thrust Vector

During each step the thrust vector starts facing backwards and then rotates rapidly forwards. During the first second (5 m) of a sprint, the vector has an average value of 780 N at an angle of 54° to the horizontal and an average external developed power of 2.4 kW. During the next half second (5 - 10 m), the average thrust angle remains about the same, the thrust rises to 1 kN and the power to 5.4 kW. The acceleration over the first 1½ seconds is 7.6 m.s\(^{-2}\), then rapidly decreases and so does the developed power. When the sprinter reaches full speed of about 10.7 m.s\(^{-1}\) after 60 m, the thrust vector is 1.8 kN at an angle of 87.6°, with a developed power of 280 W. Thus most of the thrust is devoted to sustaining the runner’s body weight.

Stored Energy

The total amount of anaerobic energy which can be released by a sprinter in 10 s is about a tenth of what would be needed if the kinetic energy invested in each step were dissipated. Thus about 90 per cent. must be stored. Some is stored elastically in the muscles, tendons, shoe and track and this is returned to the same limb during the thrust phase. At each step the balance of the stored energy is transferred across the body as the front leg makes contract with the ground. This forced check of the front leg transfers the momentum to the rear leg which is just accelerating up to speed. To optimize this efficient flail action, the lower leg should be relaxed at that stage. If it were not for this efficient check/flail mechanism, the arms would be inadequate to balance the huge torque that would be required if so much momentum had to be transferred by trunk torque.

Using a different approach, the steady state (aerobic) energy produced by the middle distance runner was also found to be about a tenth of that which would be required if all the kinetic energy invested in each step were dissipated.

If it were not for the fact that most of the energy is conserved, the running shoe would be prohibitively heavy to lug around, attached as it is to the busiest position. However, at the discounted rate, the sprinter’s shoe costs him one cent. of his energy expenditure and the middle distance runner’s shoe costs less than one per cent. of his aerobic energy supply (at 2⅛ W).

Energy Cost of Running

Margaria [1963] tested Olympic athletes running on an ergometer treadmill over a wide range of speed and found that (exclusive of wind effects) the power consumed was linear with speed — that is, the total energy cost depends on the distance covered. He compared the results with earlier tests on non-athletes and found, within the narrower speed range of the non-athletes, that they followed the same law and were only 6 per cent. less efficient than Olympic athletes. Athletes gain most of their superiority by producing a lot more power and sustaining it longer. He also tested walkers and found walking to be non-linear in power versus speed. On level ground at speeds below 8½ km/h it is more efficient for non-athletes to walk but at higher speeds it is more efficient to run. Results were also shown for running and walking on slopes.

Tactics

If Margaria’s model is correct, small variations in speed and ground slope have little effect on the total energy cost for a given distance. Thus the most important race tactic for distance runners would be to keep on the brink of causing a significant oxygen debt without actually doing so, because the efficiency of repaying an oxygen debt is very low. Then the runner should finish with a burst which just causes the maximum possible oxygen debt at the finish. (This can be repaid after the race.) Such a race tactic would result in variations of speed to match the changing biochemical activity and the variations would probably be greatest for distances of 800 – 3000 m.

Conclusion

There was not time to review record prediction, but it was asserted that predicting the ultimate performance was impossible. It was noted that the percentage improvement in various running events since 1912 increased regularly with duration of the event showing that stamina was improving more than explosive power. Exactly the same trend was found in swimming, though the amount of improvement since 1912 was greater. It was seen that there was no sign at present (1974) of a levelling off in the rate of improvement in stamina events.

Discussion

One of the questioners asked if there was an optimum stature for sprinting. Leading coach Jack Press pointed
out that champions come in all sizes and proportions. The natural gift for speed has not satisfactorily been related in any way to stature despite many studies. Mental attitudes, training and dedication were far more important factors.

In answer to another question as to why there had been so much more improvement in swimming records than running, Ken Stewart (another prominent athletics coach) explained that in 1912 runners trained much more than swimmers did; now, swimmers are doing much more stamina training in the younger age groups when rapid cardio-vascular development is occurring.

Reference

NOTES AND NEWS

Conferences and Courses

International Commission on Physics Education - Conferences

(1) International Conference on the Improvement of Physics Education, Edinburgh 29 July - 6 August 1975. (Further information from Dr R.M. Sillitto, Physics Dept, University of Edinburgh.) The principal objectives of this conference to be held under the auspices of the IUPAP, UNESCO and Edinburgh University are (i) to identify and analyse the present problems and recent trends in physics education at all levels, with particular reference to secondary school and undergraduate university courses and (ii) in the light of this analysis to prepare guidelines for plans of action - involving international, regional and national organisations for the further improvement of physics education.

(2) Second World Conference on Computers in Education. Marseille (France) 1-5 September 1975. (Further information from M.J. Hebenstreit, Ecole Superieure d'Electricite, 10 Ave Pierre-Larousse, 92240 Malakoff, France.) A multidisciplinary conference sponsored by the International Federation for Information Processing and other organizations including IUPAP which aims to bring together people concerned with the many possible roles of information in education.

(3) International Conference on Teaching Physics for Related Sciences and Professions. Seattle, USA, probably summer 1976. (Further information from Dr R. Geballe, Physics Dept, University of Washington, Seattle, Washington 98105 USA). This conference under IUPAP sponsorship will bring together two categories of

THE AUSTRALIAN PHYSICIST

Assistant Editor Change

B.V. Denesh has been replaced as Assistant Editor by L.S. Falconer. Brian Denesh served in this capacity for three years whilst pursuing a PhD project in the Falkiner Nuclear Department in the School of Physics, University of Sydney. Having completed his thesis, he has now departed for the USA. His contribution to the AIP has been very valuable and much appreciated - especially since it was made at a stage at which most young physicists do not want to accept extra commitments. We also appreciate Ian Falconer's readiness to take up the responsibilities of Assistant Editor.

Student Award, 1974

The Australian Physicist Award for the best student contribution published up to June 1974 has been made to T.J. McKenna, Royal Military College (UNSW). His article entitled "Out of the Mouths of Babes and Sucklings" [Aust. Phys. 11: 94] gave an interesting description of a three-year project on the use of pyromagnetic effects in gadolinium near the Curie temperature, to detect infrared radiation.

Tim McKenna came to the Faculty of Military Studies at the Royal Military College, Duntroon, from Aquinas College, Ringwood, Victoria. He is currently completing his final BSc(Hons) year with a project on the use of NMR techniques for such measurements as the study of hyperfine interactions in ferromagnetic alloys and the mobility of water in gypsum. Following graduation as a first lieutenant, Royal Australian Artillery, he hopes to mix regimental life and applied scientific research.

The award was made at a meeting of the ACT branch on 2 October, 1974.

Student Award, 1975

An award of $30 will be made for the best student contribution which is published in the Australian Physicist from July 1974 to June 1975. The award will be based on the interest, relevance to physics in Australia, and the effectiveness with which a topic is presented.

Reports of interesting lectures, seminars, conferences, projects or proposals, and news and views relating to the role of physics and physicists will be welcome provided that they have some relevance to the promotion of physics as a subject and a profession in Australia.

Contributions should be in the standard format used by the Australian Physicist, be annotated "For Consideration For Student Award" and be submitted through an Associate Editor.
participants: instructors and leading professionals from fields relying on a background in physics and physics instructors who have a special concern or responsibility for courses taken by students seeking careers in other sciences and professions.

(A copy of a circular from the International Commission for Physics Education containing more details about these Conferences can be obtained from J.S. Dryden, National Measurement Laboratory, Sydney.)

**Atomic Masses and Fundamental Constants**

The fifth international conference on this topic will be held in Paris from 3–7 June next year immediately following the celebration of the centenary of the Bureau International des Poids et Mesures. Further information can be obtained from Prof. P. Griet, Institut d'Electronique Fondamentale, Bâtiment 220, Université Paris – Sud, F 91405, Orsay.

**Atomic Spectroscopy**

The Fifth International Conference on Atomic Spectroscopy will be held at Monash University on 25–29 August 1975. The conference is sponsored by the Australian Academy of Science. The opening address will be given by the Chairman of the Organizing Committee, Dr. A. Walsh. Contributed papers are invited. Brief abstracts must be submitted before 15 January to Dr. J.B. Willis, Secretary, Fifth International Conference on Atomic Spectroscopy, Box 160, Clayton, Vic. 3168, from whom further information is available.

**Energy and Physics – Bucharest, 1975**

The Third General Conference of the European Physical Society will be held in Bucharest on 9–12 September 1975. The topics include high-energy physics; fission and fusion, statistical mechanics; energy in astrophysics, cosmology, and biology; energy transport and storage; use of solar energy; materials and strategy for the future. Further information is available from the EPS Main Secretariat, PO Box 39, CH-1213, Petit-Lancy, Switzerland.

**Thin Films, Budapest 1975**

The Third Conference of the International Thin Film Committee will be held in Budapest on 25–29 August 1975. A meeting on LEED and Electron Spectroscopy of Solids will follow on 1–5 September. Details are available from the Organizing Committee on ICTF-3, 1325 Budapest, POB 76, Hungary.

**IOP conferences**

**Symposium on incoherent light sources**, Loughborough, 8–11 April 1975 (Meetings Officer, IOP).

**Surface science**, Warwick, 17–20 March 1975 (Meetings Officer, IOP).

**Engineering uses of coherent optics**, University of Strathclyde, 8–11 April 1975 (Mr E.R. Robertson, Mechanical Engineering Group, University of Strathclyde, Glasgow, Scotland.)

**Radioisotope course for graduates, Lucas Heights**

The 20th course in this series will be held on 3–28 March 1975. Details are available from The Principal, Australian School of Nuclear Technology, Private Mail Bag, Sutherland, NSW 2232. Registrations close on 27 January.

**NUPP Group Summer School Goolwa, SA 17–20 February 1975**

The summer school will be held in the National Fitness Council conference centre at Goolwa, which is a south-coast beach resort near the Murray mouth. The guest lecturer will be Professor M. Gell-Mann of California Institute of Technology. Emphasis will be on particle physics, although nuclear and atomic physics will also be represented.

Talks will be in the mornings and evenings. Afternoons will be reserved for recreation, including swimming, bird watching, visits to nearby wineries and a possible river boat cruise. Preference will be given to students for accommodation at the conference centre. Motels in Goolwa or nearby accommodation in nearby towns (up to 10 miles away) can be arranged. If you are interested please contact Professor I.E. McCarthy, School of Physical Sciences, Flinders University of South Australia.

Lecturers and their topics are: Professor H.S. Green, Adelaide: Generalized statistics and the quark model; Professor S.S. Hanna, Stanford: Nuclear Physics; Professor L.E. McCarthy, Flinders: Breakup reactions at intermediate energy; Professor D.C. Peaslee, ANU: Statistical concepts in particle physics; Dr L.J. Tassie, ANU: Giant resonances, electron scattering.

**Bringing Science up to date**

Because of the rapidity of growth of modern scientific knowledge, the usefulness of a degree in science-based disciplines tends to diminish with the passage of time unless the graduate makes a continual effort to remain abreast of recent developments. In March 1975 the Faculty of Science of the University of New South Wales will introduce what is believed to be a unique service – a post-graduate course in current science. The units of this course will be continually updated and replaced as necessary and students whose degrees are already more than five years old may qualify for a new award of Graduate Diploma by taking a suitable part-time program within the courses available. The emphasis will be on broadening rather than deepening or specializing the student's knowledge and the courses are seen as equally suitable for holders of other post-graduate degrees. The basic qualification for entry is a degree or its equivalent in a science-based discipline. For further information about conditions and courses available contact the Faculty of Science 662-2536 or Professor D.H. Morton, Department of Applied Physics, University of NSW, PO Box 1, Kensington, NSW. 2033.
THE AUSTRALIAN INSTITUTE OF PHYSICS
NOTICE OF ANNUAL GENERAL MEETING

Notice is hereby given to all members that the 12th Annual General Meeting of the Australian Institute of Physics will be held at 3.30 p.m. on Wednesday, 29 January 1975, in the Physics Department, University of Tasmania, Hobart, Tasmania, during the AIP Summer School.

AGENDA

1. Apologies and declaration of proxies
2. Minutes of 11th Annual General Meeting
3. Business arising from Minutes
4. 12th Annual Report and Financial Statements
5. Resolution proposed by Victorian Branch as follows:
   "The Victorian Branch considers that the action taken by the Federal Council of the AIP in reducing the accumulated funds by half in the face of its financial difficulties to be opportunistic, and not to solve the long-range problems of the Institute, that for the next twelve months the Federal Council should direct that the Australian Physicist be published bi-monthly, to effect an estimated saving of $4,000."
6. Appointment of Auditor
7. Other Business
8. Declaration of Election of Executive

NOTES ON AGENDA ITEM 3 – RESOLUTIONS FOR DISCUSSION

At the 11th Annual General Meeting two resolutions were passed as follows:

1. That Council investigate the desirability of having alterations to Articles of Association, Subscriptions and similar issues, dealt with by a postal ballot of all corporate members of the Institute, and report their findings to the next Annual General Meeting.

2. That Council investigate the desirability of the Institute moving towards a national, rather than the present federal, structure, along the lines of the structure of the Canadian Association of Physicists, and report the result of their investigations to the next Annual General Meeting.

With regard to Resolution 1, Council advises that all issues are aired through publication in "The Australian Physicist" and through the Branches, and feedback from individual members has always been welcomed. Furthermore, Council believes that the provisions under Article 38 of the Articles of Association for a plebiscite to be called on any question are quite adequate. The first two sub-clauses of Article 38 state:

PLEBISCITE
38. (1) The Council may if it thinks fit, and shall on requisition, obtain the consent of the members on any question by taking a plebiscite.

(2) Each requisition shall be signed
(a) by at least one third of the members attached to a branch;
(b) by twenty financial members;
(c) by the ten financial members demanding a plebiscite at a general meeting under clause 35.

With regard to Resolution 2, Council believes that the Institute is already moving in the direction outlined in the resolution. The entire Membership Committee activity involves the assessment of professional qualifications and the assessment of standard of courses is on a national basis. The activities of the specialist Groups are national, as also is the idea of a National AIP Congress.

Whilst the concept of a national structure has much appeal, some Branches believe that there is a great deal of scope for the extension of local branch activity in assisting the development of Physics interests in the States' country centres. The present structure of the Council ensures that each State is represented on it, whereas the alternative of a truly national structure would involve the election of the whole of Council by the whole of the membership.

K.H. Clarke, Honorary Secretary.

12th ANNUAL REPORT 1974

The Institute has pursued a policy of endeavouring to increase its involvement, influence and interaction with the community and, in many ways, this has been a very successful year.

At Government level the Institute has responded to a general invitation by the Hon. W.L. Morrison MP, Minister for Science, to comment and make recommendations on the establishment of an Australian Science Council and on science policy. The Institute has also made recommendations to the Minister for Environment and Conservation concerning membership of advisory committees on Ionizing Radiation and on Environment and Conservation. In order to keep itself in readiness to offer further comment on issues as they arise, the AIP has established a Science Policy Committee to facilitate the flow of information, opinion and ideas between Council and members, between the Institute and kindred organisations, and between the Institute and Government bodies.

A major milestone was passed this year by the holding of the First AIP National Congress in Adelaide in May. It was designed not only to attract physicists, but also to involve industry and the community as a total integration of science, industry and the community. The Congress covered eight disciplines within Physics, each section comprising a review paper followed by short research papers. An exhibition of apparatus and scientific equipment was arranged, and a public symposium was held entitled "Physics in Industry and Society".

The Institute has continued to inform itself on educational and employment matters, and is seeking new ways in which it can encourage and stimulate the development of physics education at all levels. The AIP Education Group is preparing a tape/slideset on "Physics and Mathematicians in Action" to be used in secondary schools. The Victorian Branch has again organised a successful Youth Lecture Series at three provincial centres attracting a total attendance of nearly a thousand. The WA Branch has offered the services of its AIP speakers to an educational programme. A number of State Branches also make annual Science Talent Awards.

Important changes to the Articles of Association were introduced this year changing the former corporate grade of

The Australian physicist, December 1974 223
Associate to that of Member, and introducing two non-corporate grades of Associate and Group Affiliate to recognize the value that the Institute attaches to the interaction of physicists with scientists of other disciplines, and the importance of the resulting cross-fertilisation of ideas. (The changes to the Articles and consequent changes to the By-Laws were detailed in the April and July issues of "The Australian Physicist").

FINANCE

The accounts for the year ended 30 September 1974 are presented in the same form as last year. The consolidated accounts comprise the individual accounts of the Branches, Groups, Council-controlled Funds, and "The Australian Physicist". The Benevolent Fund is independent from Institute Funds and is reported separately. Members should have received financial statements directly from the Branches and Groups to which they belong.

The consolidated Institute accounts show a surplus of $1658 which resulted from the combination of a deficit for Council-controlled funds of $689 (including the extraordinary transfers both from provisions for Stationery of $500, and to the budgeted provision for Long Service Leave of $100), a surplus of $795 for "The Australian Physicist", and a surplus of $1552 on the operations of the Branches and Groups; most of the latter surplus was due to the special activities of the AIP National Congress and the Vacuum Physics Group's exhibition.

Income received by the central office from subscriptions and other sources under the control of Council was disbursed as follows:

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<th>Year</th>
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<th>Council Expenses</th>
<th>Interest to Branches and Groups</th>
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Total Disbursed 31850
Less Gross Deficit 1189
Net Surplus 30661

Since this accounts for the major part of the Institute's income it broadly reflects the operations of the Institute as a whole.

The gross deficit of $1249 in Council-controlled funds was greater than the budget estimate of $400. This was due almost entirely to the large amount of printing, and somewhat offset by welcome additional (one-third) profits from the activities of the Branches and Groups. This printing included the re-printing of Articles and By-Laws, General Information Booklet, and new application forms required by the recent changes in membership names and regulations. These are items which recur every few years (they last occurred in 1969) and which are partly stabilised by transfers to and from the extraordinary provisions for Stationery. The operations of "The Australian Physicist" resulted in a surplus of $795, making the cost to the Institute $7405 as against $7970 last year.

While the above figures indicate that the finances of the Institute are in reasonable accordance with budgetary expectations they do not imply that costs are being safely contained within the resources of the Institute. The effects of the current rate of inflation of 20% show in the rising proportion of Administrative expenditure (37% against 28% last year), and the consequent falling proportion devoted to Branch and Group activities (24% against 26% last year). This trend is expected to continue and the present estimates are that in 1975 "The Australian Physicist" will cost the Institute $12 000, and there will be an overall deficit in Council-controlled funds of $7040. This amount is almost equal to the total accumulated Funds of $7308, approximately 20% of the budgeted expenditure. It is clear that if services to members are to be maintained, then a substantial subscription rise of 50% at the very least will be required for 1976.

MEMBERSHIP

The Institute records with regret the deaths of Dr G.R. Hercus (Member) and Mr W.A. Wiebenga (Subscriber).

The Membership figures as at 1 December 1974 are shown in table I, and changes during the year are summarized in table II. It is regretted that the names of 29 corporate members and 18 non-corporate members had to be removed from the Register for non-payment of annual subscriptions.

During 1974 Dr J.F.G. Darby and Associate Professor J.H. Smith dealt with 16 enquiries regarding the assessment of overseas professional qualifications in physics. The Hon. Registrar or his nominee participated in the assessment of three courses in physics to determine whether the qualification obtained was of sufficient standard to be acceptable for Graduateship. Qualifications at present acceptable for Graduateship are shown in table III.

As shown in table II membership continues to rise slowly. Corporate membership increased by just over 3% to 1510, and overall membership by just under 2% to 762. Company Subscribers now number 22, a loss of 1 since last year.

"THE AUSTRALIAN PHYSICIST"

Many operational problems have had to be contended with this year including increased paper, printing and postal charges, and industrial disputes. Bulk-mailing of pre-addressed journals to members in the same institution was explored as one method of

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**TABLE I — REGISTER AS AT 1 DECEMBER 1974**

<table>
<thead>
<tr>
<th>ACT</th>
<th>NSW</th>
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<th>SA</th>
<th>TAS</th>
<th>VIC</th>
<th>WA</th>
<th>OS†</th>
<th>UN*</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Hon. Fellow</td>
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<td>1</td>
<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Fellow</td>
<td>22</td>
<td>75</td>
<td>14</td>
<td>23</td>
<td>5</td>
<td>74</td>
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<tr>
<td>Member</td>
<td>47</td>
<td>167</td>
<td>46</td>
<td>67</td>
<td>12</td>
<td>195</td>
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<td>39</td>
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<tr>
<td>Graduate</td>
<td>52</td>
<td>187</td>
<td>26</td>
<td>72</td>
<td>15</td>
<td>176</td>
<td>46</td>
<td>44</td>
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<tr>
<td>Total Members</td>
<td>123</td>
<td>430</td>
<td>87</td>
<td>162</td>
<td>32</td>
<td>446</td>
<td>102</td>
<td>95</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
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<td>2</td>
<td>3</td>
</tr>
<tr>
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<td>46</td>
<td>29</td>
<td>65</td>
<td>3</td>
<td>63</td>
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<td>17</td>
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<td>Grand Total</td>
<td>139</td>
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<td>118</td>
<td>178</td>
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<td>528</td>
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<td>96</td>
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<tr>
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<td>4</td>
<td>6</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>41</td>
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<tr>
<td>Group Affiliate</td>
<td>* Unattached</td>
<td>* Unattached</td>
<td>* Unattached</td>
<td>* Unattached</td>
<td>* Unattached</td>
<td>* Unattached</td>
<td>* Unattached</td>
<td>* Unattached</td>
<td>22</td>
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</table>

† Overseas

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234  The Australian Physicist, December 1974
TABLE II – CHANGES IN REGISTER DURING 1974

<table>
<thead>
<tr>
<th>GRADE</th>
<th>GAINS</th>
<th></th>
<th>LOSSES</th>
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<td></td>
<td>New</td>
<td>Transfers To</td>
<td>Decreased</td>
<td>Resigned</td>
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<td>Hon. Fellow</td>
<td>—</td>
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<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Fellow</td>
<td>3</td>
<td>22</td>
<td>—</td>
<td>3</td>
</tr>
<tr>
<td>Member</td>
<td>24</td>
<td>20</td>
<td>1</td>
<td>15</td>
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<tr>
<td>Graduate</td>
<td>38</td>
<td>43</td>
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<td>14</td>
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<tr>
<td>TOTAL MEMBERS</td>
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<tr>
<td>Associate</td>
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<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Student</td>
<td>51</td>
<td>—</td>
<td>45</td>
<td>10</td>
</tr>
<tr>
<td>Subscriber</td>
<td>4</td>
<td>—</td>
<td>—</td>
<td>4</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>122</td>
<td>86</td>
<td>87</td>
<td>46</td>
</tr>
</tbody>
</table>

reducing distribution costs, but this was disallowed by the Post Office; however the reclassification of the journal to Category B mailing has been a most welcome relief.

The Editor and his Committee are to be congratulated on keeping the increased cost of publication of "The Australian Physicist" well below the inflation rate in the community. The editorial content has been broadened, and consideration is being given to the possibility of feature issues containing special matters of interest which may be linked to special conferences or exhibitions.

There has been much debate in Council on the cost-benefit analysis of "The Australian Physicist". Council firmly believes that "The Australian Physicist" is a most important communication medium for the Institute, and has voted to maintain the format and the number of issues for 1975. The editorial staff need the understanding and support of members in improving the standard of the journal, and members are encouraged to make greater use of "The Australian Physicist" in voicing their ideas and opinions on important issues.

INSTITUTE, BRANCH AND GROUP ACTIVITY

The Eleventh Annual General Meeting of the Institute was held at Flinders University on 21 May 1974. The President was in the Chair and 69 members were present. The unconfirmed minutes of this meeting were published in the June 1974 issue of "The Australian Physicist". Two Council meetings each lasting two days were held in May and October. The Executive Committee met nine times during the year.

The First AIP National Congress, referred to previously, proved very successful. Organised by the SA Branch, it was held on 21–24 May 1974 at the Flinders University of South Australia, Bedford Park, and was attended by 250 registrants. 120 papers were presented under 8 topic headings.

The Fourteenth Pawsley Memorial Lecture was held in Brisbane and was given by Professor B.Y. Mills of Sydney University. His subject was "Exploring the Milky Way". Approximately 130 people attended.

The Summer School, organised by the WA Branch, was held at the University of Western Australia on January 21–25. Named Terraprove, it aimed to review important topics in geophysics, geochemistry, surveying and data processing, and the integration of these disciplines in exploration.

Other conferences supported by the AIP held this year were:
- the International Commission for Optics Conference in Sydney in August at which Professors Françon and Mérchal were the Special AIP Lecturers;
- the Royal Melbourne Institute of Technology: B.App.Sc. Degree (Physics); Fellowship Diploma in Applied Physics or Applied Physics (Meteorology);
- The School of Mines and Industries, Ballarat: B.App.Sc. Degree (double major in Physics); Diploma in Applied Physics;
- South Australian Institute of Technology: B.App.Sc. Degree in Applied Physics;
- Sydney Technical College: The ASTC Diploma in Physics, provided it was obtained prior to 1964;
- The University of Adelaide: B.Tech. Degree in Industrial Physics; B.App.Sc. Degree in Applied Physics on work done at the South Australian Institute of Technology;
- University of Melbourne: B.App.Sc. Degree, provided it includes Physics at the third level, Electronics and Mathematics;
- The University of New South Wales: B.Sc. Degree in Textile Physics;
- Western Australian Institute of Technology: B.App.Sc.
the International Union of Crystallography Conference in Melbourne in August at which Professor H. Lipson was Special AIP Lecturer;


Also, the lecture tour by Professor A. B. Pippard to all States during September/October was an outstanding success. His subject was "The Science and Craft of Physics". All the Branches and Groups have shown an increase in activity during 1974 and are exploring ways in which they can improve their impact. Some Branches maintain regular monthly meetings, often associated with dinner, whilst others prefer irregular meetings arranged as special lectures or symposia. In all instances where public lectures have been arranged, such as with the National Congress, the Pippard series, and the Victorian open lecture "Science and Music", the attendances have been very rewarding.

The Groups, being national in character, meet less frequently, but they maintain essential contact amongst their members through the publication of Newsletters or Bulletins. The Biophysics Group held the Fourteenth Conference on "Physics in Medicine and Biology" in Sydney in May in conjunction with the Australian Regional Group Hospital Physicists Association, and with joint sessions with the ANZ Society of Nuclear Medicine. The Vacuum Physics Group held the Fourth Australian Vacuum Physics Conference in Canberra in February, and integrated with this was a School on Vacuum Physics and an exhibition of equipment.

The Nuclear and Particle Physics Group has published its lecture notes from its first vacation School in May 1973, and the plans for its second School to be held in February 1975 are well advanced.

The Education Group, whilst national in vision, has to be active at State level because of the way in which education is organised in Australia. It is aiming to increase substantially its interaction with science teachers, and is hoping to attract many teachers to AIP Group Affiliate membership.

CO-OPERATION WITH OTHER SCIENTIFIC ORGANISATIONS

The Institute values its membership of the Conference of Allied Societies which meets twice a year for discussion of topics of mutual interest. Associated societies are the Australian Institute of Mining and Metallurgy, the Institute of Engineers, Australia, the Royal Australian Chemical Institute and, since this year, the Australian Institute of Agricultural Science and the Institution of Surveyors Australia.

The Institute has reciprocal arrangements with a number of other societies whereby a member of one Society visiting the other's country can be helped in establishing contacts with other physicists there, and enjoy most of the benefits of membership of the other Society (without subscription and with no voting rights) on a short term basis. These reciprocal arrangements exist between the AIP and the American Institute of Physics, the Canadian Association of Physicists, the European Physical Society, The Institute of Physics, London, The Institute of Physics, Singapore, the Physical Society of Japan and the South African Institute of Physics.

The Institute is represented on a number of bodies as listed below.

PHYSICS ARCHIVES

The Institute's records dating back to the beginning of the Australian Branch of The Institute of Physics (UK) are now housed in the Adolph I. Stein Library, Australian Academy of Science, Canberra.

It is hoped that Branches will also deposit their records there, and that other organisations holding interesting physics material will notify the Institute so that this can be cross-referenced.

BENEVOLENT FUND

Members' contribution to the Benevolent Fund are gratefully acknowledged. No payment was made during the year and the Fund stood at $4338 at 30 September 1974.

MEMBERSHIP OF COUNCIL FOR 1974

The following members of the Executive took office in February 1973 and complete their term at the conclusion of the Twelfth Annual General Meeting in 1975:

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>President</td>
<td>Dr. F. J. Jacka</td>
</tr>
<tr>
<td>Vice-President</td>
<td>Dr. J. G. Campbell</td>
</tr>
<tr>
<td>Hon. Registrar</td>
<td>Dr. J. L. Rose</td>
</tr>
<tr>
<td>Hon. Treasurer</td>
<td>Dr. J. K. Mackenzie</td>
</tr>
<tr>
<td>Hon. Secretary</td>
<td>Mr. K. H. Clarke</td>
</tr>
</tbody>
</table>

Professor R. Street held office on Council (ex officio) as Immediate Past President.

Each Branch was represented on Council by its Chairman, who holds office until 31 December 1974 as follows:

<table>
<thead>
<tr>
<th>Branch</th>
<th>Representative</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT Branch</td>
<td>Dr. R. W. Crompton</td>
</tr>
<tr>
<td>NSW Branch</td>
<td>Dr. T. M. Sabine</td>
</tr>
<tr>
<td>QLD Branch</td>
<td>Dr. J. D. Whitehead</td>
</tr>
<tr>
<td>SA Branch</td>
<td>Mr. W. S. Boundy</td>
</tr>
<tr>
<td>Tas Branch</td>
<td>Dr. I. A. Newman</td>
</tr>
<tr>
<td>Vic Branch</td>
<td>Professor H. C. Bolton</td>
</tr>
<tr>
<td>WA Branch</td>
<td>Dr. B. Thomas</td>
</tr>
</tbody>
</table>

OFFICERS OF THE INSTITUTE

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secretary</td>
<td>Mr. K. H. Clarke</td>
</tr>
<tr>
<td>Assistant Secretary</td>
<td>Mrs. E. P. Smith</td>
</tr>
</tbody>
</table>

Editorial Committee "The Australian物理ist"

Editor: Dr. J. R. Bird
Assistant Editors: Dr. R. V. Markby (to October), Dr. I. S. Falconer (from October), Dr. P. E. Cudmore
Book Reviews: Mr. G. A. Bell
Circulation: Mr. E. G. Thwaites
Secretary: Dr. G. R. Hogg
Treasurer: Dr. C. J. Howard
Associate Editors: Mr. P. W. Brown, Dr. J. C. Macfarlane, Professor H. C. Webster, Dr. P. W. Seymour, Mr. P. M. McCulloch, Dr. J. D. Cashon, Dr. J. R. de Lacter
Auditor: Maxwell Withrow & Company

Trustee for Benevolent Fund: Mr. J. K. Mackenzie (ex officio), Professor H. C. Bolton, Dr. R. W. Crompton, Mr. A. E. Harper, Dr. J. G. Campbell

Returning Officer: Professor B. M. Spencer

Membership Committee: Dr. J. L. Roux (Chairman), Professor H. C. Bolton, Dr. J. F. C. Darby, Ex officio members: Dr. F. J. Jacka, Dr. J. K. Mackenzie, Mr. K. H. Clarke

Finance Advisory Committee: The Executive

AIP Representatives on Joint Office Management Committee: Mr. K. H. Clarke, Dr. J. K. Mackenzie, Dr. J. L. Roux

BRANCH AND GROUP COMMITTEES

ACT BRANCH: Dr. R. W. Crompton (Chairman), Dr. P. B. Tracey (Vice Chairman), Mr. C. S. Newton (Secretary), Mrs. E. M. Rice (Treasurer), Mr. G. E. Barlow, Mr. J. W. Bissett, Mr. D. C. Creagh, Mr. J. C. Dooley, Mr. M. J. Goodspeed, Mr. I. T. Lonergan, Mr. J. P. Rayner, Dr. D. M. Rosalyn

NSW BRANCH: Dr. T. M. Sabine (Chairman), Professor H. J. Goldsmith (Vice Chairman), Dr. D. Paix (Secretary to May), Dr. I. Basset (Secretary from May), Mr. G. G. Fletcher (Treasurer), Dr. I. Rignell, Dr. J. R. Bird, Dr. C. Burton, Mr. R. Cordell, Professor C. D. Elliott, Professor H. D. Morton, Dr. G. Paul

TAS BRANCH: Dr. J. A. Newman (Chairman), Dr. R. D. Watson (Vice Chairman), Dr. J. R. Fox (Secretary-Treasurer)

VIC BRANCH: Professor H. C. Bolton (Chairman), Professor K. D. Cole (Vice Chairman), Mr. J. V. Sullivan (Secretary), Mr. D. L. Swinley (Treasurer), Professor H. H. Bonifaz, Mr. J. D. Buntine, Dr. J. G. Green, Mr. J. E. rivet, Dr. J. G. Jenkins

WA BRANCH: Dr. B. Thomas (Chairman), Dr. R. Green (Vice Chairman), Dr. M. Lynch (Secretary), Dr. B. H. O'Connor (Treasurer), Dr. J. Black, Dr. J. Chute, Mr. R. Flay, Mr. S.
Ganson, Dr B. Hartley, Mr R. Price, Dr J. Robbins, Dr J. Swan, Mr K. Robins, Mr T. Edwards

BIOPHYSICS GROUP: Dr H. G. L. Coster (Chairman), Professor A. B. Hope (Secretary-Treasurer), Mr K. H. Clarke (Secretary-Treasurer to March), Mr L. L. Black (Secretary-Treasurer from March), Dr J. L. Black, Dr C. D. Field, Dr J. Maloney

EDUCATION GROUP: To March – Mr J. E. Shaw (Chairman), Professor R. E. B. Makinson (Vice Chairman), Mr P. E. Ciddor (Secretary-Treasurer), Mr M. Henderon, Dr J. Johnston, Dr J. Giutronich, Dr B. McNess, Mr W. A. Miller, Miss P. Simpson. From March – Mr P. E. Ciddor (Chairman), Dr G. Paul (Vice Chairman), Dr C. E. Gould (Secretary-Treasurer), Dr P. E. Clark, Mr W. G. Durant, Mr L. G. Little, Dr B. McNess, Associate Professor R. E. B. Makinson, Mr W. A. Miller

VACUUM PHYSICS GROUP: Dr M. T. Elford (Chairman), Dr E. Dennis (Vice Chairman), Dr R. J. MacDonald (Secretary), Mr J. Gascoigne (Treasurer), Dr R. W. Crompton, Mr L. Cotterell

NUCLEAR AND PARTICLE PHYSICS GROUP: Professor B. M. Spicer (Chairman), Professor I. E. McCarthy (Vice Chairman), Dr M. J. Kenny (Secretary-Treasurer), Dr I. F. Bubb, Dr J. R. Bird, Professor H. H. Boltotin, Professor C. A. Hare, Dr B. G. Kenny, Professor G. Opat, A. Professor R. B. Taylor, Dr P. B. Tracey

REPRESENTATION ON OTHER BODIES
Council gratefully acknowledges the services of those members who represented the Institute on the Councils or Committees of other bodies; they were:

ANZAAS.
Australian Journal of Physics Advisory Committee: Professor D. Muggleton
Australian UNESCO Committee for Natural Sciences: Dr. J. R. Philip
National Association of Testing Authorities: Professor L. W. Davies
Australian National Committee on Illumination: Mr. I. E. Shaw
Australian Institute of Radiography: Mr J. F. Richardson
Acoustic Standards Committee of SAA: Dr R. W. R. Muncey
Australian Academy of Science National Committee for Physics: Professor R. Street.

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**CONSOLIDATED BALANCE SHEET AS AT 30th SEPTEMBER, 1974**

<table>
<thead>
<tr>
<th>1973</th>
<th>1973</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACCUMULATED FUNDS</strong></td>
<td><strong>CURRENT ASSETS</strong></td>
</tr>
<tr>
<td>General – 7,170</td>
<td>137</td>
</tr>
<tr>
<td>Balance 1st October, 1973 3,889</td>
<td>Cash on Hand 12,717</td>
</tr>
<tr>
<td><strong>Add Surplus for Year</strong></td>
<td>4,906</td>
</tr>
<tr>
<td>11,059</td>
<td>Cash at Bank 1,041</td>
</tr>
<tr>
<td><strong>Specifically Allocated to Branches and Groups</strong></td>
<td>Cash on Deposit – Permanent 13,509</td>
</tr>
<tr>
<td>13,592</td>
<td>Building Society 9,205</td>
</tr>
<tr>
<td><strong>24,651</strong></td>
<td>Accounts Receivable 2,756</td>
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<tr>
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<td>Stock on Hand at Cost 1,193</td>
</tr>
<tr>
<td></td>
<td><strong>INVESTMENTS – at Cost</strong></td>
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<td></td>
<td>20,844</td>
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<td></td>
<td>Debentures etc. which are dealt in on a prescribed Stock Exchange 1,441</td>
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<tr>
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<td><strong>FIXED ASSETS</strong></td>
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<td>Furniture, Fittings &amp; Plant – 1,277</td>
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<td>at Deemed Value 1967 1,277</td>
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<td>at Cost 20,844</td>
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<td><strong>$31,326</strong></td>
</tr>
<tr>
<td></td>
<td><strong>$36,471</strong></td>
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</tbody>
</table>

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**CONSOLIDATED STATEMENT OF INCOME & EXPENDITURE FOR THE YEAR ENDED 30th SEPTEMBER 1974**

<table>
<thead>
<tr>
<th>1973</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1,300) Deficit/(Surplus) from normal year’s activities after making the following Charges and Provisions 977</td>
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<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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*The Australian Physicist, December 1974*
COUNCIL FUNDS – BALANCE SHEET AS AT 30th SEPTEMBER 1974

1973

<table>
<thead>
<tr>
<th>Accumulated Funds</th>
<th>1973</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,159 (2,837)</td>
<td>7,996.25</td>
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<tr>
<td>Balance at 1st October, 1973</td>
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<td>Less Deficit for year</td>
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<td>CURRENT LIABILITIES</td>
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<tr>
<td>7,996</td>
<td>7,307.62</td>
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<tr>
<td>CURRENT LIABILITIES</td>
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<tr>
<td>872 Accounts Payable</td>
<td>1,046.61</td>
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<tr>
<td>400 Audit Fee</td>
<td>450.00</td>
</tr>
<tr>
<td>412 Due to Benevolent Fund at Call</td>
<td>417.74</td>
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<td>413 Subscriptions in Advance</td>
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<tr>
<td>Funds held on behalf of Branches and Groups</td>
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</tr>
<tr>
<td>Provisions for Specific Purposes for Change of Subscription Year</td>
<td>400.00</td>
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<tr>
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<td>Long Service Leave</td>
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<td>500</td>
<td>1,277</td>
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<td>13,592</td>
<td>1,441.00</td>
</tr>
<tr>
<td>$24,585</td>
<td>$23,439.19</td>
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<tr>
<td>1973</td>
<td>$24,585</td>
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<tr>
<td>$23,439.19</td>
<td>$23,439.19</td>
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</tbody>
</table>

COUNCIL FUNDS – INCOME & EXPENDITURE FOR YEAR ENDED 30th SEPTEMBER 1974

1973

<table>
<thead>
<tr>
<th>Income from Normal Sources</th>
<th>1973</th>
</tr>
</thead>
<tbody>
<tr>
<td>Members Subscriptions for 25,138</td>
<td>26,344.83</td>
</tr>
<tr>
<td>Members Subscriptions for 912</td>
<td>1,189.35</td>
</tr>
<tr>
<td>1973</td>
<td>27,534.18</td>
</tr>
<tr>
<td>370 Group Subscriptions for 704</td>
<td>470.00</td>
</tr>
<tr>
<td>1,759.87</td>
<td>399</td>
</tr>
<tr>
<td>176 Printing, Stationery &amp; Insurance</td>
<td>1,737</td>
</tr>
<tr>
<td>178 Postage, Telephone &amp; Cartage</td>
<td>540</td>
</tr>
<tr>
<td>168 Sundry &amp; Bank Charges</td>
<td>176</td>
</tr>
<tr>
<td>176 Donation of Balance of L.O.P. Fee</td>
<td>176</td>
</tr>
<tr>
<td>176 Depreciation &amp; Accountancy</td>
<td>176</td>
</tr>
<tr>
<td>176 Council Meetings &amp; Executive Expenses</td>
<td>176</td>
</tr>
<tr>
<td>2,003 Assessment of Qualifications</td>
<td>2,003</td>
</tr>
<tr>
<td>2,666</td>
<td>2,666</td>
</tr>
<tr>
<td>9,000</td>
<td>9,000</td>
</tr>
<tr>
<td>Extraordinary Income</td>
<td>850.00</td>
</tr>
<tr>
<td>Transfer from Provisions for 500</td>
<td>500.00</td>
</tr>
<tr>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Long Service Leave</td>
<td>200</td>
</tr>
<tr>
<td>Deficit for Year</td>
<td>688.63</td>
</tr>
<tr>
<td>EXPENDITURE Administrative</td>
<td>3,950</td>
</tr>
<tr>
<td>Salaries &amp; Wages</td>
<td>6,936.53</td>
</tr>
<tr>
<td>Transfer to Provision for Long Service Leave</td>
<td>100.00</td>
</tr>
<tr>
<td>Rent &amp; Cleaning</td>
<td>435.95</td>
</tr>
<tr>
<td>7,472.48</td>
<td></td>
</tr>
<tr>
<td>$29,172</td>
<td>$31,849.56</td>
</tr>
<tr>
<td>$29,172</td>
<td>$31,849.56</td>
</tr>
</tbody>
</table>

INVESTMENTS AT COST AS AT 30TH SEPTEMBER 1974

<table>
<thead>
<tr>
<th>1974</th>
<th>%</th>
<th>1974</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,000</td>
<td>(2,000)</td>
<td>A.G.C. Ltd.</td>
<td>12.73</td>
</tr>
<tr>
<td>3,000</td>
<td>(3,000)</td>
<td>Alliance Holdings Ltd.</td>
<td>9.74</td>
</tr>
<tr>
<td>3,000</td>
<td>(3,000)</td>
<td>Associated Securities Ltd.</td>
<td>9.75</td>
</tr>
<tr>
<td>802</td>
<td>(800)</td>
<td>L.A.C. Ltd.</td>
<td>3.76</td>
</tr>
<tr>
<td>2,837</td>
<td>(800)</td>
<td>C.U.B. Ltd.</td>
<td>11.76</td>
</tr>
<tr>
<td>Redeemed</td>
<td>8%</td>
<td>Redeemed</td>
<td>8%</td>
</tr>
<tr>
<td>$3,000.00</td>
<td>88%</td>
<td>3,000.00</td>
<td>88%</td>
</tr>
<tr>
<td>824.00</td>
<td>6%</td>
<td>788.00</td>
<td>6%</td>
</tr>
</tbody>
</table>

The Australian Physicist, December 1974


### FUNDS HELD ON BEHALF OF THE BRANCHES AND GROUPS

<table>
<thead>
<tr>
<th>Balance at 1.10.73</th>
<th>Deduct Withdrawals</th>
<th>Add Unclaimed Grants</th>
<th>Profits from Activities</th>
<th>Annual Interest</th>
<th>Balance at 30.9.74</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BRANCHES:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.C.T.</td>
<td>742</td>
<td>52</td>
<td>794</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N.S.W.</td>
<td>3,111</td>
<td>218</td>
<td>2,829</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qld.</td>
<td>916</td>
<td>64</td>
<td>880</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.A.</td>
<td>1,588</td>
<td>111</td>
<td>2,250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tas.</td>
<td>301</td>
<td>18</td>
<td>214</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vic.</td>
<td>4,823</td>
<td>338</td>
<td>4,511</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W.A.</td>
<td>930</td>
<td>65</td>
<td>995</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GROUPS:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biophysics</td>
<td>38</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>631</td>
<td>44</td>
<td>475</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuc. &amp; Part. Phys.</td>
<td>12</td>
<td>1</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacuum Phys.</td>
<td>500</td>
<td>35</td>
<td>535</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$13,592</td>
<td>$1,593</td>
<td>$561</td>
<td>$949</td>
<td>$13,509</td>
</tr>
</tbody>
</table>

**THE AUSTRALIAN PHYSICIST**

**INCOME & EXPENDITURE ACCOUNT FOR YEAR ENDED 30TH SEPTEMBER 1974**

<table>
<thead>
<tr>
<th>1973</th>
<th>1973</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INCOME</strong></td>
<td><strong>EXPENDITURE</strong></td>
</tr>
<tr>
<td>9,000 Special Supplements and Inserts</td>
<td>2,552 Special Supplements and Inserts</td>
</tr>
<tr>
<td>741 Grant from AIP</td>
<td>8,500 Reprints and Extracts</td>
</tr>
<tr>
<td>1,570 Reprints and Extracts</td>
<td>8,099 Publication costs</td>
</tr>
<tr>
<td>481 Sales and Subscriptions</td>
<td>2,032 Distribution costs</td>
</tr>
<tr>
<td>150 Bank Interest</td>
<td>2,000 Accountancy and Clerical</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>$11,942</td>
<td>$14,528</td>
</tr>
</tbody>
</table>

**BALANCE SHEET AS AT 30TH SEPTEMBER 1974**

<table>
<thead>
<tr>
<th>1973</th>
<th>1973</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CURRENT LIABILITIES</strong></td>
<td><strong>CURRENT ASSETS</strong></td>
</tr>
<tr>
<td>2,434 Account payable</td>
<td>6,216 Bank Accounts</td>
</tr>
<tr>
<td>114 Subscriptions in Advance</td>
<td>195 Accounts Recoverable</td>
</tr>
<tr>
<td>14 Income received in Advance</td>
<td>288 Stock on Hand at Cost</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>6,411</td>
<td>2,099</td>
</tr>
</tbody>
</table>

**ACCUMULATED FUNDS**

<table>
<thead>
<tr>
<th>(175)</th>
<th>(175)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surplus at 1.10.73</td>
<td>859 Bank Accounts</td>
</tr>
<tr>
<td>Net Surplus for year</td>
<td>795 Accounts Recoverable</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>859</td>
<td>795</td>
</tr>
</tbody>
</table>

**BALANCE SHEET OF BENEVOLENT FUND AS AT 30TH SEPTEMBER 1974**

<table>
<thead>
<tr>
<th><strong>ACCUMULATED FUNDS</strong></th>
<th><strong>ACCUMULATED FUNDS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance at 1.10.73</td>
<td>3,712.15 Bank Accounts</td>
</tr>
<tr>
<td>Members’ Contributions and Interest less Payments</td>
<td>675.70 Accounts Recoverable</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>$3,421</td>
<td>$3,421</td>
</tr>
</tbody>
</table>

**Represented by:**

- Bank Account: 584.71
- AIP General Account: 417.74
- Investments at Cost: 3,385.40

---

*The Australian Physicist, December 1974*
BENEVOLENT FUND INVESTMENTS AT COST

<table>
<thead>
<tr>
<th>1973 (Nom.)</th>
<th>1973 (Nom.)</th>
<th>%</th>
<th>Due</th>
<th>$195.90</th>
</tr>
</thead>
<tbody>
<tr>
<td>196 (200)</td>
<td>S.E.C. Loan</td>
<td>4%</td>
<td>1.2.75</td>
<td>1,300.00</td>
</tr>
<tr>
<td>300 (500)</td>
<td>Commonwealth Special Bonds Series T to 39.9.76</td>
<td>8.0</td>
<td>1.8.75</td>
<td>496.50</td>
</tr>
<tr>
<td>500 (1,300)</td>
<td>Commonwealth Special Bonds Series 2C to 39.9.76</td>
<td>8.2</td>
<td>1.2.79</td>
<td>500.00</td>
</tr>
<tr>
<td>496 (500)</td>
<td>Commonwealth Bonds</td>
<td>5.0</td>
<td>1.9.80</td>
<td>500.00</td>
</tr>
<tr>
<td>393 (400)</td>
<td>M.M.B.W</td>
<td>5.0</td>
<td>1.9.80</td>
<td>500.00</td>
</tr>
<tr>
<td>500 (500)</td>
<td>S.E.C. Loan</td>
<td>6.2</td>
<td>1.9.80</td>
<td>500.00</td>
</tr>
<tr>
<td>500 (500)</td>
<td>S.E.C. Loan</td>
<td>7.2</td>
<td>1.9.80</td>
<td>500.00</td>
</tr>
<tr>
<td><strong>$2,585</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>$3,385.40</strong></td>
</tr>
</tbody>
</table>

REPORT OF COUNCILLORS

Your Councillors submit herewith the following audited financial statements:

Income and Expenditure Account made up for the year ended 30th September 1974. Balance Sheet as at the end of the financial year then ended. Your Councillors report that:

1. The net surplus of the Institute for the financial year amounted to $1,658.
2. Prior to the making out of the Income and Expenditure Account and the Balance Sheet your Councillors took reasonable steps to ascertain what action had been taken in relation to the writing off of bad debts where necessary and the making of provision for doubtful debts and are satisfied that there are no known bad debts to be written off and no provision is considered necessary for doubtful debts;
3. At the date of this report your Councillors are not aware of any circumstances which would render the position as regards accounts recoverable as stated above inaccurate to any substantial extent;
4. At the date of this report your Councillors are not aware of any circumstances which would render the values attributed to current assets in the accounts misleading;
5. At the date of this report no charge on the assets of the Institute has arisen since the end of the financial year which secures the liabilities of any other person; and no contingent liability has arisen since the end of the financial year;
6. No contingent or other liability has become enforceable or is likely to become enforceable within the period of twelve months after the end of the financial year which in the opinion of your Councillors, will or may affect the ability of the Institute to meet its obligations when they fall due;
7. The result of the Institute's operations during the financial year were, in the opinion of your Councillors, not substantially affected by any item, transaction or event of a material and unusual nature save for the transfer from Provisions for Specific Purposes of $500 as stated in the Income and Expenditure Statement;
8. There has not arisen in the interval between the end of the financial year and the date of the report any item, transaction or event of a material and unusual nature likely, in the opinion of your Councillors, to affect substantially the results of the Institute's operations for the next succeeding financial year;
9. Since the end of the previous financial year no Councillor has received or become entitled to receive any benefit not disclosed in the accounts by reason of a contract made by the Institute with the Councillor, or with a firm of which he is a member, or with a company in which he has a substantial financial interest.

Signed on behalf of and in accordance with a resolution of the Councillors dated 28th November 1974.

J.K. MacKenzie
K.H. Clarke

STATEMENT OF COUNCILLORS

We, JAMES KENNETH MACKENZIE and KENNETH HENRY CLARKE, being two Councillors of THE AUSTRALIAN INSTITUTE OF PHYSICS state that in the opinion of the Councillors:

(a) The Income and Expenditure Account is drawn up so as to give a true and fair view of the surplus of the Institute for the financial year ended 30th June, 1974, and;
(b) The Balance Sheet is drawn up so as to give a true and fair view of the state of affairs of the Institute as at the end of the financial year ended 30th September 1974.

Signed on behalf of and in accordance with a resolution of the Councillors dated 28th November 1974.

This 28th day of November 1974 J.K. Mackenzie
K.H. Clarke

STATEMENT OF PRINCIPAL ACCOUNTING OFFICER

I, JAMES KENNETH MACKENZIE, being the principal accounting officer of THE AUSTRALIAN INSTITUTE OF PHYSICS state that, to the best of my knowledge and belief, the accounts give a true and fair view of the matters required by Section 162 of the Companies Act 1961, to be dealt with in the accounts.

Signed this 28th day of November 1974 J.K. Mackenzie

AUDITOR'S REPORT

To: The Members of THE AUSTRALIAN INSTITUTE OF PHYSICS.

As required by the Companies Act 1961, we report as follows -

In our opinion:

(a) The attached accounts are properly drawn up -
   (i) so as to give a true and fair view of the matters required by Section 162 to be dealt with in the accounts, and;
   (ii) in accordance with provisions of that Act.
(b) The accounting and other records and the registers, required by the Act to be kept by the Institute have been properly kept in accordance with the provisions of the Act.

We have not acted as auditor for the following Branches or Groups.

Branches: Australian Capital Territory, New South Wales, Queensland, South Australia, Tasmania, Western Australia.
Groups: Biophysics, Education, Nuclear and Particle Physics, Vacuum Physics, The Australian Physicist.

We have examined the Auditor's Reports on the various accounts.

We are satisfied that the returns from Branches and Groups are in form and content appropriate and proper for the purposes of the preparation of the attached Balance Sheet and supporting accounts of the Institute. The Audit Reports on the accounts of the Branches and Groups were not subject to any qualification or comment.

R. W. VANCE - Partner,
MAXWELL WITHEROW & CO.
Chartered Accountants.
OPTICAL INFORMATION PROCESSING

J.J. McNeill
Division of Chemical Physics, C.S.I.R.O.
Report of Conference held at the University of Sydney on August 19–22, 1974.

This conference was organized by the Australian Academy of Science and supported by the International Commission for Optics, the CSIRO, and the AIP. It attracted 40 delegates from 14 overseas countries as well as 70 Australians. The serious business of the conference, comprising 25 invited papers and 24 contributed papers, was spread over eight sessions on 20–21 August. A substantial proportion of the papers were on radioastronomical techniques, reflecting the interest of this particular branch of optics in Australia. A selection of invited and contributed papers will appear in the February 1975 issue of Optica Acta.

The opening session was held on Monday afternoon, 19 August, with the conference secretary, Mr P.E. Ciddor, in the chair. A short address of welcome to the delegates was made by Dr A. Walsh on behalf of the Academy. Dr W.H. Steel responded for the ICO and Professor J.-Ch. Viénot for the overseas delegates. Then followed a pleasant reception at the National Measurement Laboratory with Dr J.R. Price (Chairman, CSIRO) and Dr Steel as joint hosts.

Invited Papers

The conference got under way on the Tuesday morning with the first of the invited papers. This was E.N. Leith's "Synthetic Apertures in Radar", dealing with a system of aerial 'photography' at radar wavelengths. Leith pointed out that an aperture sufficient to give a resolving power comparable with conventional optical photographs can be synthesized by a single airborne radar aerial. The main problems lie firstly in storing and subsequently processing the vast amount of data generated by such a system and secondly in stabilizing the flight path to an accuracy equal to the radar wavelength. The paper was notable for its clarity, conciseness, and for the speaker's verbal legedernain when, in discussing the exotic optical processing systems, he caused a certain conical lens to appear and disappear in a most diverting manner. The paper concluded with some beautiful radar 'photographs'.

J.P. Wild's "Imaging in Radio Astronomy" dealt with stationary arrays as distinct from synthetic aperture techniques. It was emphasized that, when dealing with rapidly changing phenomena such as occur on the surface of the sun, it is essential to provide a multiplicity of receivers whose signals are processed in parallel. Speaking specifically of the Culgoora radioheliograph, Wild pointed out the economic reasons for diluting the array and the consequent need to generate electronically an apodizing function to simulate the performance of a solid array of equal resolving power. A short cine-film showing the propagation of an intense solar disturbance demonstrated the power of the Culgoora instrument and the elegance of the visualization technique.

The third session opened with M. Françon's paper on "Image Processing with Random Carriers", which dealt with the enhanced possibility for information processing consequent upon the spread of the information in the Fourier plane by diffusion with a suitable screen. This technique has the further advantage that information relating to different objects could be directed to different areas in the Fourier plane, thus facilitating the separation of their images. Examples of image subtraction applied to terrestrial photographs taken from an earth satellite and to angiograms showing dye diffusion in the human brain were shown in slides. Françon also demonstrated on the bench a system of Young's fringes in a speckle interferometer. This effect is the basis of Labeyrie's beautiful work on measurements of double stars at Mt Palomar.

K. Biedermann was unable to be present, but his invited paper on "Information Storage Materials" was read by P. Harirayan. This was a tight-packed review of materials capable of recording and restoring optical wavefields. The advantages and disadvantages of silver halides, dichromated gelatin, photo-resists, thermoplastics, photo-degradable and photo-chronic materials, and of electro-optic and magneto-optic crystals were treated as extensively as the limited time would permit. The paper concluded with a reference to such hybrid devices as the liquid crystal-photoconductor cell and the cathode ray tube-thermoplastic combination.

W.N. Christiansen -- "Synthetic Apertures in Radio Astronomy" -- spoke of the development of aperture synthesis in Australian radioastronomy, with particular reference to the unique features of the synthesis radiotelescope array at Fleurieu. In this instrument, which consists of a north-south and an east-west baseline, all the components are fixed. Synthesis is effected either by the rotation of the earth for observing invariant radio sources, or by interferometric elements in the two baselines for rapid observations of variable sources such as the sun.

"Models of Information Transfer Processing and Access along a Light Channel by means of Complex Correlations in Coherent Optics and some Derived Processes" was the title of J.-Ch. Viénot's invited address, delivered with marked Gallic verve. Viénot pointed out that the amount of information which can be derived from any optical
Dr W.H. Steel, President of the ICO, with Professor A. Maréchal, Director of the Institut d'Optique.

recording process depends both on the complexity of the recorded signal set and on the coherence — spatial and temporal — of the carrier wave. For a spatially coherent carrier, the information is displayed as a complex two-dimensional modulation of the wave — the conventional hologram. For a carrier with a high degree of temporal coherence, the space and time variables may be interchanged and the time distribution of a coherent disturbance can be recorded. When the carrier is largely incoherent, a statistical description of the carrier is needed, provided that the statistical properties of the wave are not related to the observation time — a technique which leads to Fourier spectroscopy.

The application of coherent carrier-wave processes was illustrated by a technique for identifying unknown script letters. The generation of average letters and average holograms leads to the definition of the overall characteristics of a given writer or a given language. The holographic recording of self-luminous objects would normally involve some form of monochromatic filtering to achieve a non-zero degree of coherence prior to the application of a coherent optical-processing technique. The resolution thereby achieved is limited by the restricted frequency band-pass. However, if the frequency spectrum of the light source is obtained with a spectroscope and is then modulated by the spatial frequency spectrum of the object, the result is effectively a hologram; the resolution is then related to that of the spectroscope and remains fairly good.

A.W. Lohmann — "Digital Image Processing" — presented a comparative survey of digital, analogue and visual imaging processes (DIP, AIP and VIP) which impressed through the speaker's obvious command of the subject, and was enlivened by a pleasant vein of humour. Lohmann pointed out that it was impossible to make a categorical decision in favour of any one of these three processes, as their relative advantages and disadvantages depended on the nature of the application. In photogrammetry, for example, the information content of each picture exceeded the handling capacity of DIP; AIP was possible with matched filtering, though there remained a context problem; and VIP (stereo observation) was probably the simplest and best. On the other hand the problem of X-ray tomography could be handled by DIP, whereas AIP was not applicable and VIP not possible. In the overall view, considerations of speed, cost, data capacity, reliability of storage materials and — a frequently overlooked factor — the availability of skilled manpower, led to the tentative conclusion that a hybrid (HIP) of AIP and DIP techniques offered the most favourable possibilities for future development.

The last of the invited papers — J.W. Goodman's "Synthetic Apertures in Optics" — was not presented as the author was unable to attend the Conference.

Contributed Papers

The 24 contributed papers represented a wide diversity of interest in the field of optical information processing, though the adjective optical had to be stretched a little to cover some of the papers. Holographic subtraction, which Françon had discussed in his invited paper, was used by V. Russo to correct for aberrations introduced by the propagating medium in microwave holography. E. Marom, working at optical wavelengths, effected his subtraction with a double hologram from two objects symmetrically positioned with respect to the optical axis along which the reference beam is directed. Françon had made use of the phenomenon of speckle in his subtractive process; but M. Kato, P. Haritharan, and N. George were concerned to reduce speckle, the first by using an extended, incoherent, monochromatic light source in combination with a random (0, π) phase mesh, the second by means of a moving aperture in the hologram plane or in the pupil of the imaging lens, and the third by changing the wavelength of the dye-laser source.

Technological applications were described by A.D. Gara, H.H. Arsenault, and L. Stringa. The first was concerned with image enhancement in computerized control of wheeled mounting in automobiles, the second in the use of aeromagnetic contour maps for detecting buried magnetic bodies, and the last-named with the development of an automatic postal-address recognition system.

S. Lowenthal's first paper described a method of visualizing a progressive acoustic wave field which, coupled with an analysis of the spatial spectrum of the wave, can be used to determine the elastic constants of the acoustic radiator. B.H. Briggs, on the other hand, used a double acoustic Fourier transform, in which piezoelectric transducer arrays replaced conventional lenses, to form an image of the macrostructure of the ionosphere. F.T.S. Yu reported the use of a coherent optical information processor to generate speech spectrograms for research in speech synthesis, analysis, and processes.
J.P. Huignard spoke favorably of the use of Li NbO₃ as a material for storing and processing information, but G.R. Knight was inclined to contest this view when he presented his paper on holographic associative storage and processing.

W.K. Klemperer discussed non-redundant two-dimensional spatial filters for improving detail in aberrated incoherent optical systems.

S.H. Lee was concerned with the use of non-linear devices to perform such processes as convolution, correlation and image enhancement, and showed how their effectiveness could be increased by optical feedback.

F. Gori dealt with the application of the eigenfunction technique to a study of the degrees of freedom of two-dimensional coherent images from point-like-element pupils. S. Lowenthal, in his second paper, reported a method of reducing the number of samples to be computed and plotted in a synthetic hologram by an amount equal to the number of degrees of freedom in the processed image.

T.W. Cole delivered two papers dealing with image processing in radio astronomy. The first of these dealt with the general problems of imaging, aperture synthesis and spectroscopy, and described an acousto-optical spectrograph and its operational results. In his second paper, he reviewed two non-linear methods of optical processing— the maximum entropy method and an iterative process of beam subtraction — which are useful where the extent of the spatial frequency spectrum of the image precludes the use of linear methods.

M. De discussed at some length a complete analytical solution of Schell's integral for the point spread function of a telescope with an apodizing filter working in a turbulent atmosphere.

W. Schneider dealt with methods of facilitating image evaluation by special photochemical or incoherent optical processes, or by a combination of either with electronic analogue processing techniques.

F. Lanzl described a method of calculating the self-entropy of experimental images which is applicable to all incoherent linear imaging devices independently of wavelength.

O. Bryngdahl was more concerned — as he himself put it — to deliberately distort a picture than to correct distortion. This was his way of describing devices, including computer-generated holograms, to perform image transformations and localized distortions such as translation, inversion, rotation and stretching. His transformation of a Volkswagen Beetle into a 12-passenger limousine was greeted with acclaim.

Social Activities

The official business of the Conference was matched by an equally well-organized social programme. On the first day, in addition to the opening ceremony and official reception, there was an exhibition of boomerang throwing, following the tradition established at the first conference ten years earlier. There has been some speculation that this may lead to a Decennial Opticians' National Games, the Australian manifestation of which would be singularly appropriate to the associated acronym.

The Conference Dinner at the University Staff Club was highly successful, not least because the official speeches were kept to a minimum. The highlight of the evening was possibly A. Marechal's 12-word address in praise of Australian wine. Delegates were also able to attend a symphony concert at the Sydney Opera House.

The conference committee deserve the warmest congratulations for the work which they put into the organization of the overall programme.

LETTERS

High School Physics

SIR:—A recent article [P.L. Gardner, Nature, 250, 465, 9 Aug. 1974] may be of interest to readers in view of recent AIP discussions on the "swing against physics": (AP, p. 141, July 1974.) Stimulated in part by a decline in high school physics enrolments in Victoria in 1971 and 1972, Gardner (Faculty of Education, Monash University) surveyed over 1000 students before, during and after their first year of a PSSC course. His results, very briefly, indicated that students were much more likely to be "turned off" physics by interactions between teacher behaviour and student personality, rather than by the effects of curriculum changes. He concludes that the current decline in support for nationally-funded curricula and the growth in pre-service and in-service training of teachers are moves in the right direction.

—J.C. MacFarlane,
National Measurement Laboratory,
Chippendale, NSW.
Academy of Applied Science, Engineering and Technology.

SIR: Our attention has been drawn to a statement in The Australian Physicist, July 1974, 137, on "a proposal" submitted to members of the Conference of Allied Societies by Dr W.I. Whittone (RACI) and Dr K.T.H. Furrer (RACI) concerning the formation of an Academy of Applied Science, Engineering and Technology.

I would be grateful if you would allow me to correct what seems to us to be a wrong emphasis. Dr Whittone and I attended the meeting not as members of the RACI but as members of the Steering Committee for an Academy, and not to submit a proposal, but, as a matter of courtesy in view of discussions held among individuals, to inform officers of Allied Societies formally of the history and current situation concerning movement towards a second Academy. In fact, much more has happened since.

On 3 July, in Melbourne, a group of thirty-three men drawn from many disciplines and fields of endeavour formally constituted themselves to be a Council for an Academy of Applied Science, Engineering and Technology. Sir Ian McLeRae was elected President, and Dr H.K. Worner, FAA, Secretary. The Treasurer is Mr H.A. Wills. An Executive Committee was elected, and has met three times, Finance and Membership Sub-committees are now working, and a start has been made on the mechanics of formally constituting an Academy concerned primarily with the applications of science, the exact name of which has yet to be decided. Close touch has been maintained with the Australian Academy of Science throughout the long gestation period and a warm message of encouragement was received from the President, Professor G.M. Badger, at the meeting on 3 July.

-K.T.H. Furrer
Chairman, Executive Committee,
Council for an Academy of Applied Science, Engineering and Technology.

IOP Membership

SIR:—Shortly I will, for the second time, be under the necessity of paying membership dues direct to the IOP in London. The decision last year by the AIP to cease collecting dues from IOP members who also belong to the AIP seems to have attracted little comment.

From my personal point of view this was a deplorable decision, indicating no concern for the convenience of those members who had used the facility. Further, the costs for remitting small sums of money to London being what they are (my bank charges 56 cents commission to raise a cheque payable in English currency; postage costs a further 35 cents), IOP members sending money privately are collectively wasting a significant sum.

Added to these considerations, the AIP decision was to my mind a quite unnecessary gesture of indifference indicating a diminution of interest in its former parent body.

I would be very interested in some indication of the number of physicists reading this letter who are IOP members and who would use a bulk payment scheme. As a first step, I will be happy to add to my own remittance to the IOP the subscription of any member who cares to entrust it to me, in Australian dollars at the ruling rate plus 20 cents to cover mail costs, within 3 weeks of receiving his renewal notice from London. Any money so received will be acknowledged by me.

-D. Paix
Senior Lecturer in Medical Physics,
SAIT

OBITUARY

Dr G.R. Hercus

Dr G.R. Hercus MSc, D Phil, MAIP of the Solid State Chemistry Section of the Division of Chemical Physics, Clayton, died recently after a long illness.

After an MSc project at the University of Melbourne involving the design and construction of a mass spectrometer he joined the CSIRO Division of Industrial Chemistry in 1946 and was immediately sent to Pasadena for instruction in the use of a mass spectrometer then being manufactured in the United States.

When this was later shipped to Australia, Dr Hercus was responsible for its installation at Fishermen's Bend.

This was the first commercial mass spectrometer to be used in this country.

In 1950 he left to take up an ANU research scholarship at Oxford and while there gained his D Phil degree.

When he returned to Australia Dr Hercus rejoined the CSIRO and worked for the rest of his career in the Division of Chemical Physics.

Apart from his scientific work, Dr Hercus had a keen interest in Aboriginal languages and with his wife, a senior lecturer in Sanskrit at the ANU and a lecturer in linguistics at Monash University, he spent many holidays living with Aboriginal communities in the South Australian outback to record the voices of the few remaining speakers of ancient languages such as Aranda.
AUSTRALIAN INSTITUTE OF PHYSICS
NUCLEAR AND PARTICLE PHYSICS GROUP

SUMMER SCHOOL
GOOLWA, FEB. 17-20, 1975

The Summer School will be held at the Goolwa Conference Centre, which is near
the beach and the lakes at the Murray mouth.
Accommodation is at the conference centre or the nearby motel.
Professor M. Gell-Mann has agreed to be the principal lecturer.
Sessions will be in the mornings and evenings. Afternoons will be free for informal
activities or for participation in organized entertainment.

Registration fee: $20.00

For further details please write to the local organizer
Professor I. E. McCarthy,
Department of Physics,
Flinders University of South Australia,
Bedford Park, S.A. 5042.

THE NEW SOUTH WALES INSTITUTE OF TECHNOLOGY
SCHOOL OF PHYSICS AND MATERIALS

Applied Physicist — Engineer

Solar Energy

An applied physicist or engineer is required to carry out research and development
work in the field of solar cooling of buildings. Under the sponsorship of BHP and
ARGC the Institute is constructing a pilot plant for the production of water or
steam at 130°C to supply power for an absorption type air-conditioning plant.
The successful applicant should have an appropriate degree or diploma. He will be
responsible for detailed design of the apparatus and liaison with workshops at
NSWIT and at BHP Melbourne Research Laboratories.
Initially the appointment is for one year at an annual salary of $7,287.
For further information phone Dr. T. M. Sabine, on 20922, Ext. 2714.
Application forms are available from The Appointments Branch on
20922, Ext. 2543, and close with The Bursar, P.O. Box 123, Broadway,
Sydney, 2007, on 8 January 1975.
THE AUSTRALIAN NATIONAL UNIVERSITY

Research Scholarships
Research School of Earth Sciences

In 1973 the Department of Geophysics and Geochemistry was reconstituted to form the Research School of Earth Sciences, and Professor A. L. Hales was appointed as the first Director.

The University offers a limited number of scholarships to applicants of high scholastic calibre with a capacity for research, who hold, or expect to hold, a good honours degree (generally at least upper second class honours). Some of these scholarships are tenable in the Research School of Earth Sciences. Applications are sought from graduates with backgrounds in physics and mathematics and who are interested in pursuing a course for the degree of Doctor of Philosophy in the fields outlined below.

Research within the School is directed towards interdisciplinary studies in geophysics, geochemistry and geology. Areas of current research which relate to the techniques and concepts of physics and mathematics include:

- Experimental deformation of minerals and rocks under high pressure and temperature (including electron microscope study of deformation processes), with applications to flow within the solid Earth and to earthquake mechanics.

- Ancient and present-day variations of the Earth’s magnetic field and their relationship to relative motions of continents and to the electrical conductivity and temperature within the Earth.

- Use of seismic data in the determination of the parameters characterizing the earthquake source and of the physical properties (especially density and velocity and attenuation of elastic waves) of the Earth’s interior and their significance for geodynamic processes.

- Elastic and transport properties of minerals at elevated pressures and temperatures and, by comparison with observed properties of the Earth, elucidation of the composition of the solid mantle and liquid core.

Prospective students are invited to write informally to the Director regarding specific details of research projects in these or related fields.