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An Expatriate Looks at Australian Science

KEITH B. MATHER

Director & Professor of Physics, Geophysical Institute, University of Alaska College, Alaska, U.S.A.

Anyone seeing the above title will probably say 'Now he's going to be nasty!' 'Expatriate', as I understand it, means either to be driven from one's native land or to betake oneself voluntarily, though the distinction between the two may be somewhat obscured within the subtleties of volunteering to prosper and volunteering to perish. Either way, the term seems to carry the implication that he didn't like it in Australia and now he's going to tell everyone what's wrong. I could but I won't.

It is all too easy to be a professional knocker and Australian science is overstaffed with them now. The purpose of this article is to be constructive. If I sometimes criticize, it is only to set the stage for suggested remedies or improvements. The suggestions have not necessarily originated with me, in all cases, for I have had numerous opportunities to talk things over with other expatriate Australians (American science has many of them) and with visiting Australians. Nevertheless, I am not trying to shift responsibility; the overall scheme suggested below reflects my own opinions.

One other qualification: In looking at Australian science and making comparisons one must adopt and specify a frame of reference. If, for instance, I were to compare Australian science with that of South America, where I had occasion to visit recently, I could only say the sweetest things about Australia and Australians. Any problems faced by Australian science are minuscule compared with those of Argentina, Brazil, Peru, etc. Australia has political stability, a high standard of living, plenty of technician-class employees available, no uneducated peasant class to be a millstone round the economic neck, a background culture of education and technology, and it pays reasonable scientific salaries. South America has no counterpart to these tremendous assets, and one could similarly take as a basis for comparison most parts of Asia or Africa and many segments of Europe and conclude with a pretty favorable verdict for Australia.

But what if one takes North America as the standard? Professor David Caro, in his excellent (if somewhat depressing) survey of the problems of training physicists (The Australian Physicist, July 1964), makes the comment: 'It is noticeable that during the last decade Australia has moved from an agricultural to a balanced economy and the present economic pattern is markedly similar to that of a high income industrial country. It seems reasonable to compare Australia with other high income countries'. In this I wholeheartedly concur. Australia is rich in the small club of rich nations. It is legitimate therefore to compare its science and its scientific institutions with those of rich countries, and to enquire what improvements are suggested by the mode of organization of science among the elite. I have elected to take the U.S.A. as a standard, partly because it is the highest standard but also because some of the factors from which its strength stems would seem to be translatable to the Australian scene at the cost of no more than money and the right Bills through Parliament.*

Whatever the standard for comparison, no one of sane mind would write off contemporary Australian science lightly. Two Nobel Prizes have been won by Australian medical science in recent years; the name of the CSIRO is a byword in radio-astronomy and very highly regarded in many other branches of physical and biological science. Mt. Stromlo is one of the great observatories of the world, the

*Compare this with the obstacles to be overcome in underdeveloped countries,—long-term programs of mass education, at least one generation of industrialization and technological education, costly public health measures before anything else becomes very profitable, oftentimes unstable economics and turbulent politics.

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Antarctic Division if the Department of External Affairs has an honorable place in the annals of high latitude geophysics, there are pockets of research excellence scattered through the Australian universities, etc. These are just a few examples that come spontaneously to mind and I am confident that there are others.

The question is not whether Australian science is good in spots. It is. Nor is the question whether it is as good as U.S. science in general. The answer is plainly written in the number of expatriates in the U.S. and the widespread discontent with their lot among Australian university scientists. The interesting questions are:

What can be done to make Australian science better?

What has to be done to make the scientific scene more attractive to promising young men?

What else can be done for scientific staffs of universities to boost their productivity?

What positive steps can be taken to defuse the perennial problem of personality clashes and inter-departmental antagonisms?

The remainder of this article is an attempt to provide most of the answers in one large parcel. I could, of course, write about staff salaries (they could be better but they are not bad), the status of scientists in Australian society (c.f. the editorial in Science, Aug. 21, 1964), the lack of travel funds (see David Caro’s article), but I think all this has been said adequately many times before and is well recognized. The ‘large parcel’ aims at the core of the problem—the lack of research funds within the universities; the other ills, real or imagined, would tend to vanish as incidentals if the root cause is tackled.

AN AUSTRALIAN SCIENCE FOUNDATION?

Anyone who browses through American scientific journals will very soon meet that familiar acknowledgement: This work was supported by the National Science Foundation, Grant No. .......... Or, if not NSF, it might be any one of many major sponsors of science within the U.S.A. Immediately after the war and for a number of years until NSF came to fruition the major role was taken in the physical sciences (and to a lesser extent in biology also) by the Office of Naval Research, ONR. (A very fine account of the history of ONR was given by D. E. Gray in Physics Today, Sept., 1951.) A corresponding position in the biological sciences was occupied by the National Institutes of Health (NIH), and both remain strong and liberal supporters of basic and applied science to this day. Other sponsoring agencies, to name just the best known, are the various branches of the Air Force (the Office of Scientific Research, AFORS; the Cambridge Research Laboratories, AFCRL; etc.), the Army (Electronics Research and Development Laboratories, ERDL; the Cold Regions Research and Engineering Laboratory, CRREL; etc.), the National Aeronautics & Space Administration (NASA), the Atomic Energy Commission (AEC), and the Department of Defense (DOD). Many others such as the Weather Bureau, the Coast & Geodetic Survey, the Geological Survey, the National Bureau of Standards, etc., sub-contract or make grants on a more restricted basis. And, finally, there is a host of private foundations (Ford, Rockefeller, Carnegie, Kellogg, Fleischmann, Kettering, Sloan, etc.) which, important though they are, we will not consider further here.

Chiefly I want to discuss the National Science Foundation and its implications, leading up to the suggestion that Australia would do well to create a similar independent agency of government, charged with the prime responsibility for disbursing funds to worthy individuals for original scientific investigations. The reason for taking NSF as the pattern, rather than certain other sponsoring agencies, some of which disburse more money, is that only the Foundation is unbiased in supporting research in every scientific category, physical and biological and social, with regard solely to the merit of the proposed research. The other agencies all have their particular slants and idiosyncrasies (it would take a book-length article to describe them) but in one phrase they can be described as ‘mission oriented’, i.e., they themselves have a mission and they tend, appropriately, to support research which furthers that mission. I will come back to this later.

The National Science Foundation was established by Act of Congress in 1950 To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes, as it says in the preamble. Those who want the legislative details can get them from the original document, National Science Foundation Act of 1950, Public Law 507—81st Congress, and subsequent Amendments. The Annual Reports of the National Science Foundation are extremely informative, especially the Director’s Statement near the beginning, in regard to current trends and thinking.

The Foundation comprises a National Science Board (24 distinguished scientists, educators and administrators) and a Director, all of whom are appointed for a 6-year term by the President of the United States. There are Associate-Directors for each of the main functions—research, scientific personnel and education, and planning. Under the Associate-Director for Research come the Divisions of Mathematics & Physical Sciences, Engineering, Biological & Medical Sciences, Social Sciences, Institutional Programs, and the Office of Antarctic Programs. Within the divisions are various Sections and within each section are Programs, each having its own Program Director. When a grant is to be made for research it will be handled by the ap-
propriate Program Director. However, NSF puts out numerous little brochures about its programs and procedures, so I will not elaborate further here.

The NSF budget for fiscal year 1964-65 is $420,400,000: this is after fourteen years of growth. The corresponding figure for Australia, scaled according to population, would be approximately $26,000,000. Not all of the NSF budget goes to support research outright; much of it is directed to science education programs, i.e., looking to the future (see breakdown, Table I).

Let us now look at the NSF from the point of view of a prospective grantee, i.e., a university man who has a pet project and needs money to get it rolling. How does he go about it?

I will tell you how we at the Geophysical Institute go about it, for we have extensive dealings with the Foundation. Our annual budget is about $2,200,000, 90 per cent of which comes from federally sponsored research. Out of some 40 grants and contracts 18 are from NSF. If you work this out it means that on the average about $38,000 of successful research proposals have to be sent out per week (and more than this, taking account of unsuccessful proposals). Nearly half of the proposals go to the Foundation. Among the grants that we have had as small as $20,000 and one (the IQUA special funding) for as much as $244,000 per year. A typical grant would probably be about $50,000 per year, and this might run for one year or several years.

The key to all this is the research proposal, a carefully prepared document of anywhere from three to thirty or more pages which (i) introduces briefly the nature of the research project being proposed. (2) discusses at some length the current state of knowledge in the particular field and thereby delineates clearly the need for the further research, (iii) describes in detail the proposed investigation, how and with what equipment it will be carried out, who will do it, etc. and (iv) provides a detailed budget (salaries, permanent equipment, expendable items, travel funds, station operating costs, publication costs, indirect costs, etc.). This involves a lot of work; it generally takes a scientist several weeks to put the entire manuscript together. In general, therefore, it pays to have preliminary discussions with the appropriate program director of NSF to get his general reaction to the idea before embarking on writing the proposal. Not that the program director will often give a firm opinion; such is not his function. But 'advisory' comments can be almost as helpful. He may say, for instance, 'You ought to have a talk to Dr. . . . at such-and-such a university. He's doing almost the same thing, and I doubt we would want to make two grants for the same scheme.' Then, best you think up something new or you're almost certainly wasting everybody's time. Or, more often, he will merely say, 'Sounds like a fine idea, why don't you put it in and we'll see how it fares with the reviewers. Of course, we are pretty short of money right . . . ' He always finishes up that way!

But assuming the initial reception to the idea is at least cordial, and that the proposal is written, it goes through various internal editing (exactly as though it were an article for publication) and it may even be sent to outside reviewers for comment, and their comments duly incorporated. Finally it is sent to NSF as a fully signed document for their consideration and (hopefully) funding. The signatures are those of the proposing scientist (the so-called principal investigator) and various university and business office officials.

Then the Foundation's procedures begin. It is sent to their chosen reviewers (experts in that field) and the results of the reviews of many such proposals are considered competitively at a Panel Meeting (the Panel comprising eminent scientists, appointed by the Foundation, for that specialty). Depending on the level of funding available in the NSF coffers at the time, a certain number of the proposals will be accepted, the others declined. Six months, perhaps more, have elapsed since the proposal was submitted.

The issuance of a grant to the individual's university (note that it is a grant to the university) will duly be notified in writing. The individual will be named as principal investigator, and the conduct of the subsequent investigations is almost wholly within his hands. The role of the head of the department is very minor, once the grant has been received, unless it becomes clearly evident that progress on the grant is poor without reasonable cause. Action would then be drastic. On such competitive funding one does not retain non-competitive staff. But the man who emerges from his first grant with flying colors has got himself a healthy start for another, perhaps bigger, grant. As his name becomes better known, both among the Foundation personnel and, by his research publications, among the scientific fraternity at large, so the grant-getting will tend to become easier and the proposal-writing a little less arduous. But the fact remains that sponsored research is always competitive.

Let us very briefly summarize some of the advantages of this scheme of sponsored research: (i) It is competitive. (ii) It places a premium on ideas. (iii) It forces a man to review the literature thoroughly. (iv) The way is open to get funds if the man is good, so it encourages the 'quality' man. (v) It supports people and not institutions. (vi) The fact that the grant is to the university and handled through its business office is a necessary fiscal safeguard. The grant may, and probably will be cancelled if the principal investigator leaves.) (vii) The scientist, if he becomes principal investigator on a grant, is virtually independent of the head

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of his department. If the head happens to be an unimaginative or obstructive dolt, the initiative of the younger staff is not forever stifled. (vii) On the other hand, if the head is thoroughly alive he can take the lead in promoting new lines of research and encouraging his staff to prepare research proposals. (viii) Inter-disciplinary proposals become more practical within the university structure. A physicist and a chemist, or a physicist and a biologist (or a whole group) can get together and pool their talents in a joint proposal. (ix) A substantial part of research grants is usually devoted to equipment. The effect on certain industries of having part of Foundation grants passed on to them is to stimulate their own research and development. This has been a notable feature in the U.S. To expand on just one of these items, let me recall a conversation I once had when visiting a cyclotron team. It went something like this:

QU: What are you doing with the cyclotron now?
ANS: We're doing reactions of protons on copper.
QU: Why protons?
ANS: Well, the cyclotron produces a proton beam.
QU: Why copper?
ANS: It's fairly easy to produce thin copper targets.
QU: But surely there is some physical reason for studying this particular reaction?
ANS: We're hoping so. But in any case it's very good training for M.Sc. students.

It is incidental, of course, that this was in fact very bad training. To do pointless research is no more intellectual experience than peeling potatoes. But the relevant point is that such research would never get to first base if it had to go through the mill of competitive funding via proposals. Yet too much Australian physics, it seemed to me when I was there, consisted of little more than tinkering with equipment (possibly very elaborate equipment), with only the haziest notion as to goals and objectives. The equipment became an end in itself. It is so easy to say 'I'm going to determine some energy levels' or 'I'm building an ionosonde' or 'We are planning some angular correlation experiments' or 'We need a higher power radar' (or a Van de Graaff, or helium liqueur, or nuclear magnetic resonance gear—it can be any of the paraphernalia of science). It is so much more difficult to explain in detail with full documentation what will be done, why it needs to be done, how much science will be advanced by doing it. Sponsored research has a habit of weeding out the rubbish and finding the really significant and well considered projects—of which there are plenty in Australia, struggling for nourishment along with the weeds. Sponsored research can put the money where it ought to go and cut off the rest. This is the key point.

I have been pondering for some years and am now suggesting, not without certain misgivings, that Australia might be ripe for the government creation of an Australian Science Foundation (ASF), a counterpart in purpose and similar in mode of operation to the U.S. National Science Foundation. It is certainly true that the ASF would be a fillip to science and a boost to morale merely by disbursing grants to individual scientists within universities and (possibly) other organizations. It would presumably make provision for several international symposia in Australia per year, offer travel funds for Australians wishing to attend foreign meetings, provide the full costs of visiting professorships to Australia, assist in publication costs of major works, and offer fellowships to promising post-doctoral candidates and pre-doctoral students.

The idea of an Australian Science Foundation, patterned on the American scheme, is not new. I can remember lunch-time discussions of the subject at Melbourne University prior to 1961. But the time did not seem ripe, and there were still uncertainties as to what the effect of the Australian Universities Commission would be and to what extent the Australian Academy of Science would exert scientific leadership and influence the government. Now it is clear that something more is needed.

Any misgivings which I have stem primarily from the cynical feeling that some Australians, in the worst tradition of British universities, are small-minded, ungenerous, illiberal, parochial and over-ridingly guilty of the sin of envy when it comes to passing judgment on the work and the successes of their should-be colleagues in some other department or another university. I deplore it but fear it is true. Would it be possible for, say, a physicist at Sydney University to obtain a fair review of his proposal if it went to a physicist at the National University?

The United States, with its population more than an order of magnitude above Australia's, offers enough variety of high talent in any one field of specialization that many reviewers can be found by the Foundation for any one proposal. Can this be done in Australia? If not, one solution might be to enlist foreign reviewers when difficulties occur. In any case, it would place more responsibility upon the program directors' discretion and wisdom. They would need to know the Australian scene intimately and make allowances here and there.

This sounds like torpedoing the scheme at the outset. Not so; I am merely drawing attention to the danger spots of sponsored research in a small closed community. (Similar problems, though not very serious, have had to be faced in the U.S. over the 'conflict of interest' question; see the editorial in Science, Nov. 23, 1964.) In my opinion, the potential gain to Australian science warrants all the risks incurred in the creation of an Australian Science Foundation.

When I reached this point in writing the article I called up my friend Dr. Earl Droessler, Head of
the Atmospheric Sciences Section of NSF in Washington, D.C., and yarnd to him about the idea. (I hope he won't mind being quoted.) Eard spent a year recently in Australia, on leave from the Foundation, so he knows both the American and Australian environments and he certainly knows the game of sponsored research from Capitol Hill to the boondocks. I was delighted to find that he came out unequivocally in favor of an Australian Science Foundation at this time. He also told me that the Australian Academy of Science had already gone on record in favor of its creation. The reviewing of proposals, he agreed, posed a problem, but he recommended using overseas scientists to supplement local reviewers. (By the way, Australia would be wise to enlist the advisory aid of such experienced American scientists as Dr. Droessler when the time comes to establish its own Foundation and to define its role and modus operandi. There are pitfalls; the U.S. has already met most of them and Australia may as well benefit from that experience.)

**ITS ORGANIZATION**

Unless good reason were shown for departing from it, the structure of the Australian Science Foundation should be organized on the U.S. pattern—a Controlling Board appointed by the Prime Minister on the advice of such bodies as the Australian Academy of Science, the Executive of CSIRO, the Vice-Chancellors of the Universities, the Australian Universities Commission, and possibly the heads of some government departments. The Director would be appointed by the Prime Minister on the advice of the Controlling Board, and all lower appointments (program staffs, etc.) would be handled by the Director.

It can be anticipated that programs would be developed within ASF according to scientific discipline, growth of funding and availability of administrative staff, along the American lines. From the outset it should contain programs in physical, engineering, biological, medical, and social sciences. However, in view of the tautness on the part of Australian science (excepting a few notable cases such as the CSIRO wool research) to recognize the fruitful field of interdisciplinary studies, all programs should be inherently flexible and encourage inter-program proposals from inter-departmental scientists.

Moreover, it is very important that the ASF establish within itself a strong liaison section, the equivalent of a program, which would maintain the closest working relationships with the CSIRO and the Academy. This is a feature which, so far as I can see, has no counterpart of comparable significance on the American scene. The CSIRO is now a major research enterprise by world standards and every effort should be made to utilize its laboratories and staff in association with the universities, as follows:

(i) By providing grants to enable university staff to join CSIRO laboratories for prolonged (1-3 terms) research tours.

(ii) By financing the sojourn of CSIRO research staff within university departments to lecture advanced students and initiate research projects within their fields of specialty.

(iii) By exploiting available CSIRO facilities for thesis projects for Ph. D. students, under supervision of CSIRO staff.

(iv) By insisting, likewise, upon the full integration of other established facilities and institutions of repute within the research-education framework (e.g., the Weather Bureau, the Bureau of Mineral Resources, the Department of Supply, the Australian Atomic Energy Commission, the Antarctic Division, etc. These are by no means uniformly good, but in all of them there are appropriate 'pockets' of quality which should be integrated into the total research and training pattern).

Neglect of one and all of these opportunities has been a classic failure of the Australian Universities Commission. In other words, I am saying don't spend unnecessary money in duplication. Use the existing facilities and qualified manpower more efficiently before 'crying poor'. On the scientific level, Australia needs a McNamara* to take a cold look at the whole picture. Before launching pell-mell into disbursing grants round the countryside, an ASF program director should ask 'Who else is doing this; does the equipment already exist; if so what is its utilization factor? Hence the need for the liaison section. The ASF would have to be fully informed; in many instances it may have to take the initiative in opening up to university staff and students laboratories that are now sealed,—sealed because no one has tried thawing the wax.

The liaison with the Australian Academy of Science is equally important, for different reasons, and here the parallel is closer to the U.S. The Academy has a sort of watch-dog role. It should be alive to trends and developments in science across the board, and it should alert the ASF to the need for putting more funds here or there to exploit recent surges of interest. Control of the funds should remain firmly with the ASF, of course, but a comfortable working relationship between the two groups is mandatory.

Ideally, it would be advisable for the ASF, the Academy, the CSIRO and the Universities Commission to report to the same Minister in the interests of consolidating future co-ordination.

Far and away the most vital feature, however,

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* R. S. McNamara, U.S. Secretary for Defense. His policies in regard to efficiency and thorough evaluation and the closing down of obsolete facilities have provoked much controversy.

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is that the ASF would sponsor research on a competitive basis. This means unsolicited proposals, reviews, and acceptance or rejection according to merit. If there is any departure from this general principle, it might be on grounds of regional equitability (a very touchy subject among U.S. Congressmen at present) or, on the advice of the Academy, by selecting proposals in a certain field of research with the object of initiating it or intensifying the effort therein.

THE COST

An Australian Science Foundation will cost a considerable sum of money and somewhere along the line someone is going to have to convince the legislators that in today's technological world the rich are rich because they are also technological and that technology has its cradle in basic science. That investment in science pays better national dividends than any exotic stocks is almost axiomatic to those familiar with the history of science, but then legislators are not usually au fait with science or its history. It is a selling game and I have only one piece of advice for the salesmen: Many of the touchy questions can be anticipated by reading the Congressional Record. (See, for instance, the Independent Offices Appropriations for 1965, Part I, pp. 511-569, Part II, pp. 1626-1672; it is also entertaining to read the exchanges printed in Government & Science, Hearings before the Subcommittee on Science, Research and Development of the Committee on Science & Aeronautics, U.S. House of Representatives, 89th Congress, Oct. 15-29, Nov. 5-20, 1965; see also 'Science and Federal Programs: The Continuing Dialogue', Science, May 22, 1964; 'Science and the 1964 Election', Science, Oct. 2, 1964; 'Justifying Basic Research', Science, Jan. 1, 1965; 'Science and Public Policy', Physics Today, Jan. 1965.)

What will it cost? I have given neither the time nor the thought to exploring this in any depth, but the figures in Table II came to mind as a reasonable starting point and growth rate for the first five years. The universities could not absorb funds effectively in the initial years much faster than this, I suspect. The Foundation's budget might be expected to reach a plateau in 15 years, after which it would keep pace with population growth and changes in cost of living.

OTHER AVENUES

In the United States, as remarked earlier, there are many federal sponsoring agencies, most of the others having commitments to a particular mission. NASA supports a large volume of university (and industrial) research, all of it being space-related to a greater or lesser degree. Likewise the AEC is the major supporter of the big accelerator facilities, nuclear physics in general, and many related fields in engineering, chemistry and biology. There are enough such specialized agencies that, by and large, the field of science is covered. The military agencies are more difficult to categorize. True, they have obvious commitments to hardware and striking power, but their Ph.D.-loaded staffs, in pursuit of 'keeping ahead', enjoy a considerable amount of latitude as to what they sponsor within universities or elsewhere. Their attitudes vary widely among the various departments and laboratories, some being more liberally disposed towards basic science (the long-term investment) than others, but sufficient to remark here that military support is an important factor in university research. I want to make the point that all this is additional to the National Science Foundation. In other words, there are other avenues.

As this article has grown interminably lengthy, I will not dwell in detail on the corresponding avenues of research sponsorship that are almost or entirely non-existent in Australia, even though in many cases the corresponding organizations exist. But just a few examples:

It is not sufficient for the Department of Supply to occasionally allow, as a personal dispensation of infinite generosity, a university scientist to put a payload in a rocket at Woomera. How many university scientists is the Department of Supply encouraging by substantial research grants to participate in the space program? How many Ph.D. students are writing theses on investigations done at Woomera with Department of Supply sponsorship? Multiply these questions throughout the AEC, the Departments of the Air, Army and Navy, the

### Table I

<table>
<thead>
<tr>
<th>Activity</th>
<th>Distribution of fiscal year 1964 appropriation</th>
<th>Distribution of fiscal year 1965 appropriation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic research project support</td>
<td>110.7</td>
<td>125.0</td>
</tr>
<tr>
<td>Development and improvement of institutional science programs</td>
<td>52.0</td>
<td>74.0</td>
</tr>
<tr>
<td>Specialized research facilities support</td>
<td>19.0</td>
<td>25.9</td>
</tr>
<tr>
<td>National research centers</td>
<td>19.0</td>
<td>19.0</td>
</tr>
<tr>
<td>National research programs</td>
<td>24.6</td>
<td>40.5</td>
</tr>
<tr>
<td>Science education programs</td>
<td>10.3</td>
<td>11.8</td>
</tr>
<tr>
<td>Science resources planning</td>
<td>103.2</td>
<td>108.7</td>
</tr>
<tr>
<td>Program development and management</td>
<td>1.8</td>
<td>2.0</td>
</tr>
<tr>
<td>Total</td>
<td>353.2</td>
<td>420.4</td>
</tr>
</tbody>
</table>
TABLE II
Suggested Budget for Australian Science Foundation
First 5 years
[In kilo-dollars]

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research project support:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,880***</td>
</tr>
<tr>
<td>Mathematical &amp; physical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>910</td>
</tr>
<tr>
<td>Biological &amp; medical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,300</td>
</tr>
<tr>
<td>Social</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>675</td>
</tr>
<tr>
<td>Subtotals</td>
<td>490</td>
<td>1,360</td>
<td>2,985</td>
<td>4,925</td>
<td>6,765</td>
</tr>
<tr>
<td>Specialized research facilities</td>
<td>100</td>
<td>260</td>
<td>550</td>
<td>900</td>
<td>1,230</td>
</tr>
<tr>
<td>International participation programs</td>
<td>50</td>
<td>130</td>
<td>275</td>
<td>450</td>
<td>615</td>
</tr>
<tr>
<td>Liaison &amp; information surveys</td>
<td>40</td>
<td>70</td>
<td>95</td>
<td>115</td>
<td>130</td>
</tr>
<tr>
<td>Educational programs:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fellowships</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,135</td>
</tr>
<tr>
<td>Scholarships</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>985</td>
</tr>
<tr>
<td>Summer Institutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>310</td>
</tr>
<tr>
<td>Symposia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>215</td>
</tr>
<tr>
<td>Visiting scholars</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>245</td>
</tr>
<tr>
<td>Foreign travel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>180</td>
</tr>
<tr>
<td>Subtotals</td>
<td>250</td>
<td>650</td>
<td>1,375</td>
<td>2,250</td>
<td>3,070</td>
</tr>
<tr>
<td>Administrative costs **</td>
<td>70</td>
<td>130</td>
<td>220</td>
<td>360</td>
<td>490</td>
</tr>
<tr>
<td>Total</td>
<td>1,000</td>
<td>2,600</td>
<td>5,500</td>
<td>9,000</td>
<td>12,300</td>
</tr>
</tbody>
</table>

* Detailed breakdown according to program given for 5th year only.
** Assumes rental space; building costs additional.
*** Example of breakdown of M & P project funding, 5th year:

\[
\frac{36 \times 20,000}{144 \times 5,000} = 270 \text{ projects for } 2,880,000
\]

Department of Works, the Department of the Interior, the Department of Health. I cannot think of any better way to enliven their own futures and to assist the Australian universities than for these departments to devote a fraction of their budgets to sponsoring research. Experience in the U.S.A. has shown the benefits to be mutual.

Such sponsorship of the universities by government departments and agencies, if it came to pass (and I would bet my final bottle of old Haig & Haig that it would be resisted to the bitter departmental end) would in any case be no substitute for an Australian Science Foundation. The latter, alone, can brighten the horizons for the young scientist who has an idea that doesn't obviously line up with the mission of any government department. He needs encouragement, and nothing is so encouraging as dollars for his idea. Now he can work on it; now he feels wanted and appreciated. The Foundation, only, can do this. I hope the young man can get that support in Australia before... he gets a letter from me suggesting he join the expatriates.

THE AUSTRALIAN PHYSICIST, MARCH, 1965 45
Symposium on Crustal Seismology

Dr. R. Green, Grad. A.I.P.

When Dr. Dean Carter of the U.S. Coast and Geodetic Survey visited Australia in 1957, the Australian National University took the initiative on that occasion in organizing a gathering of seismologists from all parts of Australia. All who attended that meeting agreed that it should be the beginning of more or less regular meetings of Australian seismologists. Since then, important advances have been made in seismological investigations in Australia and it was highly desirable that a meeting be held to facilitate the interchange of information between the workers in the field. Following a series of suggestions, the University of Tasmania undertook to convene the meeting, and a symposium on crustal seismology was held in the Geology Department of the University of Tasmania, 24th-29th August, 1964.

On this occasion, we were fortunate in having as a participant from overseas Mr. George Eiby, from the Geophysical Division of the New Zealand D.S.I.R. We were particularly pleased in having someone from New Zealand because that country has a history of accomplishment in seismic research and their experience is of value to Australian seismologists. One of the features of the Symposium was that adequate time was given to speakers to present their observations, and discussion following the paper was encouraged. It was felt by the 22 participants that this approach was highly successful and that they derived greater benefit from the symposium than could possibly be gained from a larger gathering. It was also felt that this practice of restricted numbers could be taken over with similar advantage by other specialist groups.

PAPERS PRESENTED

Monday, 24th
Opening remarks. Dr. R. Green
Definitions of the Crust. Prof. S. W. Carey
Seismicity and crustal structures of S.E. Australia. Mr. H. Doyle
Lunch.
Inspection of the University of Tasmania.
Tuesday, 25th
The crust and upper mantle in New Zealand. Mr. G. Eiby
Crustal structure in South-Western Australia. Mr. I. Everingham
Lunch.
A study of travel times from some Australian earthquakes. Mr. R. White
Visit to Mt. Wellington. (ABC-TV and radio telemetered seismic repeater.)
Wednesday, 26th
Crustal structure studies in Tasmania. Dr. R. Green

Techniques for first motion studies. Mr. R. Underwood
Lunch.
Discussion on the most suitable form and means for the interchange of seismic information.
Discussion on seismic research.
Led by Dr. R. Green

Thursday, 27th
Electronic instrumentation for seismology.
Filtering methods in seismology.
Prof. G. Newstead
Electronic instrument for seismology
(the Tasmanian and Rabaul seismic nets).
Mr. P. A. Watt and Prof. G. Newstead
Lunch.
Automatic digital processing of seismic data.
Mr. G. The and Mr. K. Muirhead
The Vice-Chancellor (Prof. K. S. Isles) entertained participants in the symposium.
Participants invited to an address on "Deep and shallow focus earthquakes in New Zealand", held under the auspices of the Geological Society of Australia—Tasmanian Division. Mr. G. Eiby
Friday, 28th
Proposed investigation of crustal thickness variations in New Guinea. Mr. J. Brooks
Discussion of Geophysical work in New Guinea. Mr. P. St. John
Lunch.

For the benefit of readers who are not solid earth geophysicists I will summarize the week's deliberations but I wish to point out that this brief summary is my impression of what the individual speakers said.

SUMMARY OF SYMPOSIUM

The symposium began with a most appropriate paper by Professor S. W. Carey in which he examined the definitions of the crust. He traced the historical development of the concept of the crust and pointed out that the velocity discontinuity found to exist by seismologists and accepted by them as the boundary between the "crust" and the "mantle" is certainly not the same discontinuity as is found by other methods, such as, for instance, the magneto-telluric method. One is a velocity discontinuity and the other is an electrical conduction discontinuity. He suggested that we retain the term Mohorovicic Discontinuity for the seismic discontinuity and that in all geophysical papers the "crust" be defined as being a seismic, gravity magneto-telluric, etc., type of crust. It is only by clarity at this stage can confusion be avoided at a later stage.
The six papers dealing with the structure of the crust and upper mantle can be grouped together. In south-east Australia in the past six years, there have been some fifty tremors large enough to have their point and time of origin accurately fixed by the seismic network operated in the Snowy Mountains by the Australian National University. Consequently these data are of value in determining crustal structure. Of this number, three tremors Robertson (1961), Berridale (1959) and Rock Flat (1958) were sharp enough to cause damage.

The crust in the area can be generalized as follows:

<table>
<thead>
<tr>
<th>Depth km</th>
<th>P-wave velocity km./sec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5.5</td>
</tr>
<tr>
<td>1-2</td>
<td>5.8</td>
</tr>
<tr>
<td>15</td>
<td>Upper Crust</td>
</tr>
<tr>
<td></td>
<td>poorly defined irregular boundary</td>
</tr>
<tr>
<td>37</td>
<td>Lower Crust</td>
</tr>
<tr>
<td></td>
<td>irregular boundary</td>
</tr>
<tr>
<td>39</td>
<td>Moho</td>
</tr>
</tbody>
</table>

MANTLE

In Tasmania some sixty epicentres have been fixed by the Tasmanian radio-telemetered net. Of the sixty tremors, five have been widely felt. Gravity work in the State has further shown the extension to depth of a number of graben structures, striking north-west across the State. The crustal structure in Tasmania is similar to that given but it differs in the following ways:

1. the crust is 40 km. thick.
2. the velocity of the upper mantle is 7.9-8.0 km./sec. Evidence was put forward that the proportion of basic rock increases with depth and that extensive inter-digitation of crust and mantle occurs at the Moho.

Based on the results of A-bomb blasts and the earthquake travel-times to the various Australian seismic stations, it was shown that the crust thins towards the west reaching a minimum of 33 km. in the far west of South Australia. Towards the south-west of Western Australia the crust thickens but it is very different from that in the eastern States. The difference is impressively displayed by a comparison of the recorded ground movements in the two areas for shocks of similar epicentral distance. The West Australian record is characterized by a spaced series of very sharp impulses; each corresponds to a clear distinct ray path. On the other hand, in eastern Australia the record lacks such clarity of arrivals. In addition in the east, the pulse that comes through the crustal layer P (6.0 km./sec.) dominates, even at distances well beyond the critical distance at which refracted rays from the mantle come in. Geologically, the west is a granite shield area whereas the east is part of the Tasman geosyncline which has undergone repeated folding throughout geological time. In the discussion, the fact that terrestrial heat flow in the east is twice that in the west was pointed out and it is apparent that the seismic and geochemical models agree, in that the crust in eastern Australia is much more complicated than in the west. The simple layered structure of the west is a fact and not an artifact of lack of data.

However, for a really complicated crust, New Guinea is most impressive. The departure of the geoid by some 52 metres from the reference ellipsoid is centred on New Guinea and gravity anomalies of a few hundred milligals are associated with such features as the Ramu-Markham trough and the Sepik. Earthquakes are very common, running into several hundreds of detectable ones per annum. The crust is thicker than normal and velocities are slower. A low velocity layer exists over the range of depths of 75-150 km. With the limited number of stations at present operating in New Guinea, little improvement in precision can be made in detailing the crustal structure by using body-waves, but the symposium heard of a proposal for three movable stations each equipped with matched seismometers (frequency and amplitude) so that accurate determination of crustal thickness could be made by this method.

A highly sophisticated but spatially small, telemetered net has been constructed for vulcanological research and eruption-prediction service at Rabaul. It is worth study not only by seismologists, but by all physicists who have the problem of the operation of out-stations together with demands of high reliability of operation.

The paper on first motion studies related these movements as registered on the surface of the Earth to the proper sense of movement at the earthquake focus and furthermore demonstrated that seismic nets provide sufficient fidelity and spatial control for the direction of ground movements in New South Wales to be stated. These directions of first motion are symptomatic of the stress field in that part of the crust under consideration.

The special session on electronic instrumentation for seismology began with examination of the seismic signal in terms of a combination of 'signal' and 'noise', in which case improvement of the signal to noise ratio can be achieved by using filters which discriminate against 'noise'. However, filtering may be on the basis of frequency filtering, correlation filtering or velocity filtering. Each of these was examined in turn, bearing in mind the frequency range (0.1-20cps) and dynamic range (60 db) of genuine seismic signals and that seismic 'noise' is only roughly a combination of white and band-limited noises. This led to the determination of band-width necessary for the telemetry of genuine seismic signals with a given S/N ratio.

It was pointed out once the analogue outputs of a number of seismometers have been telemetered to a central recording stations the most powerful method of processing the data is to carry out auto- and cross-correlations. However, seismology is a real-time data processing problem and a practical
method is necessary. A suitable stieljes correlator, built by the University of Tasmania, was described to the meeting.

The discussion on the most suitable form and means for the interchange of seismic information dealt with the conventions to be adopted by Australian seismologists and is of interest to anyone except practicing seismologists. However, a topic which will excite all geophysicists, and interest physicists in general, was a discussion on seismic research. It must be remembered that many worthwhile seismic research projects are beyond the financial resources of any one university or research organization in Australia.

It was resolved that one major project be selected, and a unified effort be made by all groups interested in seismology to co-operate with one another on the single selected project.

PROPOSAL FOR CO-OPERATIVE RESEARCH

It was noted that experiments, such as a Maine seismic experiment and more recently the Lake Superior project which was carried out as an international co-operative experiment to determine crustal and upper mantle structure of North America, have been highly successful. A similar project for Australia was discussed (Thursday 26th 2.00 p.m.) and in particular such questions as the logistics and feasibility of the project were examined.

It was noted that Bass Strait offers the best location in Australia for this type of project for the following reasons:

1. The Strait is a continental structure.
2. The water depth is ideal, being not too deep for placed charges, yet sufficient to contain the explosions, thus delivering the maximum acoustical coupling to the crust. Furthermore the structure of geological layers is adequately known following marine seismic and aeromagnetic surveys.
3. Recording arrays could be set up in Tasmania and Victoria with little difficulty and this arrangement would permit the use of reversed profiles.

(4) Broadcast of the timing of the shot can be provided through the Mt. Barrow repeater and the shot instant recorded on the University of Tasmania seismic net. Signals from the new time signal station VNG (5.5Mc/s, 7.5 Mc/s, 12 Mc/s) are clearly received in the whole region.

(5) A number of 1,000lb. charges could be fired at a known place (relative to islands on the Kent and Furneaux groups) and at a known time (see item 4), providing a seismic source, of known location, of fixed time and sufficient magnitude.

(6) Existing seismic instrumentation would provide definitive crustal measurements but improved instrumentation is to be investigated and a recommendation made as to the most suitable equipment, so that standardization may be achieved. The Bass Strait experiment can be conveniently scheduled for February, 1966. It was suggested that, in the light of the experience gained from the Bass Strait experiment, other sites around the Australian coast could be examined. Every group and organization that could make use of the Bass Strait explosions is urged to do so.

It was reported that in Australia there are now 47 seismic stations either operating or in a position to be operated. This shows the great improvement in seismic coverage in Australia in the past ten years.

This account of the symposium is of necessity brief. However, those members who are interested in any of the ramifications of seismology or who wish to discuss any point with the authors of papers presented to the symposium may write to Dr. Ronald Green, Geophysics Department, University of Tasmania, Hobart, Tasmania.

He will undertake the dispatch of all correspondence which relates to their enquiries.

PROFILE OF A UNIVERSITY PHYSICS DEPARTMENT — ADELAIDE

The history of the Adelaide Physics Department dates from 1875, when Horace Lamb was appointed Professor of Mathematics and Physics; his successor was W. H. Bragg after whom are named the new physics teaching laboratories completed in 1961. The development of the Department of Physics up to 1958 has been summarized by Sir Leonard Huxley (Introducing South Australia, A.N.Z.A.A.S., 1958) who succeeded Sir Kerr Grant as Elder Professor of Physics in 1949. This is not the place to attempt a detailed history of the Department, but no account would be complete that failed to acknowledge the major contributions made by Dr. R. S. Burdon and Mr. G. R. Fuller, during the many years when they were almost the entire academic staff of the Department.

The Adelaide Department of Physics now has an academic staff (lecturer and above) of eighteen; there are five demonstrators and about thirty research students most of whom are working for the Ph.D. degree. There is close collaboration both at the senior undergraduate and research levels with the Department of Mathematical Physics and the two Departments are accommodated in the same buildings. The major research interests of the Department of Physics are in the fields of atmospheric and space physics, solid state physics and x-ray crystallography, and seismology.

Adelaide is very favourably situated for research in atmospheric and space physics and, with the collaboration of the Department of Supply, the University has been able to extend considerably the research carried out in its own laboratories and field stations. The work is being supported by grants from the Radio Research Board, the Department of Supply and the United States Air Force.

The investigations which are being made fall into three closely related groups:

(i) Ground based observations:
Radar observations of ionized meteor trails in the upper atmosphere are being continued using improved techniques to obtain further information about meteor astronomy and about the circulation pattern of the air in the upper atmosphere.

The radio signals transmitted by artificial earth satellites are being observed in order to study irregularities in the ionosphere which produce scintillations in the radio signals recorded at the ground. Complementary measurements of the scintillation of radio stars are being made and the two techniques are providing new information about the size, shape and motion of ionospheric irregularities.

Motions, or drifts, in the ionosphere can also be studied by observing the reflection of radio waves transmitted from the ground and a very large area covering an area of nearly a square mile and consisting of 100 aerials and radio receivers is under construction for this purpose at the new Buckland Park field station. This equipment will provide a novel and powerful technique which will enable much more detailed ionospheric data to be obtained than is possible using existing methods.

Another method which is being developed in Adelaide involves the use of a high power, giant pulse, laser beam to study dust layers and density fluctuations in the atmosphere by means of optical radar.

(ii) High altitude observations.
Solar and stellar radiation of wavelength shorter than 3000Å is completely absorbed in the atmosphere and cannot be studied from ground based observatories. High altitude sounding rockets fired from Woomera are being used to study the atmospheric absorption of solar ultra-violet radiation. These experiments provide information about the energy balance of the atmosphere, assist in the determination of its chemical composition at various heights and are fundamental to an understanding of the production of the ionosphere.

Other rocket and balloon experiments are concerned with celestial X-ray studies, with the determination of the oxygen and ozone profiles at high altitudes, with measurements of the ultraviolet spectrum of moonlight and with cosmic ray observations.

(iii) Laboratory astrophysics.
Extensive laboratory studies of atomic collision processes are needed for the detailed interpretation of many atmospheric and astrophysical observations. The main lines of investigation which are being followed in Adelaide are concerned with electron-atom scattering, photo absorption and ionization in gases and other problems in vacuum ultraviolet physics. Major facilities which are available include a ½ metre Seya vacuum monochromator, a one metre normal incidence vacuum monochromator, a differential scattering chamber with intersecting electron and atomic beams, and a fast evaporator for the preparation of highly reflecting metal surfaces in the vacuum ultra-violet.

SOLID STATE PHYSICS AND X-RAY CRYSTALLOGRAPHY. (Drs. S. G. Tomlin, E. H. Medlin, R. Lawrance, L. G. Ericson and C. J. E. Kempster.)

Research in solid state physics covers a variety of topics. Electron-spin resonance studies of paramagnetic ions in inorganic crystals and minerals have been carried out, with particular attention being paid to forbidden transitions. The E.S.R. spectrometer is also being used in studies of the production of free radicals by radiation damage in organic crystals. Electroluminescence in evaporated films of ZnS has been studied extensively and optical properties of thin films of carbon and selenium are being investigated. The development of microwave methods for the study of semiconductors has been very successful and the work completed in Adelaide appears to open up a very promising field.

X-ray diffraction studies are mainly concerned with determination of the structure of nucleic acids and other molecules of biological importance. Theoretical and experimental work on the intensities of emission of characteristic X-rays is being continued.

SEISMOLOGY. (Dr. D. J. Sutton.)

The Department of Physics operates three seismograph stations: one at Mt. Bonython near Adelaide with 'worldwide standardised seismograph network' WWSSN) equipment, a three component station at Hallett, and a single component station at Cleve on Eyre Peninsula.

With this network of stations studies are being made of local earthquakes and crustal structure. The results of this work are being supplemented with information gained from quarry blasts using portable equipment as well as the permanent stations.

Theoretical Rayleigh wave dispersion curves are being computed for different crustal models and compared with the experimental dispersion curves obtained from long-period vertical records. Studies are also being made of microseisms and their relationship to weather disturbance and waves at sea.

—J. H. CARVER.
Notes and News

South Australian Branch

The lecture series of the South Australian Branch began on March 17th, 1965, with a talk by Mr. J. W. Holmes on 'Evaporation from Vegetation on Large Areas and Water Resources: Physical Principles'. Mr. Holmes is an officer in the Division of Soils of C.S.I.R.O. at the Waite Research Institute.

The lectures are held on the third Wednesday of each month except September in the Observatory Lecture Theatre of the Physics Department, University of Adelaide, at 8 p.m. The April 21st Lecture will be given by Professor M. A. Brennan on 'Some Modern Developments in Plasma Physics'. Other lectures will be listed as available in 'The Calendar'.

N.S.W. Branch

Branch meetings began on March 9th with a lecture given by Professor C. A. Swenson, Iowa State University. He spoke on 'The Inert Gas Solids'. Lectures are given generally on the second Tuesday of each month although extra lectures or changes in programme do occur to suit a speaker. The venue is generally Lecture Theatre No. 4, Physics Department, University of Sydney, at 7.50 p.m.

The next meeting will be on April 13th and will be given by Dr. Peter Pockley, A.B.C. Co-ordinator of Science Programmes on Radio and Television. His subject has not been announced.

The N.S.W. Branch introduced awards to the top Leaving Students this year. First Prize of £25 went to Neil Cramer of North Sydney Boys' High School and Second Prize of £10 to Andrew Fallos of Randwick Boys' High School. The two winners were also taken on conducted tours of the A.A.E.C. Research Establishment, N.S.L. and Radiophysics Laboratories of C.S.I.R.O., and the Physics Departments of the University of Sydney and the University of N.S.W. The tours covered three days. Finally, the Branch has offered to arrange payment of Student Membership fees for one year as part of the award. It is hoped that considerable interest will develop in these awards.

Changes of Address

All Branch Secretaries have asked that we publish a request to members to notify the local secretary of any change of address. It is becoming increasingly important that this be done quickly in view of the gradual change over to personal distribution of papers regarding meetings and so on and also of the Australian Physicist.

Where a member is moving overseas permanently or at least for two years, the Registrar is notified of the change of address and copies of the A-P are forwarded by the Editor. Where the stay is shorter, e.g., for sabbatical leave, the local Secretary sends on papers and the A-P. Please assist by notifying your local Secretary of changes of address so that he can keep his records up to date.

Physics in Medicine and Biology

The Fourth Annual Meeting on Physics in Medicine and Biology held in Sydney from 8th — 10th October, 1964, followed the example of previous meetings in presenting work from a variety of fields by a wide range of specialists with physics as a common factor. The programme, a summary of which had been published in the Australian Physicist in September, had been very smoothly grouped together by Mr. B. W. Scott acting as organizer and general manager for the Biophysics Group of the A.I.P. and the Australian Group of the Hospital Physicists' Association. We listened in four different lecture rooms, visited many laboratories and saw a lot of Sydney in between.

In the first session, the physicists joined the annual meeting of the College of Radiologists of Australia. Some applications of radioactive isotopes in cancer and other studies were described. The use of ultrasonic beams as an aid to medical diagnosis was explained and suffered a lengthy discussion. Other items included the measurement of erythemal ultraviolet in sunlight in relation to skin cancer and the application of computer methods to radiation dosages problems. The session demonstrated clearly the keen interest in physical procedures on the medical side — providing they have a medical application.

The afternoon found us engrossed in some of the research being pursued in the Physiology Department of the University of Sydney. Description of the detailed probing into the pulmonary nature of blood flow and into nerve action was followed by a visit to the laboratories where we were fascinated by the abundance of physical equipment and thingking to match. This brought a steady barrage of questions from our physicists and it is hoped that this exercise was of as much benefit to our demonstrators as it was to us.

The second day's activities were at Lucas Heights as guests of the A.A.E.C. and A.I.N.S.E. Here it was appropriate to discuss physical techniques and measuring devices for their own sake without so much thought for particular applications. Progress in thermoluminescence dosimetry was outlined and also in measurement of high-activity gamma-ray sources. Whole-body counters of different designs were described, two for rats and one for humans. After the visitors had described their own devices, the A.A.E.C. provided an inspection of new accommodation and facilities including health physics re-
search and the production of radioactive sources for therapy and industry. Just in case the earlier discussion of nuclear accident dosimetry might seem purely academic in the normal Lucas Heights environment, a film of an overseas accident demonstrated that although nuclear reactors have developed into smooth-running, reliable devices there can never be any departure from endless vigilance especially with semi-trained personnel.

The final session in the Department of Medicine in the University of Sydney dealt with more academic physiological processes being investigated by physical methods, mostly using radioactive isotopes. For further variety, there was an exposition of the way in which certain biological control processes follow the physical principles of servo mechanisms. This was followed by laboratory demonstrations in the Department of Medicine. The whole programme came to a fitting climax with a grand procession through the streets of Sydney. Unfortunately this was not on our programme so that the only members of this meeting who saw anything of the parade were those who had to thread their way through it while endeavouring to catch planes to their respective States.

The Fifth Annual Meeting of the Biophysics Group will be held in Brisbane in October, 1965. This will be the first of these meetings to be held in Brisbane where there will be plenty of fresh ground to cover. Anyone with bio- or medico-physical interests will be welcome.

The local organising secretary is Mr. D. F. Robertson, Department of Physics, University of Queensland.

Australasian Newsletter of Medical Physics

In the February issue, mention was made of the publication put out by the Biophysics Group and the Australian Group of the Hospital Physicists' Association. The Australasian Newsletter of Medical Physics is published four times per year and is sent free to all members of the Biophysics Group. Additional subscriptions may be taken out at 10/- per annum, and separate copies are available on application to the Honorary Secretary, Biophysics Group, Mr. K. H. Clarke, Cancer Institute, 278 William Street, Melbourne.

Second A. D. Ross Lecture

In 1962, the Western Australian Division of A.N.Z.A.A.S. instituted the A. D. Ross Lectures to commemorate the public work and contributions to science of Professor A. D. Ross; members will have already seen the citation relating to Professor Ross on the award of an Honorary Fellowship of the Australian Institute of Physics. The first A. D. Ross Lecture was given on 27th November, 1962, by Sir Mark Oliphant, who took as his subject 'Education and the Age of Science'.

The second A. D. Ross Lecture was given in the Winthrop Hall of the University on 5th March, 1965. The speaker on this occasion was Professor A. E. Alexander, F.A.A., who was appointed to the chair of Physical Chemistry at Sydney University in 1956. As the title for his address, he selected 'University Organisation and Government: a Century out of date'.

S.A. Institute of Technology: Physics Department

We extend a welcome to Mr. Cyril George Wilson who arrived in Adelaide to take up his appointment as Head of the Physics Department of the South Australian Institute of Technology. He will become the first Head of the Physics Department which formerly was part of a combined Mathematics and Physics Department.

Mr. Wilson is a graduate of Leicester University College and since 1949 has been on the staff of the Royal Military College of Science at Shrivenham where, for the past eight years, he has been a Principal Lecturer in Physics. In addition to academic duties, Mr. Wilson has been responsible for the administration of the Rutherford Laboratory which was set up in 1956 to teach nuclear science to all students passing through the College at levels up to and beyond pass degree standard.

Mr. Wilson's personal research interests are in the field of crystal structure, particularly the structural changes in alloys caused by neutron irradiation, together with an interest in plastic deformation and self-diffusion in gallium.

Errata

We regret to advise that there was an error in the list of Office Bearers of the Australian Institute of Physics published on page 11 of the January, 1965, issue. In the section relating to the Biophysics Group, 'Mr. B. W. Scott, A.A.I.P., State Bureau of Physical Services, Royal Prince Alfred Hospital, Camperdown, N.S.W., should read 'Prof. E. P. George, F.A.I.P., School of Physics, University of N.S.W., Box 1, Post Office, Kensington, N.S.W.'.

Members' Addresses Required

Following the return of correspondence by the Dead Letter Office, the Secretary would be grateful for the present addresses of the following members whose former addresses are given: Mr. A. J. Webb, Grad. A.I.P., 57 Raes Ave., Coorparoo, Qld.; Mr. I. Lowe, Student, 9 Ian Street, Kingsford, N.S.W.

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