ELECTION OF EXECUTIVE OF THE INSTITUTE

Under the Article of the Association of the Institute the Council is required to make nominations for Executive positions which become vacant at the end of the 16th Annual General Meeting (to be held on 16th January 1979). Notice is hereby given that the following are the Council’s nominees:

President: Prof. H. C. Bolton
Vice-President: Prof. N. H. Fletcher
Hon. Treasurer: Dr. C. J. Howard
Hon. Registrar: Dr. J. G. Collins
Hon. Secretary: Dr. J. R. Bird

Any additional nominations for executive positions must be made in writing by three members and accompanied by written consent of the nominees to accept office if elected. Such nominations should be received at the office of the Institute at the Science Centre, 35-43 Clarence Street, Sydney, N.S.W. 2000, by December 8th, 1978.

The Article of Association provides that:

(i) No person shall accept nomination for more than one office.
(ii) No member may nominate more than one candidate in any year for any one position.
(iii) No person who has held the office of President or Vice-President for a full term of office shall be eligible for election to the same office for the next succeeding term.

J. R. Bird,
Hon. Secretary.

CONTENTS

President’s Column .................................. 145
Letters ............................................. 146
AIP THIRD NATIONAL CONGRESS ................. 148
Welcome ........................................... 149
Programme and Speakers .......................... 149
Western Australia – People, Places and Physics 156

COVER: Aerial view of the main campus of the University of Western Australia looking from the Colleges towards the Royal Perth Yacht Club and Pelican Point. The Physics Department is the prominent light-coloured building right of centre, near the Reid Library (centre).

The statements made and the opinions expressed in The Australian Physicist do not necessarily reflect the views of the Australian Institute of Physics, its Council or Committees.
PRESIDENT’S COLUMN

The Swing Against Relevance

I have recently returned from the 11th General Assembly and Congress of the International Union of Crystallography held in Warsaw, Poland.

At that meeting I was particularly impressed by the quality of European science, and by the number of sessions devoted to pure science. No apologies for the lack of relevance to current social problems were made, and none were considered necessary.

It was only in work from outside Europe that any mention was made of relevance, and this was greeted with expressions of faint amusement.

Upon reflection it is obvious that this should happen. In the early ’70s science felt that it was in some way responsible for the problems of the world and, on the simplistic tenet that “what science can mess up, science can fix”, scientists felt an obligation to go into areas such as energy. In the intervening years it has become clear that science can do what it set out to do, and can find technological solutions; however, it is also clear that the scientific solution is only part of the whole. Political, social, economic and legal problems have equal or greater weight. When these are solved, and their solution is not our concern, we know that we can do our part.

In Australia the major problem is lack of planning and nowhere is this more evident than in the energy field.

We have spent five years actively talking about fossil fuels, nuclear power, solar power and no policy of any sort has been established. Technologists are saying “Tell us what you want us to do and we will do it. Do not waste our time and efforts on solutions you do not want”. Scientists are saying, “We will return to the real world of pure science. Call us, we won’t call you”.


LETTERS

SIR,

Dr Thompson, in her prize-winning essay on the Nuclear Debate, concludes by asking “May I know your thoughts?” You may certainly know mine. They are to ask, dear Editor, how such an essay comes to be published in the house journal of an organization of professional physicists. Apart from the question of style — which may be usual for prize essays but, for my part, “dear friend”, “an uncomfortable shudder goes down my spine — What about yours?” — the essay is completely unbalanced. Nuclear reactors generate electricity. A discussion of their role might start with an assessment of the demand for electricity and a discussion of whether reactors are one of the most suitable ways of generating it, where suitability is judged by availability of resources and comparative public hazard. There is no mention of electricity generation in Dr Thompson’s essay — apart from a passing reference “After 100 kWh of electricity has been generated by one of the larger thermal stations per year...” (Capacity factors do need improvement!)

To name but a few of the more glaring errors:

(a) “... the fuel rods...are long thin aluminium cans, called cladding, filled with uranium 238 whose isotopic content of uranium 235 has been artificially enriched...” (Apart from anything else the ubiquitous modern fuel element is zircalloy-clad UO2 and no power reactor ever used aluminium cladding).

(b) “The release of energy per nucleus is six times greater for hydrogen fusion than for uranium fission”. (Check that nuclear physics).

(c) In the fast breeder “the heat produced has to be pumped through the core to remove heat sufficiently fast”. (?)

(d) Speaking of supervision of mining: “Nowhere are there checks and balances incorporated to ensure that the recommendations of the Code of Practice will under all circumstances be carried out”. (Outrageously unfair to the recent regulatory legislation).

(e) “...it is proposed to vitrify the waste products... in a glass cylinder 50 cm diameter and about 75 cm high. These cylinders will be stored in water-filled ponds...” (Proposed dimensions are about 30 cm x 300 cm. The glass would be sheathed in stainless steel a few cms thick, and no one has ever proposed storage, even temporarily, in water-filled ponds).

(D) “...20 years ago the same oil companies, by lowering the price of oil and bringing pressure to bear on western governments, determinedly by undermined funding for all nuclear power research and development work. In fact both fission and storage of atomic waste would today be in a very much better state of development had financial support not been withdrawn on such a large scale.”

Accusations like this are out of place in our Journal.

A. W. Pryor.
SIR,

I would like to thank Dr Pryor for his thoughts, thus opening the debate. I must assume that he is not aware of the conditions set by the AIP for this essay. These were to aim the essay at the high school level, which I interpreted as including all non-scientific educated people; to have a maximum word limit of 5000 words and to be submitted prior to November 30th 1977.

The format of the essay was, therefore, considered to be of vital importance by me. After some mental searching I found to my great joy that, in addressing the debate to an individual person, I had just "rediscovered" the format of the great classic debates of Plato and Lucertius and therefore hoped that this would prove acceptable to members of the Australian Institute of Physics.

I am sorry that the 5000 word limit did not allow the vital discussion on the estimated demands for electricity, and this discussion should now follow in the "debate". I hope that Dr Pryor will find time to elaborate on this subject and also tell us about the most recent regulations in the Australian Code of Practice on Radiation Protection.

The shortage of time between the initial announcement and the competition's closing date, plus the fact that no proof reading copy was submitted to me, may explain some of the errors although it is not an excuse! Error (b) should read energy per nucleon, 100 KWh had been changed to 100 MWh but the change got lost in the typesetting. Error (c) crept in by retyping the manuscript as the sentence had been withdrawn altogether and should read "Liquid sodium has to be pumped through the core to remove heat sufficiently fast." With regard to comment (f) I would like to substantiate my remarks with some figures which I was able to obtain from the United Kingdom Atomic Energy Authority Annual Reports. The Estimates of Expenditure submitted to Parliament (UK) reached 100 million pounds for the year 1958-59 and declined thereafter to £92, 93, 78, 68 M. This downward trend was partially compensated by income from other sources. Expenditure on Fusion Research fell from £3.5 M in 64-65 to £3 M in 65-66 with a corresponding reduction of scientists and engineers from 200 to 190. AERE Harwell was instructed to diversify its research and development projects into non-nuclear areas which in scientific circles earned the sarcastic comment of AERE Harwell entering the plastic gnomes business!

In the United States heavy cuts in the research fields were experienced a little later, the Vietnamese war being a contributory factor. Since the publication of Flowers and Fox reports these trends have reversed. In 1973-74 the UK AEA Fusion budget was still £3 M and there was no separate expenditure quoted on Nuclear Safety. Since then the figures are as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Nuclear Safety</th>
<th>Fusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>74-75</td>
<td>8.1 M</td>
<td>4.3 M</td>
</tr>
<tr>
<td>76-77</td>
<td>18.2 M</td>
<td>6.6 M</td>
</tr>
<tr>
<td>77-78</td>
<td>19.0 M</td>
<td>7.3 M</td>
</tr>
</tbody>
</table>

plus JET (Joint European Torus) Fusion program is being set up at Culham (UK); so we are moving in the right direction.

I would, however, like to add that general remarks such as Dr Pryor's last sentence have little place in a discussion whose aim should always be to throw more light on the subject without raising the temperature of the debate. Light not Heat please.

Trudi Thompson

PRESIDENT'S COMMENTS

Dr. Pryor has missed the point of the essay competition.

Our object is not to find an essay which represents an Institute consensus, but to reward what is, in the opinion of the judges, a cogent, well-written scientifically correct, contribution to public understanding of the matters raised in the nuclear debate.

The competition was open to anybody and, while I will not enter into discussion about the way in which entries were judged, I can say that the pro- or anti-nuclear stance of the contributors was not relevant.

The essays are published by direction of Council. The Editor has no discretion.

T. M. Sabine
President.

Dear Sir,

In 1979 the School of Chemistry, Macquarie University, will offer a new three-year part-time course work program of studies in Energy Science, leading to the degree of Master of Science. The aim of the course is to meet the current social and industrial interests in the area and it will be of benefit not only to people currently working in this field, but also to those interested in doing so. The program of studies will normally consist of eight courses—five compulsory and three optional, chosen from other course work Masters programs offered by the School of Chemistry, or elsewhere within the University—plus a minor research component. Following an introduction to the fundamental principles of energy science, the release of energy by combustion and by nuclear processes, and the chemistry of fossil fuels and their interconversion will be dealt with in depth. Topics such as photosynthesis, solar energy trapping and energy economics will be covered.

I am writing, as I believe this to be the first course of its kind offered in New South Wales, and probably Australia, and it could well be of particular interest to your members. If you would like any further information, please contact me at the above address or by telephone (88-9409)

Yours faithfully,

Dr. B. D. Batts.
MACQUARIE UNIVERSITY,
North Ryde, N.S.W. 2112

Churchill Fellowship

Physicists are reminded that Churchill Fellowships provide financial support to enable Australians from all walks of life to undertake overseas study on an investigation project of a kind not available in Australia. Applications for Churchill Fellowships tenable in 1980 must reach the Churchill Trust by 28 February, 1979. Information brochures and application forms are available from the Winston Churchill Memorial Trust, PO Box 478, Canberra City, ACT, 2601.
This issue of the *Australian Physicist* is a special one, designed to tell you about Western Australia, about the physics in Western Australia and about the 3rd Congress.

The members of the A.I.P. in Western Australia are delighted that we will have the chance in January 1979 to show you what our sunny State is all about. It has plenty to offer — not necessarily in order of importance these include: heat!, scenery, quokkas, beaches, surf, Swan lager, excellent academic institutions and a wide range of physics research and service activities in academic, industrial and health areas. We invite you to share the goodies with us in 1979.

The Congress will provide an excellent scientific forum and will also give you the chance to make or renew acquaintances with scientists working in your field of interest or related fields. In addition to the scientific program we have an interesting line-up of social events which will combine relaxation with the chance to see and learn a little about our beautiful State.

Get out your sun hats and your sun tan lotion and start preparing to pack. January 1979 is not far away.

Looking forward to seeing a large number of people at the Congress.

John L. Black,
Chairman, W.A. Branch,
Australian Institute of Physics.
Our Third National Congress has as its theme “Science, Technology, Industry and Resources” — STIR in its abbreviated format — in recognition of the fact that during the past 150 years of the State’s existence, Western Australia has utilised its natural resources to an increasing extent, and that science and technology together with industry, have played no small part in the development of the State that has enjoyed.

And this would be true of Australia as a whole! The importance of physics underlies much of our development, yet it sometimes requires an “Interscan” or a “Synroc” to remind people that basic science and technological development are intimately related. It is necessary that the relationship of physics to the real world be made visible from time to time and in this respect, we as physicists, have a communications role to fulfil. This Congress has been organised for the physics community, but we plan to use this opportunity to present some of the facets of our work to the layman.

The role of physics in the community is an ongoing one, dynamic and everchanging. We seem to have been very successful in our pursuit of knowledge, and yet many real-life problems still remain unanswered. Western Australia has experienced drought conditions in recent years, yet we know very little of the local meteorological parameters involved. The Meckering Earthquake demonstrated our ignorance of local plate tectonics and of earthquake prediction. The development of our mineral resources will depend increasingly on geophysical techniques, many of which will have to be adapted to Australian conditions. Modern medicine will depend on an increasing extent on sophisticated instrumentation and biophysical techniques. And it is certain that physics will play an integral part in the provision of our energy requirements whether it be by nuclear reactors, solar energy or fusion power.

The Congress will be held at the University of Western Australia in Nedlands. Situated 5 km from Perth on the banks of the Swan River, UWA is recognised as possessing one of the most beautiful campuses in Australia. Weather conditions should be ideal in mid-January, and the fine conditions will allow us to use the evenings to best advantage. A barbecue will be held on the Monday evening at the Western Australian Institute of Technology. This will provide an opportunity for delegates to visit the facilities at WAIT, an Institute of Technology with a student population in excess of 11,000. The Congress dinner will be held at University House located on the Swan River, Perth, in the cool of the evening.

On the Wednesday of the Congress no technical sessions will be held, but a number of tours are available to show visitors some of Perth’s science attractions. Others may wish to enjoy the beaches, which are only a short distance from UWA. It will also provide an opportunity for delegates to visit their colleagues at CSIRO; Medical Physics Departments; Physics Departments at UWA, Murdoch University of WAIT; the Observatory in the Bickley Valley, or the Geophysical Observatory at Mundaring. It is planned to invite members of the public on the Wednesday evening to the Congress venue, where they will be able to listen to a number of lectures on evolving areas in Physics, to see films and to visit the exhibitions.

We hope that some Eastern States physicists will bring their families with them and spend some time before or after the Congress participating in the State’s Sesquicentennial Celebrations. The first Congress in Adelaide demonstrated that Australia could successfully host a National Congress. The second, in Sydney, showed that Physics had come of age. The Organising Committee of this Congress believes that it will consolidate our National image and demonstrate the relevance and importance of physics in the future development of Australia. We look forward to seeing you in Perth next year.

John R. de Laeter, Chairman, Organizing Committee.
SCIENTIFIC
PROGRAMME

INVITED SPEAKERS:

The Premier of Western Australia, Sir Charles Court, has been invited to deliver the opening address at the Congress. Sir Charles is well known for his dynamism, and his address promises to be most stimulating.

Invited speakers for each of the Congress Symposia have been nominated by the various State branches of the AIP and the Congress committee. The speakers have been chosen on the basis of the interest in their subject matter and the excellence with which it will be presented.

The speakers are:
Dr. N. T. Crook, (Exxon Production Research Co., USA)
Dr. M. T. Gladwin, (University of Queensland)
Dr. S. C. Haydon, (University of New England)
Dr. B. Mainbridge, (Murdock University)
Dr. L. Mestel, (University of Sussex, U.K.)
Dr. D. C. Morton, (Anglo-Australian Observatory)
Dr. G. I. Opat, (University of Melbourne)
Dr. J. H. Reynolds, (University of California, Berkeley, USA)
Dr. D. C. Robinson, (Culham Laboratory, U.K.)
Mr. R. W. Stanford, (Royal Perth Hospital)
Dr. G. V. M. Wilson, (Royal Military College, Duntroon)

CONTRIBUTED PROGRAMME

Parallel sessions will be run on each of the four working days of the Congress (Wednesday has been set aside for tour activities). Whenever possible, contributions have been scheduled to minimise clashes of interest. On Tuesday and Friday, the Australasian College of Physical Scientists in Medicine will contribute to the Health and Biophysics symposium, while on Thursday the Australian Society of Exploration Geophysicists will present a number of interesting papers in the Geophysics symposium.

Poster sessions will be held on Tuesday and Thursday afternoon. These will be displayed in the exhibition area adjacent to the tea and coffee services and should attract a great deal of interest.

CATEGORIES

A: Astronomy and Astrophysics
B: Atmospheric, Oceanographic and Environmental Physics
C: Education, Communication and Dissemination
D: Electrons, Atoms and Molecules
E: Energy Sources
F: Geophysics, Mineral Exploration and Utilisation
G: Health and Biophysics
H: Instrumentation, Information and Computer Techniques
J: Nuclei and Particles
K: Solids and Surfaces, Low Temperature and Vacuum Physics.

POSTER PRESENTATIONS

The space allowed for each poster will be 1800 x 1200 mm; the longer side horizontal. Two sheets of white card, 815 x 1020 x 1.5 mm will be provided for each presentation. Authors should prepare photographs, figures and texts to conform to these sizes. Photographs should have a matt finish and text should be photographically enlarged. The top left of the exhibit should display the title of the presentation and its programme number in letters not less than 20 mm high, together with the names of the authors and their affiliations.

Posters will be on display for one whole day and authors are expected to place them into position before 10 a.m. and remove them after 5 p.m. Authors are expected to attend their displays during morning and afternoon tea breaks as well as at the time scheduled in the programme. Writing paper and pens should be provided by the author.

Requests for special facilities should be addressed to the Congress Secretary.

ANNUAL GENERAL MEETING AND COUNCIL MEETING

The Annual General Meeting of the Australian Institute of Physics will be held at 4 p.m. on Tuesday afternoon. A Council meeting will be held at 3.45 p.m. on Thursday afternoon. Meetings of AIP special interest sub-groups may be arranged during Congress week.

THE EINSTEIN CENTENARY SUMMER SCHOOL ON GRAVITATIONAL RADIATION AND COLLAPSED OBJECTS

The Universities of Western Australia and Rome, through their gravity wave and astrophysics research groups will hold a Summer School to celebrate the centenary of the birth of Albert Einstein. The School will be held in the Physics Department, U.W.A. immediately after the Third National Congress, from 22-31 January, 1979. A number of distinguished Australian and overseas speakers have accepted invitations to lecture at the School. Their presentations will be grouped into three major themes:

1. Experimental Relativity, Measurement of Weak Forces, Quantum Non Demolition
2. Pulsars and Neutron Stars
3. Collapsed Objects : Exact Solutions

As befits Perth's January climate, the School schedule will be Mediterranean in flavour. Each morning session (9.00 - 1.00) will contain material from the above three themes and will be followed by an afternoon siesta. An evening session, from 5 to 7 p.m. daily will be reserved for advanced seminars and research reports.

The School Chairman are Professors Remo Ruffini and Michael Buckingham.

Limited travel support may be available to postgraduate students of astronomy and astrophysics. Those intending to seek travel assistance and/or wishing to reserve accommodation for the Summer School should contact Dr. Cyril Edwards, Physics Department, University of Western Australia, Nedlands, W.A. 6009; Telephone 09-380-2723.
<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.00 - 10.00</td>
<td>Registration.</td>
</tr>
<tr>
<td>10.00 - 10.40</td>
<td>Opening Session: (The Premier of Western Australia, Sir Charles Court; the Vice-Chancellor of the University of Western Australia, Professor R. Street and the President of the Australian Institute of Physics, Professor T. Sabine.)</td>
</tr>
<tr>
<td>10.40 - 11.10</td>
<td>Morning Tea.</td>
</tr>
<tr>
<td>12.30 - 2.00</td>
<td>Lunch.</td>
</tr>
<tr>
<td>2.00 - 2.40</td>
<td>J1 Invited lecture — The Present Scene in Elementary Particle Physics — G. I. Opat.</td>
</tr>
<tr>
<td>4.40 - 5.00</td>
<td>H3 Simplified Superconducting Cavity Stabilized Oscillator for Gravitational Antenna Accelerometer — R. N. James.</td>
</tr>
<tr>
<td>5.00 - 5.20</td>
<td>B3 Ground-Based Remote Sensing of Atmospheric Temperature and Humidity — R. A. Bradford, N. E. Holmes and M. J. Lynch.</td>
</tr>
<tr>
<td>5.20 - 6.00</td>
<td>H4 A Variable Temperature Cryostat Utilising the Steady State Vapour Bubble Principle — S. O. Martin and I. R. Herbert.</td>
</tr>
<tr>
<td>6.00 - 6.20</td>
<td>B4 Analysis of the Phase and Amplitude of Atmospherically Scattered Sound Waves — C. P. Bevilaqua, N. E. Holmes and M. J. Lynch.</td>
</tr>
</tbody>
</table>

Professor Geoffrey Ivan Opat of the School of Physics, University of Melbourne will speak on "The Present Scene in Elementary Particles". The paper will consist of a review of the experimental findings and theoretical developments of the last few years.

Geoffrey Opat took his doctorate at Melbourne University in 1961 in theoretical nuclear physics. Following his degree he became a research associate in high energy physics at the University of Pennsylvania. On returning to Australia in 1964 he was instrumental in setting up a theoretical and experimental high energy group at the University of Melbourne. He is currently the leader of the experimental group which has undertaken bubble chamber studies of antiproton interactions at Brookhaven and Argonne National Laboratories in the United States, and the Rutherford Laboratory in England. Recently he was part of a group studying the "forbidden" weak decays of the muon in an experiment of the Canadian accelerator TRIUMF in Vancouver.

In addition to his interests in high energy physics, he has initiated an experimental program testing the geometrical foundations of physics. In 1976 he undertook an experiment (with A. G. Klein) at the Institut Laue-Langevin reactor in Grenoble to study the spinorial aspects of geometry as seen by neutrons. A new sensitive experiment to determine the frame of absolute rest with respect to rotations is in its planning stages.

Professor Opat has interests outside physics in opera and tennis.
Tuesday


10.00 - 10.20 K3 The Nordheim-Gönter Rule for Diffusion Thermopower in Alloy Systems — R. S. Crisp.

10.20 - 10.40 K4 The Diffusion Thermopowers of Some Silver Alloys Below 4K” — S. J. Song and R. S. Crisp.


10.40 - 11.10 Morning Tea.


11.50 - 12.10 K7 Limitations on the Mechanical Q of Resonant Gravitational Radiation Antennae — J. Ferreirainho.

G5 Bioelectric Monitoring of Xylem Water Fluxes — B. Mainsbridge.


12.30 - 2.00 Lunch.

2.00 - 2.20 B5 The Interpretation of Acoustic Scattering from Marine Biota — J. D. Penrose.


2.40 - 3.00 B7 Laser Bathymetry — D. M. Phillips.


3.00 - 3.20 B8 Optics Near the Sea-Air Interface — V. J. M. Bosher.

G10 Early Results from an Electron Linear Accelerator — B. Hedland-Thomas.


G11 The Use of Microprocessors in Physiological Monitoring in Intensive Care and the Operating Theatre — J. L. Black and E. Chelva.

3.40 - 4.00 Afternoon Tea.

4.00 - 5.00 Annual General Meeting.

4.00 - 5.00 Poster Session:

PB13 Noise Distribution in a Residential Area — I. H. Bailey.


PG19 Clinical Physical Evaluation of a New Linear Accelerator — Dynaray 18 — B. Hedland-Thomas.

The Australian Physicist, November 1978 151
Professor Sydney Charles Haydon is Professor of Physics at the University of New England, Armidale. He will speak on the subject “Electrons, Atoms, Molecules”, and is expected to reveal new insights into the Laser Age.

Professor Haydon is a graduate of both the Universities of Oxford and of Wales and a Fellow of the Institute of Physics and Physical Society and of the Australian Institute of Physics. His research interests include fundamental collision processes in gaseous breakdown, transient nanosecond phenomena in gas discharges and pulsed and tunable dye lasers. His studies have been concerned with ionization phenomena arising from collisions between electrons, atoms and molecules in the presence of d.c. and radio frequency electric fields as well as magnetic fields. Emphasis has been given recently to the particularly dominant roles of neutral metastable particles in some ionization phenomena including their significance in gas discharge laser devices.

Two-photon absorption techniques involving the use of tunable dye lasers are now being applied to examine the possible significance, for the nitrogen fixation mechanism in plant systems, of processes involving excitation energy transfer from metastable particles to oxides of nitrogen. He is also developing new laser devices responsible for electrical discharge “pluming” phenomena on high-power aerial systems operating in the 5–30 MHz band.

Professor Haydon joined the Department of Physics at New England in 1954, returned to University College, London for a year in 1960 to study some aspects of metastable helium particle interactions with surfaces, and spent 1969 as a Visiting Fellow at the Joint Institute for Laboratory Astrophysics in Boulder, Colorado. His work at JILA, in collaboration with the late Professor H. Brandt, on laser-induced fluorescence of organic dyes and scintillators followed development of a pulsed nitrogen UV laser. His interest in extending laser facilities into the VUV region was pursued further during a recent period spent at the Clarendon Laboratories, Oxford, where development of a fast discharge exciplex laser operating at 250 nm, was successful.

Prof. Geoffrey V.H. Wilson

Professor Geoffrey V. H. Wilson is a member of the Faculty of the University of New South Wales at the Royal Military College, Duntroon, where he was appointed Professor in 1971. He is to speak on “Radiative Detection of Nuclear Magnetic Resonance”, a review of the detection of NMR of radioactive nuclei via observation of the β and γ radiations.

Professor Wilson graduated in Physics from Melbourne and Monash Universities. He spent two years in the low temperature nuclear orientation group at Oxford University and then returned to Monash as Queen Elizabeth II Fellow and later Senior Lecturer before taking up his present post.

He is a Member of the Commission on Very Low Temperatures of IUPAP, and Associate Editor of “Hyperfine Interactions”.

His main research interests are in the hyperfine interactions of nuclei in magnetic materials and in studies of critical phenomena associated with magnetic transitions.

The Duntroon low temperature group has been the first to produce coherent resonant rotations of radioactive nuclei and to hence detect spin-echo magnetic resonances. Also at Duntroon new techniques to greatly extend the accuracy of measurement of the susceptibility of ferromagnets near their Curie temperatures have been developed and have been applied to rare earth ferromagnets.

Dr. T. Norman Crook

Dr T. Norman Crook, elected President of the Society of Exploration Geophysicists 1978-79, has been a member of SEG for 27 years. He served as First President of SEG for 1976-77. He served as Chairman of both the SEG Foundation Trustees and the Foundation Scholarship Committee. He has also served on the SEG Committee on Magnetic Recording Standards. He is affiliated with the Geophysical Society of Houston and was Chairman of their Student Education Committee. He is a member of AAPG and AIME, and is a registered professional engineer in Texas.

Norman Crook is now manager of the Stratigraphic Exploration Division of Exxon Production Research Co. He joined Humble in 1949 and spent his first five years in seismic field operations. Transferring to Humble’s Research Center in Houston in 1954, he helped introduce magnetic tape recording and analog processing into operations. In 1959 he was placed in charge of a research group that developed Humble’s first digital recording and processing system. He joined Exxon Production Research Co. when it was formed in 1964, and became manager of the Basic Geophysics Division in 1967. In 1968, he transferred back to exploration operations where he served as assistant division geophysicist of the Eastern Marine Division and division geophysicist of the Gulf Coast Division.

He has published a number of technical papers in company and industrial journals. He holds six U.S. patents covering devices and techniques used in exploration geophysics.

Norman Crook’s academic background includes a B.S. degree in Electrical Engineering from Texas A&M University. He also received a B.S. degree in geology from the University of Houston in 1961.

WEDNESDAY

A Free Day, Tours etc.
**THURSDAY**

10.00 - 10.20 E3  Three-Dimensional Ideal Concentrators — D. R. Mills and J. E. Giutronich.
10.20 - 10.40 E4  "Radiative Cooling of Surfaces Exhibiting Spectral and Directional Selectivity — B. Landro and P. G. McCormick.
F2  A Cryogenic Gravity Gradiometer — F. J. van Kann.
10.40 - 11.10  Morning Tea.
11.10 - 11.30 K8  The Structure of the Metal-Vacuum Interface — P. J. Jennings.
F3  Abstracts not yet available.
F4  Abstract not yet available.
F5  Abstract not yet available.
F6  Abstract not yet available.
12.30 - 2.00  Lunch.
2.40 - 3.00  B10  Processes Involved in the Dispersal of Nocturnal Inversions — C. E. Coulman.
3.00 - 3.20  B11  Windfield Analysis of the Kwinana Industrial Region — F. H. Kamst, T. J. Lyons and J. N. Carras.
F8  Proton Decoration in Fluorite — J. R. Bird and R. W. T. Wilkins.
3.40 - 4.00  Afternoon Tea.
3.45 - 5.00  Council Meeting.
4.00 - 5.00  Poster Session:
PA7  The Isotopes of Palladium and Nucleosynthesis — N. Mermelengas.
PC7  Interactive Programs for Introductory Physics — J. J. Millar.
PC8  The Cloudy Crystal Job Market Ball — J. R. Prescott.
PH5  Maximum Entropy Spectral Analysis — J. S. Reid.
PH6  A 'Condensation' Vacuum Gauge and Gas Analyser — Emeritus Professor C. J. Milner.

---

**Dr. Michael T. Gladwin**

Dr. Michael T. Gladwin is a senior Tutor in the Department of Physics at the University of Queensland. His topic is "Earthquake Prediction Studies in the U.S.A.", and will be broadly treated as a subject of general interest to physicists.

After a classical training in physics, Dr. Gladwin's initial interest in earthquake prediction studies began in 1966 when he became involved in the development of a technique for monitoring in situ stress using the stress dependence of seismic velocity of propagation. In the course of this work he was diverted into the study of attenuation mechanisms in elastic media and developed a simple technique for the measurement of the attenuation parameter, Q, of rocks using the rise time of pulse arrivals. He was fairly extensively involved in the controversy over the expected magnitude of the stress induced seismic velocity anomaly during the years 1962-76.

In 1977, he took leave at Stanford University in the U.S. and worked in detail for many months with the United States Geological Survey Office of Earthquake Studies in Menlo Park, California in an attempt to evaluate the current position on prediction techniques and to define, if possible, critical experiments in the subject.

Dr. Gladwin is keen to sample the tourist potenitioalities of Perth, and especially compare the delights of sailing around Perth with those he enjoys at home.

---

(Including Dr. Michael T. Gladwin's personal notes and references)
FRIDAY


G12 Patient Doses During CT Scanning — P. W. Henson.

10.00 - 10.20 A3 The Nucleosynthesis of Tellurium in Stars — C. L. Smith.


10.40 - 11.10 Morning Tea.


11.50 - 12.30 A6 Invited lecture — Some Recent Scientific Results from the Anglo-Australian Telescope — D. C. Morton.

12.30 - 2.00 Lunch.

2.00 - 2.40 C1 Invited lecture — Physics Education in Australia — B. Mainsbridge.

2.40 - 3.00 C2 Physical Science Enrolment Patterns in Western Australia — J. N. Carras and P. J. Jennings.

G15 Quality Control Methods in Radiological Computerised Tomography Scanning — R. F. Fleay.

3.00 - 3.20 C3 A Physics Laboratory Programme with a Broad Set of Aims — C. Malcolm.


3.40 - 4.00 Afternoon Tea.

4.00 - 4.20 C5 The Australian Wool Harvesting Programme — Research Opportunities for Physicists — P. R. W. Hudson.


4.20 - 4.40 C6 PSI and Beyond: Graduate Independent Study at WAIT — P. J. Rye.

---

Prof. Reynolds

Navy as Officer specialist in ordnance before proceeding to his Ph.D. in physics at the University of Chicago in 1950. He was immediately appointed to the faculty of the physics department at the University of California, where he has remained except for study visits to Bristol, Brazil, Portugal, and now Australia (he is visiting us under a National Study Foundation Cooperative Research Award). He has received many medals and awards.

Professor Reynolds is interested in all aspects of the isotopic cosmochemistry of the solar system, which will be the subject of his review paper. He will deal with isotopic anomalies which contradict the idea that the early solar system was isotopically homogeneous, and with anomalies in occurrence of the planetary rare gasses trapped in stone meteorites, problems which have come to light over the last few years.

He has applied high sensitivity rare gas mass spectrometry to the origin and history of the earth and solar system, and has studied extinct radioactivity in meteorites, radioactive dating of rocks and meteorites, natural variations in isotopic composition of the elements, lunar sample analysis, cosmochemistry, and trapped rare gases in the earth and solar system.

After graduating with a bachelor of arts degree in electronic physics from Harvard College in 1943, Professor Reynolds served in the U.S.
Dr. Morton, a Canadian, has been in charge of the Anglo-Australian Observatory since 1976, and he will discuss the Anglo-Australian Telescope and some recent scientific results from it.

His first degree in mathematics and physics from Toronto was followed by a PhD in Astronomy from Princeton University. As an astronomer in the US Naval Research Laboratory he flew rockets to study Lyman alpha night airglow, but he soon returned to Princeton where his work in various aspects of spectroscopy and in the theory of stellar atmospheres earned him the title of senior research astronomer, and the rank of professor. He was there for 15 years before being appointed to his present post.

Dr. Morton’s current research includes spectroscopy of quasi-stellar objects, galaxies and X-ray stars.

Born the son of a Rabbi in Melbourne, Professor Mestel received the major part of his education in London and Cambridge. After graduating PhD from Cambridge University in 1952, he obtained research fellowships at the Universities of Leeds and Princeton before returning to a University position in Cambridge. He was a Fellow of St. John’s College from 1957-66, during which period he revisited Princeton. A year at the Weizmann Institute of Science in Israel was followed by appointment to the chair of Applied Mathematics at Manchester University. He entered his present position in 1973.

Besides numerous research papers on different branches of astrophysics, Professor Mestel is co-author of a book on Magnetohydrodynamics. His subject at the Congress will be “White Dwarfs, Neutron Stars and Black Holes”, and will trace the evolution of a star and the origin of the objects mentioned in the title.

Bruce Mainsbridge is Foundation Professor of Physics at Murdoch, having also been Foundation Professor of Physics at the University of Papua and New Guinea until 1973. He holds the Degrees of BSc from the University of Tasmania, and PhD from the Australian National University.

He was a post-doctoral fellow at Rice University, Houston, Texas from 1960-62, lecturer in physics at the Wollongong University College from 1962-66. In 1972-73 he was Visiting Professor at North Carolina State University, in the School of Agriculture and Life Sciences. He has published in the areas of nuclear physics, plant biophysics and physics education.

His keynote address to the Congress will be on the subject “Physics Education in Australia”.

Robert Stanford graduated from Cambridge University in 1939 and is a former Scholar of Christ’s College.

During the war he was a Deputy Assistant Director of Mechanical Engineering in the War Office (London) responsible for the installation, maintenance and repair of Army Radar equipment. In 1945 he was appointed Senior Physics Master at the Felsted School in Essex but left there in 1948 to take up an appointment as Lecturer in the Physics Department of London University at Guy’s Hospital. There his main interest was in the physics of Diagnostic Radiology where his work earned him Honorary Membership of the Royal College of Radiologists of London. His early measurements of genetic dose to patients led to the formation of the UK Government Committee under the Chairmanship of Lord Adrian, whose findings on this subject were internationally acclaimed. In 1959 he was appointed to his present post at Royal Perth Hospital, where he established a broadly based Department. He has maintained a close relationship with the University of WA where he is able to indulge his love of teaching through his Lectures to Medical and Dental Students. As a foundation Fellow of the Institute he has also been accorded Honorary Fellowship of the Royal Australasian College of Radiologists.

TITLE OF INVITED PAPER
The Greeks had a word for it.
WESTERN AUSTRALIA
PEOPLE, PLACES AND PHYSICS

PHYSICS AT MURDOCH UNIVERSITY
Bruce Mainbridge, Foundation Professor of Physics

Murdoch University opened its doors in February 1975 to five hundred first year students and a small number of higher degree students.

The guidelines set by the Planning Board included the wish that interdisciplinary studies be encouraged in both undergraduate and postgraduate work. This guideline affected many aspects of Murdoch University including government, teaching and research. There is a wider range of staff and student involvement in interdisciplinary studies than at any other Australian University. Two professional schools (Veterinary Studies and Education), while not insignificant in their demand on our resources, have had a positive influence on the development of our interdisciplinary efforts.

The Physics Programme is based in the School of Mathematical and Physical Sciences but the Programme Committee consists of physical scientists from a number of Schools. The undergraduate Physics Programme includes a core of nine semester courses in classical and modern Physics and Mathematics which must be combined with a set of special general elective courses to complete an undergraduate degree programme. We offer first degree courses in pure physics, physics and computing, chemical physics, and atmospheric physics. This flexibility has been useful for preparing our students for a varied employment market. Because some students take a job when leaving high school, we have developed an external degree course in Physics which does not require on-campus attendance. Course material and experimental kits have been sent to external students in very remote corners of Australia.

Several of our internal and most of our external courses use a self-paced, Keller type, instruction. In our introductory courses, this allows students with varying backgrounds to study the one course at a variable pace. The Keller system has reduced the capital investment required for undergraduate teaching apparatus and has allowed us to incorporate advanced technology in teaching machines and laboratory equipment.

The Programme Committee under the Chairmanship of Dr Philip Jennings has been encouraged by the exponential growth in the enrolments from a small intake of three students in 1975 to an intake of 21 in 1978. The general acceptance of the teaching innovations within Murdoch University has been gratifying and a reward to the foundation staff for their full use of the opportunities available to them in 1975.

Research effort is divided into three areas: a surface physics group (Drs Price, Jennings and Cornish) using low energy electron diffraction and Auger spectroscopy to explore some basic mechanisms of catalysis, absorption and corrosion; a laser Doppler group (Drs Carras, Cornish, Mainbridge and Mr Thurgate), exploring the dynamics of processes in the water cycle as diverse as plant transpiration, and water droplet growth and collision in clouds; and a third group evaluating some educational outcomes of our teaching enterprise (Drs Jennings, Cornish, Carras and Mainbridge).

Physics has contributed to and drawn on advances in technology. New applications for Physics have emerged in fields such as medicine, environmental sensing, communications, space exploration and energy conversion. Physicists at Murdoch University are working in an interdisciplinary environment and our hope is that our students will also develop an interest in and commitment to studies of regional and national importance.

ROYAL PERTH HOSPITAL DEPARTMENT OF MEDICAL PHYSICS
R. W. Stanford, Head of Department

1. General
   The Department, with a staff of 50, is located at the Royal Perth Hospital and housed in parts of the original colonial Hospital.

   Activities are grouped under four main headings:
   - Clinical Physics, Mr R. Fleay, Scientific Computing, Mr L. Mina, Bioengineering, Mr E. Scull, Technical Services, Mr J. Ashton.
   - The Department provides Physics services also to:
     - King Edward Memorial Hospital, Princess Margaret Hospital, Department of Radiotherapy, Sir Charles Gairdner Hospital, Private Practice Radiotherapy.

2. Clinical Physics
   Regions of interest are therapeutic use of x-rays, γ-rays, electrons, microwave, radioactive substances and laser light, diagnostic use of radioactive substances, ultrasound, thermography, health physics and safety involving x-rays, γ-rays, electrons, radioactive substances, laser light, microwaves.

   Work in progress includes construction of an ultrasound power measuring device, computer programmes for data gathering, construction of isodose curves etc., quality control and dosimetry in CAT Scanners, commissioning of a linear accelerator to produce high energy photons or electrons, neutron detection.

3. Scientific Computing
   Regions of interest are the provision of a total departmental computing facility, real time data acquisition from instrumentation, scientific and clinical data reduction, design of dedicated systems and microprocessor applications.

   Work in progress includes development of detailed subsystems for bioengineering, automation of cell classification in Clinical Immunology.

4. Bioengineering
   Regions of interest are performance of metal implants, effects of pressure on tissue, tissue reactions to implants, assessment of spinal deformity, rehabilitation engineering.

   Work in progress includes corrosion of metal implants, physical characteristics of spinal cord tissue, measurement of bone strain by double exposure speckle photography.

5. Technical Services
   Regions of interest are selection, installation, commissioning, maintenance, repair, modification of all surgical instrumentation, ventilation equipment and medical electronic equipment.

   Work in progress includes design and construction of hand and clothing monitor for radioactive contamination, design and construction of hood support for hyperbaric chamber, modification to heart-lung equipment.

6. Visits
   May be arranged by telephoning 3250101 Ext. 2500 and making detailed arrangements through Mrs R. Wearn.
ELECTRON MICROSCOPY CENTRE
L. N. D. Lucas, Director

The Centre is located in the Physics Building and provides comprehensive facilities for teaching and research in all areas of transmission and scanning electron microscopy, electron probe microanalysis and light microscopy (particularly histochemistry).

Persons who are competent in these fields may carry out their own work in the Centre with assistance from members of the staff. The centre conducts regular fixed-term schools in biological transmission electron microscopy for staff and senior students and will shortly be extending these to include high-resolution light microscopy. However, full individual instruction and assistance is available to newcomers at all times regardless of whether or not they have attended schools or classes. Alternatively, the staff of the Centre will undertake specific investigations for persons who do not themselves wish to become microscopists or microanalysts.

There are two high resolution electron microscopes in the Centre. A medium resolution JEM-T6S and a low resolution JEM-30 are available for undergraduate teaching purposes.

There is also an ARL electron probe microanalyzer of the latest SEMQ type with computer control and data reduction facilities via a PDP11/05 minicomputer.

A Zeiss research microscope system is available for all-mode operation, a Leitz Ortholux system for general optical micrography, and we have a Hilger automatic recording microphotometer and a two-dimensional precision measuring machine. There is a very comprehensive range of specimen preparation facilities and a well equipped photographic section with three darkrooms. A laser-beam optical diffractometer has recently been acquired but is not expected to be set up and available until some time in 1979.

Other equipment includes full facilities for cutting (mechanical and chemical), grinding and polishing (mechanical and electro-) and ion-beam thinning.

THE BIOPHYSICS DEPARTMENT AT THE QUEEN ELIZABETH II MEDICAL CENTRE
John L. Black, Head of Department

This Department was formed seven years ago following the appointment of a Hospital Physicist, who later became the Head of the Department of Biophysics. Staff numbers have slowly grown to a present total of 24, made up of physicists, electronics engineers, technicians and support staff.

The Department is divided into 4 sub-departments, called Divisions, each with its own pyramidal staff structure and area of responsibility. The Divisions are: Clinical and Scientific Applications, Biomechanical Engineering, Bioelectronics and Computing.

The Department provides broad based scientific services to the Sir Charles Gairdner Hospital and provides some support to the University of WA Departments on the Medical Centre Site. Activities include development of electronic, mechanical or surgical equipment for a wide range of medical specialties, construction and maintenance of equipment, data analysis services and a fairly extensive clinical service in ophthalmology, neurophysiology, cardiac pacemaker testing, hand volume testing etc. Approximately 1500 patients have tests in the Department each year. The clinical testing service is provided in collaboration with various medical specialists who, following the reporting of the scientific results by the Department of Biophysics, interpret the results in the light of the patient's signs and symptoms and the results of other clinical tests. The Computing Division is heavily involved in development of microprocessor based computing systems for use in specialties such as neurophysiology, nuclear medicine, endocrinology, intensive care etc.

The Department's research activities are primarily in cardiac pacing, neurophysiology and more recently, the use of lasers in ophthalmological electrophysiology. The neurophysiology work is supported by a grant from the National Health and Medical Research Council, the grant having been awarded jointly to a senior Neurologist, a senior Radiologist and the Head of the Department of Biophysics.

In Cardiac Pacing a system based on real time vector cardiology using a PDP 11/40 computer has been developed. This system is used to carry out a sophisticated series of tests on implanted or explanted pacemaker performance and can deal with the testing of a wide range of commercial cardiac pacemakers. Patient results are stored on computer disk and can be automatically recalled and trend-analysed following each test.

In Neurophysiology the research accent has been on development and assessment of non-invasive tests for the early diagnosis of multiple sclerosis (MS). Patients have CT (computerised tomography) scans in Radiology and have cerebral visual, auditory and somatosensory evoked response studies and saccadic and pursuit eye motion tests in Biophysics. A recent introduction to the barrage of tests are psychophysical tests including double flash and double median-nerve shock resolution studies. Excellent success has been achieved in the research and a diagnostic accuracy of almost 100% for MS has been attained. The main success of the research programme has been the ability to detect sub-clinical demyelinating lesions in the central nervous system. Further development, both of tests and quantitative analysis of the electrophysiological (and CT) data, is proceeding.

Recently initiated research activities include assessment of electrophysiological tests in the early diagnosis of Huntington's disease and Cerebellar Degeneration and the design of LED or laser systems for mapping islands of optic nerve demyelination or small area retinal stimulation for electroretinography.
RESEARCH AT THE DEPARTMENT OF PHYSICS AT THE UNIVERSITY OF W.A.
W. C. Macklin, Head of Department

Research activities in the Department range over the fields of Theoretical Physics, Solid State and Chemical Physics, Astrophysics, Nuclear Physics and Geophysics. Some of the projects are briefly described below and a list of current projects, together with the staff members involved, is appended.

Dr R. R. Burman and Dr G. L. Murphy have investigated theoretically the gravitational and electrodynamic forces that would be associated with cosmic magnetic fields if the photon rest mass was non-zero. Using General Relativity theory they have shown that the existence of moderately dense interstellar clouds with relatively strong magnetisation implies that the photon rest mass is less than about 10⁻¹⁹ kg. This means that standard electromagnetic theory appears to be valid over distances of up to some 300 light years. These values represent an improvement of more than five orders of magnitude over the previous best estimates.

One of Dr B. G. Kenny's interests is the formation of Quantum Mechanics and Quantum Field Theory. Classical canonical transformations may be carried over into quantum mechanics provided the quantum mechanical operators are time-ordered. For example, it is possible to write a quantum mechanical Hamilton-Jacobi equation both in the non-relativistic and relativistic regimes. This suggests that the Feynman path integral formulation of quantum mechanics and quantum field theory may be replaced by an operator formalism (making use of the quantum mechanical action operator) which is more compact and, in some ways, more transparent. Such a formalism has now been achieved. The new formalism has the merit of giving a different perspective on the foundations of quantum mechanics and quantum field theory.

A matrix technique for the calculation of elastic and inelastic scattering cross-sections based on a microscopic model has been developed by Dr R. F. Barrett and collaborators, and applied to selected problems in atomic and nuclear physics. This technique has proved to be numerically efficient and offers a way of correctly including into the calculation the effects of particle exchange. Recently the method has been used in the study of low-energy (<20 eV) electron-helium scattering cross-section, and reproduces the experimental data to within two per cent. A simple Hartree-Fock wavefunction is used for the helium ground state. This work is being extended to describe the scattering of positrons from helium in the same energy range.

In recent years it has become evident that many of the features of the temperature dependence of the transport properties of metals are directly related to the anisotropy of the relaxation time for electrons on different portions of the Fermi surface. In particular Dr R. S. Crisp, in collaboration with Professor W. G. Henry of Queen's University, Canada, has shown that the enhancement of the phonon drag component of the thermoelectric power in very dilute noble metal alloys can be explained in terms of this anisotropy. Current work is aimed at extending studies in the systems Ag with Cu, Zn, Ga, Ge and As down to 0.3 K for unambiguous identification of the parameters associated with the diffusion component of the thermopower.

The redistribution of electron density due to chemical bonding is being studied by Dr E. N. Maslen and co-workers, using single crystal x-ray and neutron diffraction methods. Recent experiments have been directed to improving our understanding of the bonding of the transition metals. The electron densities for octahedrally bonded cobalt atoms are strongly affected by their spin state. Magnesium and nickel densities in isomorphous Tutton salts are deformed by similar forces, with the nickel atom showing further modulation because of its strongly polarizable d electrons. The copper atoms in copper sulphate pentahydrate show the effect of Jahn-Teller distortion, but they are further perturbed by the nearest neighbour interactions with the ligands. These effects are in broad agreement with theoretical arguments and with results from other experimental measurements, but much new information has been obtained at a detailed level.

A quantitative study of the nucleation and growth kinetics of thin film formation is being made by Dr J. L. Robins and co-workers. The films are formed by deposition of metal vapour atoms (such as Au) onto metallic or non-reacting substrates (such as NaCl) under ultrahigh vacuum conditions. Fundamental processes which are involved include adsorption, desorption, surface diffusion, atomic bonding, crystal structure of ultrasmall clusters of atoms, coalescence between such clusters, and the effect of strain fields due to crystallographic misfit, differences between deposit and substrate materials. The influence of deposition conditions on the structure, orientation and epitaxy of the resulting films is also studied, as such structure influences the properties of thin films used in practical applications.

Very little is known of the binding energies, metastable states and modes of dissociation of simple molecular ions. While the energy levels of the lighter diatomic ions may be calculated to various degrees of precision, the states involved are seldom accessible to conventional spectroscopy and may best be studied by observation of the energy spectra of the fragments arising from the dissociation following collision between a monoenergetic ion beam and an inert gas target. Work in this area is being carried out by Dr J. B. Swan. Lifetimes and dissociation energies of the metastable states of He⁺ have been re-calculated and the results compared with observed dissociation spectra. Earlier work on the homonuclear diatomic ion H₂⁺ and its isotopic homologue is now being extended to the triatomic ion H₃⁺, for which both electronic and vibrational excitation lead to several distinct modes of dissociation. The energy spectra of the charged fragments H⁺ or H²⁺ and relative cross sections for different target gases, are being measured using a double-focusing electrostatic energy spectrometer.

The aim of the Gravity Wave Group (Professor M. J. Buckingham, Drs. C. Edwards, F. J. van Kann, D. G. Blair and co-workers) is the development of a system capable of detecting gravitational radiation originating in our own and nearby galaxies. The antenna is to be a Weber-type resonant bar of niobium operating at liquid helium temperatures. The vibrations of the levitated antenna will be detected by a non-contacting superconducting microwave cavity accelerometer, also levitated and positioned to ~10 µm from the end of the bar. The quantum limiting temperature (i.e. the phonon limit) is of the order of 1 K rather than in the millikelvin range characteristic of other second generation antennae. The first stage of the project has involved the testing of a small (0.3 m long) levitated bar-accelerometer system together with the appropriate microwave (10 GHz) and servo-control circuitry. This system is now operational and has a vibration sensitivity ~3 x 10⁻¹⁶ m in a 1/3 Hz bandwidth at the antenna frequency (6 kHz). Work is proceeding on a number of techniques which should lower this limit appreciably. Work is also proceeding on the second stage of the project and the large dewar which will house the intermediate antenna (1 m long, 60 kg) and the large antenna (3 m long, 1600 kg), is scheduled for its first cool down in mid-1979.

The workers on the Electron-Synchrotron Project, led by Drs. H. H.
Thiess and D. M. Crawford, plan to perform high resolution experiments on photon-neutron cross-sections of light nuclei. Construction of the required equipment has been completed and tests have been encouraging. Bremsstrahlung from the electron-synchrotron interacts with a target located at the centre of a large moderator consisting of heavy water, graphite and paraffin wax. Neutrons ejected from the target are moderated and then collected by an array of 68 large BF$_3$ proportional counters. A scan is made through a series of peak-bremsstrahlung energy values and the resulting neutron yields unfolded into a cross-section, with optimum resolution of 150 keV. In light nuclei this is sufficient to resolve resonances in the cross-section which correspond to the divided excited states of the target nuclei.

Studies of the isotopic composition of the noble gases in solar system matter are being carried out by Dr P. M. Jeffery and co-workers using static gas mass spectrometry. Recently xenon extracted from selected samples of the mineral monazite has been investigated to ascertain whether an anomalous component is present which may have resulted from the fission of an extinct nuclide, possibly a superheavy element. Although the monazite xenon was highly anomalous isotopically, the anomaly could be completely accounted for in terms of known nuclear processes. Studies have also been made of the isotopic abundance of neon in terrestrial matter with the objective of detecting the possible presence of primordial neon. The results have shown that some terrestrial minerals contain neon components with a wide range of isotopic compositions. These components are probably due to uranium and thorium-produced alpha particles being captured by oxygen and fluorine thereby producing neon isotopes. The reaction product neon isotopes are so well-mixed in some minerals that it would appear to be very difficult to distinguish between the mixture and any other neon component of interest.

At the present time the only way of obtaining information on the growth conditions of halites in severe storms is from a study of the internal structures of the halite stones themselves. If these structures can be correctly interpreted theory will provide the corresponding growth histories of the stones. Dr W. C. Macklin has shown in icing tunnel experiments that the simplest analytical technique which can be used relies on crystal sizes of the various layers comprising the stones. However, this technique has the disadvantage that any recrystallization which occurs either during the growth of the halite or during the period prior to collection and analysis, can give rise to misinterpretation of the crystallographic structure. Current research is directed at understanding the recrystallization mechanisms in samples of ice, annealed at various temperatures for differing periods of time, to determine the magnitude of this effect in halites.

The high wind energy densities near the cores of some atmospheric vortices are well known and encourage the idea that vortex generation might conceivably provide a method of concentrating solar energy. Professor M. J. Buckingham, Dr E. N. Maslen and Mr A Rodesino are investigating vortices generated on a laboratory scale, with particular emphasis on the role of latent heat in determining the energy and flow characteristics within the vortex. The results suggest that the scale required for efficient concentration of energy is too large to be useful for application to power generation. Nevertheless, it has been possible to induce controlled migration of the vortices and this may help in understanding certain meteorological problems such as the migration paths of cyclones.

If a strip of ferromagnetic material is heated above its Curie point as it passes between the poles of a magnet, there is a net force acting on the strip. This can be used as a magnetic engine to convert energy from solar or thermal sources into mechanical energy. Dr R. A. Anderson is studying the properties of suitable magnetic materials and the various configurations of magnetic and thermal gradients required for such a device. Monel metal is a possible material and its properties, after appropriate heat treatments, have been examined. The forces produced on samples in possible configurations of magnetic fields and heat sources have been measured and small magnetic engines have been constructed and found to be operational.


The current projects in the Department are:

THEORETICAL PHYSICS

Theory of critical phenomena and thermodynamic phase transitions (M. J. Buckingham)

Theoretical biophysics : statistical mechanics and cell surface thermodynamics (M. J. Buckingham)

Theoretical plasma astrophysics, particularly pulsar magnetospheres (R. R. Burman)

Tests of SU(3)-invariance in the electromagnetic decays of vector and pseudoscalar mesons (B. J. Kenny)

Canonical transformations in classical and quantum mechanics and the Feynman path integral formalism of quantum mechanics (B. G. Kenny)

Series methods in critical phenomena (C. J. Pearce)

SOLID STATE AND CHEMICAL PHYSICS

Thermopower measurements of noble metal alloys at low temperatures (R. S. Crisp)

The use of soft X-ray spectrometry to study the band emission spectra of light metals and alloys (R. S. Crisp)

The nature of the critical point (C. Edwards, M. J. Buckingham)

Charge density analysis of crystalline materials using X-ray and neutron diffraction data (E. N. Maslen)

Study of nucleation and growth kinetics on thin film metal deposits on crystalline surfaces in ultra high vacuum (J. L. Robins)

Collisional excitation and dissociation of molecular ions (J. B. Swan)

Investigations of structure and function of biologically active molecules (K. J. Watson)

NUCLEAR PHYSICS

Photo-neutron experiments on non-normal parity states in light nuclei using a 30 MeV electron-synchrotron (H. H. Thiess, D. M. Crawford)

ASTROPHYSICS

Experiments in gravitational radiation detection using superconducting and other low temperature techniques (M. J. Buckingham, C. Edwards, F. J. van Kann)

GEOPHYSICS

Low temperature properties of the remanence of rocks and their dependence on domain size (R. A. Anderson)

Magnetic properties of materials suitable for solar energy studies (R. A. Anderson)

Wind vortex generation based on solar energy as a possible course of power (M. J. Buckingham, E. N. Maslen)

An investigation of the abundance and isotopic composition of neon in meteoritic and terrestrial matter (P. M. Jeffery)

Studies of reorientation and recrystallization in ice and their application to atmospheric physics (W. C. Macklin).

The Australian Physicist, November 1978 159
From the earliest days of the Institute of Science and Industry (the fore-runner of the CSIR and CSIRO), Western Australia has been closely linked with the research programmes sponsored by the Australian Government.

Much of the research carried out here has had a local flavour; and this is reflected in the Divisions represented. The Divisions of Land Resources Management and Mineralogy have their headquarters at Floreat Park, while small groups from the Division of Mathematics and Statistics, Computing Research, Animal Production and Entomology are also housed. The Divisions of Wildlife Research, Forest Research and Fisheries and Oceanography have their own regional laboratories at Helena Valley, Kelmscott and Mamboon respectively, and there is also an agricultural field station at Bakers Hill. The Division of Food Research and Animal Health are represented at the Department of Agriculture and the University of WA.

In the past, physics were not strongly represented in CSIRO's work here, although geophysical prospecting was studied in 1922, and a close liaison between the Division of Soils and Mr. J. Shearer in the Physics Department of the University began in the late 1930s. This X-Ray diffraction work would otherwise have had to be done in Adelaide.

There are physicists on the staff of the Division of Mineralogy, Land Resources Management, and Wildlife Research in Perth, all working in a multidisciplinary environment.

Mineralogy uses a wide range of instrumentation for analysis of materials, most notably microscopy, X-ray fluorescence and X-ray diffraction in addition to more specifically chemical instruments such as atomic absorption spectrophotometry. A large plasma-source direct reading spectrophotograph has just been ordered. The electron probe microanalyser has been developed from a manual to an automatic instrument, and offers quantitative analysis using either wavelength or energy-dispersive spectrometers. The latter, based on a system due to Reed and Ware at ANU, allows extremely rapid and accurate silicate analyses. The scanning of electron microscope, though old, is used in a novel way with an energy dispersive X-ray detector in V. N. E. Robinson's environmental cell. This combination allows completely uncoated specimens to be examined and qualitatively analysed, and has become one of the most popular instruments in the laboratory. A sensitive thermostatic balance has been constructed and used to study the role of oxygen in the iron-sulphur systems (J. Graham, C. E. G. Bennett, B. W. Robinson and R. S. Vigers).

Solid state electrochemical cells are under development to measure and control sulphur fugacities over a useful range of temperatures. These will be used for thermodynamic studies and for mineral synthetics (R. E. T. Hill, W. W. Barker). A range of more conventional electrochemical measurements is also undertaken and applied to ground water and to weathering processes of rocks and minerals (M. R. Thorner, A. W. Mann). Permeability of rocks can be measured using a simple water flow cell. Some experimental development is carried out, using mechanical and electronic skills (E. F. Atkins, R. G. Couper).

Besides local PDP 11's, CSIRO at Floreat Park has a direct link with the Cyber 76 computer in Canberra. The computer has been used by Mineralogy for studies of lattice energies in both ordered and disordered systems, and is extensively used by Land Resources Management for modelling.

There is a portable "acoustical laboratory" at the Division of Wildlife Research at Helena Valley, consisting of a sonograph, frequency meters, oscilloscope and assorted recorders for analysing bird calls etc. (T. Knight).

Several programmes in Land Resources Management use physics and physicists. Probably the most spectacular is the remote sensing programme, in which processed satellite imagery is compared with data collected from aircraft and from the ground. Some sensors and optical equipment are developed in the laboratory, and processing and image recording has become so specialised that a dedicated computer is being installed with hard-wired processors for particular applications. The programme is investigating surface temperatures, thermal inertia in soils and rocks, forest condition, crop species identification and area measurement, density of plants in rangelands, coastal features and wetlands, and near shore water depth (F. R. Honey). Surface temperature measurements are correlated with water stress in plants (native and introduced) and have shown the effect of Perth's extensive summer watering programme on the summer temperature in the city. (Perth is one of the few cities where the city temperature is below that of surrounding land areas) (P. G. Ozanne). The Division's Coastal Research Project includes bathymetric mapping, in shore water movements, and analysis of tides and currents, as well as dune and sediment movements. Various properties of waves will also be measured. The currents are measured by accurate surveying methods in cooperation with the Australian Survey Office, and they have revealed the existence of a ½ hour period water level variation (seiche) of the same order of magnitude as the tidal range (P. Petressevich and H. Allison). Some work is also done on deep ocean currents by the Division of Fisheries and Oceanography. Radio-telemetry is another interest of P. Petressevich.

Ground water movement and salinity has been of great topical interest in Perth because of the recent drought and the problems of bauxite mining in the Darling Scarp. A theoretical and experimental attack on the movement of ground water through soils and other porous media has resulted in some semi-empirical equations to quantify water absorption and runoff, the movement of water through the soil, and the salinity profiles to be expected (A. J. Peck). Measurement of salt in soils and in ground water is done by resistivity instruments, including the Wenner probe (T. Bromlow). Fluid mechanics has been put to use in an inexpensive but effective way to stabilize waste dumps at Kalgoorlie. Similar principles can be applied to erosion, dust abatement, stabilization of sand dunes, etc., as well as to heat exchange from surfaces (J. K. Marshall).

Another area making use of physics is the radio-isotope laboratory, where various radio-actively tagged elements are used to study metabolism in plants and animals (J. Hill, P. Farrington, J. Barrow).

Very little of this work could be described as pure physics, and in such situations communication with other disciplines is essential. Those involved feel that the necessary effort is well worthwhile.
PHYSICS DIVISION, STATE X-RAY LABORATORY
B. E. King, Physicist in Charge

The Physics Division of the State X-ray Laboratory situated at the Queen Elizabeth II Medical Centre near the University of WA is the Branch of the WA Public Health Department concerned with safety in the use of all types and research in WA. A film badge service is provided for monitoring of individual exposure to ionising radiation for most radiation workers in the State. The Division is equipped for the measurement of a wide range of energies and intensities of ionising radiations, and over the past few years has added equipment for measurement of microwaves power density levels and for radiometry, the latter with special reference to laser beams and ultraviolet sources of light.

The Division is also equipped with sodium iodide and semiconductor detectors for low level counting of small quantities of radioactive substances and analysis of their gamma ray spectra.

The Division's field staff visit organisations where radiation is used to carry out surveys, advise on radiation safety and assist in obtaining the best performance with minimum radiation exposure to personnel, and in the case of medical and dental radiography, minimum exposure of the patient. Special attention is paid to modern fluoroscopic x-ray equipment which incorporates image intensifiers with television viewing for the radiologist. A long term study is being carried out on the performance of this part of the equipment.

Medical use of radiation is the major source of radiation exposure of the public next to the natural background. The Division has carried out a survey of the gamma contribution to the natural background of the Perth metropolitan area. There is also a continuing programme of measurement of radioactivity in the air and rainwater at the Laboratory.

The staff of the Division have long felt that the best way of achieving a high standard of radiation protection is through the education of the persons using radiation. A considerable effort is put into providing short courses and lectures for groups from industrial, medical, dental and other areas who have not received formal training in radiation protection. Congress members who wish to visit the Laboratory should telephone either Mr B. E. King or Dr B. M. Hartley, 380 1122.

MUNDARING GEOPHYSICAL OBSERVATORY
P. J. Gregson, Officer in Charge

The Bureau of Mineral Resources Geology and Geophysics operates the Mundaring Geophysical Observatory as part of its geophysical observation program. Recordings made at the observatory enable basic studies to be made in the sciences of seismology, magnetism, and ionospheric physics for the following purposes:

a. To provide information on the deep seated processes that build mountains and create geological environments suitable for the accumulation of mineral deposits.

b. To provide statistics on the occurrence and strength of earthquakes. These must be taken into account in the design of buildings and other structures.

c. To produce charts of the Australian magnetic field. The Earth's field changes from time to time, so for the use of navigators, prospectors and the like, charts have to be brought up to date about every few years.

d. To provide basic data for ionospheric research and for the prediction of ionospheric conditions for radio communications.

Seismological program
A conventional six-component World Standard seismograph is operated at Mundaring; vertical component short-period seismographs at Kalgoorlie, Meekatharra, Marble Bar, and Warburton; and in co-operation with the State Government, a three-component short-period seismograph at Kununurra. An advanced seismograph (the "Seismic Research Observatory") using modern data acquisition and electronic processing techniques is operated at Narrogin to provide more and better information on earthquake waves.

Data obtained from the Mundaring Observatory and outstations are used to fix the time and place of the earthquakes and their magnitude. Rapid fixes are made by the US National Earthquake Information Service to which data are sent within a few days of the event. This service locates about 9000 earthquakes a year. Since the commencement of recording at Mundaring in 1959, over 1,500 earthquakes have been located in Western Australia.

To supplement the conventional seismographs, four strong-motion recorders (accelerographs) have been installed in the Meckering seismic zone. These instruments record only when they are triggered by strong ground movement. The data derived are of direct use to engineers in the design of buildings, dams, and so on.

Detailed studies are being made in the southwestern corner of Western Australia on the attenuation of earthquake waves, and on the variations in the ratio of the velocities of longitudinal and transverse waves, which are thought to be an indication of impending earthquakes.

Geomagnetic program
A conventional magnetograph is operated at Gnaraloo, north of Midland, which continuously records variations in three components of the Earth's magnetic field (i.e. the horizontal intensity, vertical intensity, and declination). It is planned to instal an automatic digital observatory in 1979; this will simplify and expedite the production of routine hourly data.

The Earth's magnetic field as measured at the surface includes perturbations by external fields associated with solar activity. These perturbations may be studied in relation to the occurrence of solar flares, sunspots, etc., and the effects of the corresponding changes in solar wind and ultraviolet radiation on the ionosphere and exosphere of the Earth. For study of the internal field and its secular variations, the effects of the external fields can be eliminated accurately only by making extended recordings. Only magnetic observatory results give accurate data on the various parts of the field; these data are used in compilation of isomagnetic charts of the Australian region.

Information on external variations of the magnetic field (K-indices) is distributed to interested organisations each week. Like seismology, geomagnetism is a global science and depends on international co-operative arrangements. Observatory data are lodged with World Data Centres in the USA, USSR, Japan, and Europe for research in upper atmosphere and space physics, and for global charting.

Ionospheric physics
Vertical sounding of the ionosphere over the range of 1-23MHz are made every 15 minutes, using an IPS 44 ionosonde. Basic analysis of hourly values of critical frequencies and heights of E and F layers are made. Data obtained are used by the Ionospheric Prediction Service, Sydney, to make routine predictions of ionospheric conditions and to carry out other ionospheric research.

Staff
P. G. Gregson, Geophysicist
E. P. Paul, Geophysicist
A. B. Gaull, Geophysicist
G. Woad, Technical Officer
B. J. Page, Technical Officer

The Australian Physicist, November 1978 161
GEOPHYSICS IN WESTERN AUSTRALIA
S. Gunson and N. Uren, Physics Department, WAIT.

The authors are grateful for discussions with Hugh Doyle, University of WA, Geology Department, Des Rowston, WA Geological Survey, Peter Gregson, Mundaring Geophysical Observatory and Lance Prior formerly of Watheroo Observatory. These formed the basis for the following article.

Geophysics is now regarded as a profession in its own right, and in tertiary institutions is found variously in Departments of Physics, Geology, and Earth Sciences. It had its origins as a branch of applied physics, and the exploration industry has been a significant employer of physicists. These days however, geophysics demands a special training of its own.

The first geophysical activity in Western Australia appears to have been a measurement of the gravitational acceleration at Perth by an Italian, Alessio, in 1905. Systematic and organized activities began when the Carnegie Institute established an observatory at Watheroo about 200km north of Perth on the coastal plain. The observatory was fully operational by 1919 and its suite of measurements included the magnetic elements (vertical intensity, horizontal intensity and declination), atmospheric electricity (conductivity and potential gradient), and earth currents. It was the electrical measurements that were the main consideration in choosing a site that was, in those days, quite remote. The specifications required the site to be, magnetically 'quiet', in an area of low rainfall, low topographic relief, and certain minimum distances from the ocean and the nearest railway line. Professional, maintenance, and domestic staff were in residence at the station. A multi-frequency ionospheric sounding device was installed at Watheroo in 1938.

In 1948-1949 the observatory was transferred to the Australian Government to be administered and operated by the Bureau of Mineral Resources.

A major development took place in 1959, when the observatory was moved to Mundaring, 40km east of Perth. The new position was not considered to be satisfactory for the magnetic observations and these are made at Gnangara on the coastal plain 25km north of Perth. The magnetic station is serviced from the offices and workshops at Mundaring. An important addition to the observatory at this time was the construction of a seismic vault and the installation of seismographs in the Darling Ranges close to the observatory offices. This was a major step in Australian seismology, because before this time the only seismograph operating in WA was one that was installed in the old Perth Observatory in King's Park near the city, a site which was never good and which was deteriorating with urban development.

The Mundaring Observatory also operates one of the thirteen standard seismic sets (SRO), established around the world by the US Government. Ionospheric measurements are still made (for the ionospheric prediction service) but the atmospheric and telluric electrical measurements have ceased.

In addition to observatory studies, the following early events in exploration in WA should be recorded. These are the forerunners of the extensive geophysical exploration industry as we now know it.

In 1928-1930 the Imperial Geophysical Experimental Survey was carried out by the British Government in the vicinity of the well-known lead mines in the Northampton area. The Electrical Prospecting Company of Sweden (ABEM) was involved, and electromagnetic, equipotential and potential drop ratio methods were employed.

In the early 1930s Sep Horvath carried out electrical work around the Wiluna gold fields for Gold Mines of Australia. In 1935-1940, the Commonwealth Government North Australia survey (forerunner to the Bureau of Mineral Resources) carried out electrical, electro-magnetic and magnetic work around Cue and Wiluna.

Vening Meinesz in 1935 used pendulums to establish an absolute value of g at the University of WA Physics Department. He carried out a series of readings further inland and showed the presence of a large negative anomaly over the Perth Basin.

After World War II, geophysical activity increased rapidly. The BMR Bulletin No. 1, by Noel Chamberlain concerns a gravity survey of the Collie coalfield. This survey is still used as a text book example for geophysics students today. In 1948 Don Urquhart carried out seismic and gravity measurements for deep leads in the lakes area near Kalgoorlie. It is interesting to note that no less than twelve WA Physics graduates of the early post-war years joined the developing Bureau.

Gravity traverses by the BMR at Watheroo (1949) and Bullbrook (1951), followed up in 1951-1952 by Thyer and Everingham covering the Perth Coastal plain region (published in 1956) initiated oil exploration activities. WAPT, in 1952 carried out the first seismic exploration in the Carnarvon Basin and the BMR commenced aeromagnetic surveys in the Eastern Goldfields and Perth coastal plain areas.

1953 to 1959 saw a period of extensive Geiger counter surveys in the Kimberley and Lake Johnston areas.

From this point onwards geophysical exploration gathered momentum and it is difficult to relate in detail. Significant periods of exploration on land for oil, and nickel, and the present offshore oil exploration activity are readily brought to mind.

The 1960s provided practical recognition of geophysics as a profession.

Des Rowston in 1962 was the first Geophysicist appointed to the Geological Survey of WA. Geophysics as a discipline was established in WA by the appointment of Stewart Gunson in 1968 in the Department of Physics at the Western Australian Institute of Technology and Hugh Doyle in 1970 at the Department of Geography at the University of Western Australia.

The Australian Institute of Physics and the Society of Exploration Geophysicists (USA) provided the beginnings of the Australian Society of Exploration Geophysicists in Sydney in 1970. In 1978, the WA Branch of the Society of Exploration Geophysicists was formed with Des Rowston the first President. This branch now provides the focus for geophysics in WA, and is participating in the running of the 3rd National AIP congress to be held in Perth in January, 1979. As might be expected, Exploration Geophysicists tend to be fairly mobile. It is estimated that there are 80 to 100 professional geophysicists in WA at the moment.

162 The Australian Physicist, November 1978
PHYSICS AT WAIT
Warren Walker

After ten or more years of existence it is probably not necessary to point out that Physics Departments in Institutes of Technology have a special responsibility for vocational higher education and research and development in support of the local community. They are not specifically restrained from working on problems of larger significance or indeed from conducting fundamental research but it is unlikely that the host institution will support an activity that strays too far from something which will return a demonstrable benefit in the short-term. The WAIT Physics Department has strenuously sought to tackle local or regional issues and at the same time has endeavoured to incorporate many research and development experiences in the education of students. Undergraduates, in particular, spend an appreciable proportion of their laboratory time on projects which, more often than not, have been brought into the department as contract research.

The department emphasises three broad areas of study, namely, Biophysics, Materials Science and Geophysics. This latter area is especially diverse and has been classified internally as either Atmospheric and Marine Sciences or Earth and Planetary Sciences. A fourth area, Physics Education, has recently been joined with specialist groups from other parts of WAIT to form a Science Education group (responsible for a Master of Science Education program) and in that sense has left the department.

The department has direct control of the following courses of study: Bachelor Degree in Applied Science (Exploration Geophysics and Industrial Physics), Diploma in Radiography (Diagnostic and Therapeutic), Graduate Diploma in Applied Physics, Masters Degree in Applied Physics (by thesis).

Taken together there have been a steady 50 ± 5 EFT new enrolments in these courses over the years, although, naturally enough, there have been marked changes in specific cases. Possibly the most significant change concerns the school-teacher group, which was once the sole student body but which is now almost extinct.

Leaving aside Radiography and Exploration Geophysics graduates, for whom employment is well defined and, relatively speaking, easy to obtain and noting that the graduate student is almost always studying part-time while in employment, there is — short of drawing up a long-list — the customary difficulty in specifying opportunities for industrial physicists. Without exception such graduates have found employment within a few months either side of final examinations. Only rarely have the jobs borne little resemblance to the course of study (e.g. management trainee, pilot). Most jobs have been in the general geophysics area (meteorology, seismic data analysis, hydrology etc.) in X-ray Physics and in computing and there is no evidence to support any short-term change to this picture.

In common with most higher education institutions service work dominates the teaching scene. There is regretfully very little consolidation of effort at first year level, each serviced department asking for (and getting) specialised treatment. Again, as others have found, it is a battle to preserve service arrangements when client departments face resource deficiencies (a polite way of putting it). The WAIT Physics Department has recently come out on the losing side of a major war with the Engineering School and a few other departments now seem to find the smell of blood extremely heady. Along with postulated changes in staffing formulation the signs point to a difficult future for the department, particularly with regards to teaching loads, which will probably rise by about one third over the next two years. This will put existing R&D programs at some risk.

Nevertheless, the department is determined to add to its record of enterprise and productivity and will work out some way of keeping its co-operative programs alive. The table below gives a brief survey of major applied activities which team leaders will be happy to discuss with interested visitors at the time of the AIP 3rd National Congress in Perth.

---

**WAIT Mobile LIDAR Equipment**

**ACTIVITY**

<table>
<thead>
<tr>
<th>Atmospheric and Marine Sciences</th>
<th>Atmospheric Remote Sensing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peel Harvey Hydrometeorological Study</td>
<td>(a) Acoustic Sounder</td>
</tr>
<tr>
<td>(b) Laser Radar</td>
<td>Metropolitan Oceanographic Studies</td>
</tr>
<tr>
<td></td>
<td>Marine Acoustics</td>
</tr>
<tr>
<td><strong>Biophysics</strong></td>
<td>Vehicular Lead Emissions</td>
</tr>
<tr>
<td></td>
<td>Thyroidal Imaging by X-Ray Fluorescence</td>
</tr>
<tr>
<td></td>
<td>Earth &amp; Planetary Sciences</td>
</tr>
<tr>
<td></td>
<td>Geochronology of the Pilbara</td>
</tr>
<tr>
<td></td>
<td>Transformation of two dimensional magnetic data</td>
</tr>
<tr>
<td></td>
<td>Uranium disequilibrium</td>
</tr>
<tr>
<td><strong>Materials Science</strong></td>
<td>Accelerated Weathering of Plastics</td>
</tr>
<tr>
<td></td>
<td>Deterioration of ceramic building materials</td>
</tr>
<tr>
<td></td>
<td>Community Noise Survey</td>
</tr>
</tbody>
</table>

**TEAM LEADER**

- Mr Ron Black
- Dr Merv Lynch
- Dr Warren Walker
- Dr Tom Beer
- Dr John Penrose
- Dr Brian O'Connor
- Dr Brian O'Connor
- Dr John deLaeter
- Mr Norm Uren
- Dr Peter Dallimore
- Mr Ron Price
- Mr Ron Price
- Dr Ian Bailey

**COLLABORATORS**

- UWA Botany
- ANU (CRES) with Dept. of Conservation and Environment
- Murdoch University (Env. & Life Sciences)
- WA Dept. of Cons. & Environment
- Bureau of Meteorology
- WA State Energy Commission
- WA Dept. of Ind. Development
- CSIRO (Land Resources Management)
- Australian Dept. of Primary Industry
- WA Dept. of Public Health
- Royal Perth Hospital
- WA Geological Surveys
- Carr-Boyd Minerals
- Local Industry
- Vindex Pty. Ltd.
- Local Industry
- Belmont Shire

The Australian Physicist, November 1978
SOLAR ENERGY RESEARCH INSTITUTE OF WESTERN AUSTRALIA

R. R. Booth, Chairman

The Solar Energy Research Institute was formed in January 1978 following the passage of the Solar Energy Research Act by the Western Australian Parliament late the previous year. Its purpose is to encourage, coordinate, fund and monitor research into solar energy within Western Australia.

The Institute is managed by a Board of Directors and receives advice from the Solar Energy Advisory Committee whose membership is composed of experts in the solar energy field and representatives of organisations likely to be involved in solar research within the State.

As well as being funded from the Western Australian Government, the Institute is able to enter into joint research projects with industry and individuals, and is able to receive funds from a wide variety of sources.

Since its inception, there has been a great upsurge in interest shown within the State of Western Australia in solar research and well over 40 applications have been received up to the middle of the year. Thirteen grants have been awarded which have involved the Institute in the commitment of some $200,000 of grant money but which have enabled it to become involved in projects worth in excess of $1.5 million.

The Institute has also taken the lead in seeking to provide central testing facilities for solar collectors, solar cells and domestic water heaters in Western Australia and also runs a comprehensive technical library which is open to the public.

The Western Australian Government believes that the Institute is the first such organisation established in Australia, even though the arrangement is used overseas, and the initial period of operation of the Institute has amply demonstrated the advantages that can flow from this particular approach.

CRYSTALLOGRAPHY CENTRE, UNIVERSITY OF WESTERN AUSTRALIA

E. N. Masten, Director

The Crystallography Centre provides a diffraction data collection and crystal structure solving service at the University of Western Australia and elsewhere. Most solutions are obtained using automatic diffractometry and the routine use of direct methods. The service is applied to research problems, including high precision work on electron density distributions, and an extensive series of structural studies on transition metal complexes and natural product derivatives.

Two of the staff are shared with the Departments of Physics (E. N. Masten) and Chemistry (A. White). Research within the Centre is aimed at increasing the effectiveness of structural crystallography as a research tool. Dr S. R. Hall is developing improved statistical methods for the solution of crystal structures, with the eventual aim of applying these to macromolecules of biological interest. The range of applications of high precision studies is also increasing. As far as possible new developments are prepared in a form suitable for distribution to research workers elsewhere.

THE CONSERVATION DEPARTMENT OF THE WESTERN AUSTRALIAN MUSEUM

Neil North

The prime purpose of this department is to maintain, in good condition, the objects and specimens held by the WA museum. Due to their fragile physical and unstable chemical nature, most of our time is devoted to materials recovered from shipwrecks. These shipwrecks date from 1622 to the present day and provide a wide variety of materials.

Marine archaeological materials, when recovered from the sea, are often physically fragile and in addition have all undergone chemical changes, the objects become relatively stable in their marine environment but deteriorate rapidly on exposure to the atmosphere. The stabilization of these objects is essentially a chemical treatment process but to do this successfully, consistently and economically a continuing research program must be maintained. In this research work we investigate the wreck site conditions, the process of 'decay', the products formed and the changes produced by atmospheric exposure. From these new treatment methods are developed. This requires a very broad approach and many techniques are used.

Maritime archaeology conservation is a very new field and this department is the only one, at present, in Australia and one of only a very small number throughout the world. With the active co-operation of other institutions, in particular CSIRO, Murdoch University and the WAIT, this department has established itself as a leading world figure in Marine Archaeology Conservation. Altogether there are 16 staff members 3 of whom are Chemistry PhD's.
SUMMER COURSE IN
VACUUM TECHNOLOGY
(1 week)

This course has evolved from shorter courses held in previous years. It covers fundamentals of vacuum practice with detailed treatment of pumping systems, gauges, fabrication, leak detection and materials. About half the course will be devoted to practical sessions involving the use of specially designed vacuum stations including U.H.V. and specific applications such as vacuum film deposition.

Demonstrations include machining, welding and leak detection. Teaching aids include items developed by the education division of I.U.V.S.T.A. (International Union of Vacuum Science Technique and Applications).

12th - 16th FEBRUARY, 1979
FOOTSCRAY INSTITUTE OF TECHNOLOGY
FEE: $155
Accreditation statement on completion of course.

Enquiries: Dr. A. Simpson
Mr. K. Lawlor
Applied Physics Department
F.I.T., Ballarat Road,
Footscray, Vic. 3011
(03) 689 3400 ext. 279 or 283

ICA 10th International Congress on Acoustics, Sydney

The Australian Acoustical Society has been entrusted with the organisation of the 10th International Congress on Acoustics to be held in Sydney, July 9-16, 1980.

The responsibility for ICA meetings lies with Commissioners who are appointed under the auspices of the International Union of Pure and Applied Physics – a UNESCO body. Papers are presented in a wide range of topics.

In addition to the main Sydney Congress there will be satellite symposia as follows:
Perth – Topic: Basic Causes of Noise Deafness

Adelaide – Topic: Industrial Noise Sources –
Identification and Modification

ICA Congresses are held every three years and usually attract over 1,000 participants. This will be the first to be held in the southern hemisphere and we are conscious of the high cost of travel to and within Australia for most of the delegates. In this respect we are looking for additional incentives for travel to this country, such as the possibility of other scientific meetings being organised in allied fields.

We would be most interested to learn if members of your society are proposing to organise an international, national or state conference or meeting in July 1980. If such a meeting is proposed, would it be possible to give consideration to timing it close to the dates of the 10th ICA and at a location convenient for travel to the ICA or its associated meetings.

Please address your reply to Executive Committee,
10th ICA.

J. A. Rose, Chairman
AAS/ICA Executive Committee
A regional Solid State Physics meeting will be held at the Riverina College of Advanced Education, Wagga Wagga, N.S.W. from Wednesday 7th February, 1979 to Friday 9th February, 1979. The meeting is being sponsored by the Australian Institute of Physics.

General
This is an opportunity for physicists with interests in any aspect of solid state physics to get together in the informal atmosphere of a residential college to discuss their research work and facilities.

The meeting will include:
(a) invited review papers on selected subjects,
(b) contributed papers and research reports,
(c) a group presentation by members of staff of a major solid state laboratory.

The meeting will cover a wide range of topics including magnetic, thermal, transport, resonance, optical, mechanical and structural properties of solids.

Contributed papers may cover completed work, progress reports on incomplete or controversial topics, or even "cries for help". There will be no parallel sessions. Invited review papers will be presented as lectures but emphasis will be placed on poster sessions for contributed papers, although some contributed papers will be given as talks of 15 minutes duration. As at past meetings, poster sessions will be held in the bar/lounge area of the College Union, and posters will be on display for 24 hours.

Dates and Times
Application forms will be distributed in mid-November.
Applications to attend close on Monday 11th December, 1978.
Abstracts of contributed papers must be submitted by Monday 8th January, 1979.
Conference registration commences on the evening of Tuesday 6th February, 1979.
Conference sessions commence at 9 a.m. on Wednesday 7th February, 1979.
Conference ends at mid-day on Friday 9th February, 1979.

Costs
The cost (including accommodation, meals, tea and coffee) will be approximately $22 per day, i.e. a total cost of $60–$70 for a person arriving on the evening of Tuesday 6th February and leaving after lunch on Friday 9th February.

Student members of the Australian Institute of Physics may apply in advance to the Hon. Secretary of their local branch for financial assistance to attend the meeting.

Registration Fee
There will be no registration fee for A.I.P. members.
Registration fee for non-members, $5.00.

Information and Application Forms
Application forms will be sent to institutions that have been represented at previous Wagga meetings. Further information and extra application forms may be obtained from the Conference Secretary.

Dr. D. C. Price,
Department of Solid State Physics,
Australian National University,
P.O. Box 4,
CANBERRA, A.C.T. 2600
Telephone: (062) 49-4571
(062) 49-4244 (Dept. Secretary)