CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 118, MELBOURNE, JANUARY 1969

MR. LEWIS JOINS EXECUTIVE

Mr. L. Lewis has been appointed to the Executive. He succeeds Mr. W. Ives who was recently appointed Secretary of the Commonwealth Department of Primary Industry.

Mr. Lewis has been an Associate Member of the Executive since 1966.

He graduated B.Met.E. from the University of Melbourne in 1933 and was awarded an exhibition in metallurgy.

He spent the next six years as a member of the research staff of Broken Hill Associated Smelters, Port Pirie, where he worked on techniques for roasting and smelting lead ores and refining lead bullion.

He also developed a production method for refining cadmium from lead smelter fume.

In 1940, Mr. Lewis joined CSIRO as Secretary of the newly-formed Division of Industrial Chemistry and in 1946-47 he served in London as the Australian Scientific Liaison Officer.

In 1955 he was appointed Officer-in-Charge of the Industrial Research Liaison Section.

Mr. Lewis was made Executive Officer in 1964 and an Associate Member of the Executive in 1966.

As a metallurgical engineer with a wide experience of the problems of Australian industry, Mr. Lewis has been particularly concerned with the impact of scientific research on Australia's industrial growth.

His early industrial experience and his long association with the Division of Industrial Chemistry and the Industrial Research Liaison Section have made him especially aware of the need for research and development.

Some years ago he was associated with the late Dr. S. H. Bastow of the Executive in a detailed enquiry into the problems of encouraging research in industry and into the difficulties faced by small industries in organizing research.

Mr. Lewis LEWIS

Mr. Lewis is a member of a number of industrial research councils and committees including: Manufacturing Industries Advisory Council, Australian Industrial Research and Development Grants Board, Council of the Australian Mineral Development Laboratories, Board of Management of the Australian Coal Industry Research Laboratories, National Coal Research Advisory Committee, Commonwealth Building Research and Development Advisory Committee, Council of the Bread Research Institute of Australia, and Council of the Australian Welding Research Association.

HYBRID COMPUTER

The Division of Chemical Engineering is planning to develop a hybrid computer system which will be the most powerful of its kind in Australia.

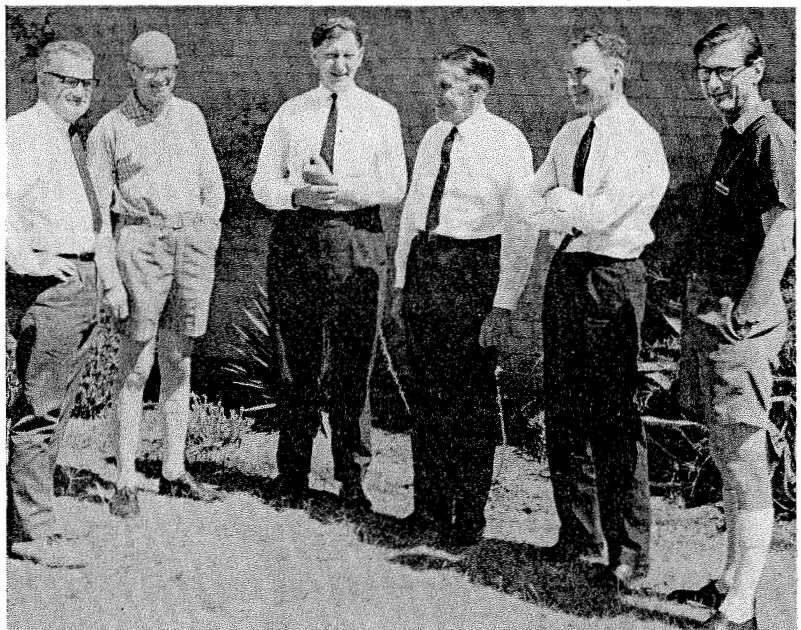
E.A.I. — Electronic Associates Pty. Ltd. have been awarded a contract worth about $120,000 to supply a 640 digital computer, a hybrid interface, and peripheral equipment.

All of this equipment will be linked to the Division's 8800 analogue computer.

The digital machine will have 8,000 words of 16-bit core store, and a direct memory access option will be included to enable operation in the hybrid mode.

As well as performing general hybrid simulation for a number of Divisions, the planned installation will also be used to solve problems of direct digital control of chemical plants.

The hybrid interface will be supplied in basic form but can be expanded to include a large number of high-speed analogue-to-digital and digital-to-analogue data transfer channels.



During the course of the current hearing on work value for Research Scientists and Chiefs of Divisions, the Arbitrator, Mr. Commissioner O. O'Reilly, visited a number of CSIRO laboratories and field stations to gain the necessary background for the case. Our picture shows Mr. Commissioner O'Reilly (third from right) at CSIRO's Solar Observatory at Culgoora with, from left to right, Mr. L. G. Wilson, Secretary (Administration); Dr. R. G. Giovanelli, Chief, Division of Physics; Dr. C. K. Coogan of the Division of Chemical Physics, Advocate for the CSIRO Officers' Association; Dr. E. G. Bowen, Chief, Division of Radiophysics; and Dr. J. P. Wild of the Division of Radiophysics.

Research as a Career

"Do not despair if the level of lecturing at the university is low. You will, and should be exasperated, but when driven to the textbooks you will get a second presentation of the subject, perhaps more illuminating.

"Looking back on the days when a once notable science department in Australia was in the doldrums, it is comforting to note that there always emerged from it men who subsequently made for themselves enviable reputations in all parts of the world.

"The very weakness of the department built in these men a spirit of independence that contributed to their later successes."

This frank comment by Dr. I. W. Wark, in his recently published book "Why Research?", is typical of the advice which he has to offer students contemplating a career in science.

"Why Research?" is the latest in a series of books on careers entitled "My Life and My Work" published by Educational Explorers Ltd. of Reading, Britain.

In his foreword to the book, Sir Harold Hartley says, "It was a brilliant idea of the editor of the 'My Life and My Work' series of books to go to one of the newer countries with its vast opportunities for development for an author to show how science can take advantage of these opportunities.

"The book forms part of an international library and in Dr. Wark they found a scientist whose researches have found application all over the world on account of their far-reaching nature."

"It is a book of unusual merit, full of shrewd ideas, the human story of a man who has put his principles to the acid test of experience and has built up from scratch one of the most successful Divisions of the liveliest research organizations in the world, the CSIRO."

After graduating in science from the University of Melbourne, Dr. Wark pursued his postgraduate studies in London and California before entering the mining industry to work on problems of electrochemistry and flotation.

Then in 1939 at the request of Sir David Rivett he joined CSIRO to establish the Division of Industrial Chemistry, now the Chemical Research Laboratories.

"Why Research?" by I. W. Wark, Educational Explorers Ltd., Reading. 123 pages. Australian price $3.50. Available from Cuisenaire Company of Australia Pty. Ltd., Blackburn, Victoria.

Dr. Wark became a member of the Executive in 1960 and on his retirement in 1965 was appointed to his present position of Chairman of the Commonwealth Advisory Committee on Advanced Education.

In his book, Dr. Wark traces his career right through from early schooling to his present position, outlining the personalities and events that influenced his choice of projects and their degree of success.

The book discusses such topics as the attitude of scientists to their work and the results of their research, employment opportunities and problems, and science and internationalism. There is also a section devoted to brief biographical profiles of several CSIRO scientists.

Perhaps the most interesting chapter is the one entitled "Does the Research Scientist earn his keep?"

Dr. Wark feels that this is a question to be taken seriously by every research worker and anyone who employs a research man.

Assessments should not be precipitate he says, but if, after a year, a research project is not coming up to expectations and not heading anywhere in particular, it should be wound up.

"It does not happen often, and perhaps it should happen more often, for research workers generally are not keen on winding up projects in which they have an interest."

Dr. Wark is critical about some advisory committees set up to ensure that money put into research is effective.

"I have a suspicion", he writes, "that, had powerful advisory committees been in existence at the time Faraday or Mendel were doing their experiments, they would have found these experiments pretty hard to accept as worthwhile research.

"Advisory committees usually play safe in assessing the value of a proposed research project, and thus tend to back the more conventional. Individuals can be more adventurous."

PARADOXES OF SCIENCE

Il y avait une fois; mucho tiempo ha; tanto tempo fa; **and once upon a time. Phrases such as these, signifying some happier time of the past, are used, I suppose, in every language. But a happier time either never was, save in our imagination, or always is; but, if it is at any one time, it is so for only some proportion of mankind and at that only in some special sense.**

The world, that was always old to man, is always new, bright and happy, for at least some young people.

In some much happier time the scientist was, or is, a shining knight.

He is, or was, highly intelligent, objective, unbiased, and tireless, in his search for new knowledge; his integrity is always high, his motives honourable, his worldliness almost nil (he lives in an ivory tower), and his interest in money is only cursory and occasional.

This description of the scientist is not merely derisory; it is real in the minds of many, and held even by some journalists, that otherwise cynical and hard-boiled race.

Moreover, it has its historical ground. Many scientists of earlier centuries matched this description, at least as nearly as humans ever approach excellence.

But the science of such people was often the pastime of the rich. It was an activity which fitted their mind and temperament as closely as writing poetry, fighting small wars of independence, and other excitements, fitted the mind and temperament of Lord Byron.

Not all early scientists were rich, and, of course, none of them was other than human, with numerous weaknesses. Nevertheless, their scientific activity was effective; there is no indication that Newton's physics suffered from his credulity about astrology.

This leads to the first point I wish to make, namely, that a scientist, like any other individual, compounds in himself a diversity of characteristics which often manifests itself in marked ambivalence.

A scientist is generally both credulous and sceptical and acts in both scientific and unscientific ways; often, the more rigorous and sceptical he is in the field of his specialization, the more ingenuous and even childish a scientist is in other fields.

Although it does not automatically follow that such a person is unscientific in those other fields, I believe that scientists do often behave unscientifically outside their own fields.

I believe it is also true that the ordinary person too can and does act both scientifically and unscientifically, the difference between scientists and others having its origin in differences of intensity of motivation with respect to one type of activity as against the other.

I would, however, go further and argue that very often even those activities that must generally be described as scientific contain elements which most people would regard as unscientific.

To analyse this further it is necessary, I suggest, to distinguish between the following:

1. Scientists.
2. Scientific activity.
3. Science as theory and method and the exercise of critical judgment.
4. Science as accumulated verifiable fact.

Moreover, these four must be distinguished from science policy and science administration, and then all of these must be kept separate from the consequences to society of the advances of science and of the application of its results.

Science is often talked about as though it were a single homogeneous entity consisting of all four of the above elements. I want to suggest that this view is erroneous.

The distinctions between these categories may be represented more or less as follows; scientists are people who engage in scientific activity for a large part, but not all, of their working life.

Scientific activity for the most part, but not all of it, consists of the exercise of critical judgment and employment of scientific method for development of scientific theory.

This article was written by Dr. G. L. Kesteven, Assistant Chief of the Division of Fisheries and Oceanography, and appeared originally in the September 1968 edition of The Australian Quarterly.

The result of this activity is to add to (and sometimes to replace) verifiable fact.

Thus, since science as theory and method and the exercise of critical judgment is the kernel of the matter, probably our best approach to this problem will be to consider what are held to be the characteristics of this science and to try to show how these characteristics distinguish this from other modes of thought.

Most generally science-as-thought is held to have five principal characteristics; in setting out these characteristics and common views of them I also set out other, often equally strongly held views which see science as being quite the contrary of the common view.

I shall argue later that "science", paradoxically, has in respect of each of these characteristics something of both views.

First, science is thought to be systematic, and yet many scientists believe that the best science is serendipitous.

Moreover, a relatively large proportion of the scientific community is hostile[1] to the planning of science, and even to any measures directed toward standardization of the terminology and methods of science.

Second, science is held to be logical, and yet some members of the scientific community consider mathematics to be outside of science, and some philosophers of science maintain that real scientific advance cannot be achieved by logical argument.

Again, many scientists place considerable emphasis (and rightly so) on the importance of individuality and they give considerable weight to the role of imagination and intuition; to the layman this must seem contrary to what he has understood to be the cold logicality of objective science.

Third, science is supposed to be objective. This characteristic is represented in one of the main tests of the value of scientific result, namely verifiability.

Yet, this characteristic is scarcely consistent with the views on individuality, nor does it seem consistent with the fact that scientific activity is often fashion-swayed almost as significantly as are popular singing and dancing.

Fourth, science is supposed to add to knowledge, and yet there are those in the scientific community who hold that the accumulation of fact is not scientific.

Fifth, and finally, science is thought to be experimental, and considerable importance is found in what are described as "crucial" experiments; moreover, many journalists seem to expect scientists to be perpetually engaged in carrying out "tests".

Furthermore, the white coat is something of a status symbol, and those who manipulate apparatus are thought to be an elite.

Yet this view is inconsistent with the arguments of Popper and Hempel of which the result is that science consists in using the mind, especially in imaginative and intuitive ways, and that experiments and observation are technology or engineering.

Nor in a different way is it consistent with the fact that some scientists, notably astronomers, cannot experiment on the systems they study and at best make observations.

Let me say at once that I do not see these inconsistencies as clay in the feet of science.

I take this view from two positions, from one of which I see some of such inconsistency as evidence of the essential humanity and substance of science, whilst from the other I see some of the inconsistency not as of science itself, but as of scientists and scientific activity, and thus further explaining the distinction between the four categories I have listed above.

But the defining statement above left us with the central question; what is scientific method? It would be a bold person who thought he could offer a novel definition of this term; for my part I believe that the most commonly held view is something like the following:

Scientific method is a course of intellectual activity[2] which has characteristics of orderliness, logicality and so forth, such as discussed above. This activity is organized through, and oriented to, the setting up and testing of hypotheses as to phenomena in that world-there-outside-of-us. The best and most advanced of this activity is focused on phenomena of which we as yet have no description or explanation; the celebrated scientists are "those who have been there first", and in this regard there is analogy with the climbing of Mount Everest. In journalistic argot the scientific method unlocks the door of nature, solves nature's riddles and makes discoveries.

The foregoing is in some sense a ladder of excellence, and we find that examination of a great deal of so-called scientific activity forces us back down the ladder.

Much of scientific activity is not concerned with scaling new heights, but with confirming[3] the truth of the reports of scientific leaders.

The hypotheses of such work, if indeed there are any, are relatively trivial and intended chiefly for confirmatory tests. Such work often lacks one or more of the characteristics of orderliness, etc., and even is more manipulative than intellectual.

I find none of this objectionable, for I do not believe that scientific activity need make a claim to perfection. But I do find objectionable any claims on behalf of scientists and scientific activity that overlook the fact of a spectrum of excellence and neglect the foregoing inconsistencies.

Courtesy "New Scientist"

An example of such claim is the one that a scientist, because of his training and of his habit of critical and objective scrutiny of evidence, is fitted to govern.

Now, it is probably true that some of the people who carry the label "scientist" are fitted to govern.

However, it is a reasonable hypothesis that the disposition to govern is commensurate and correlated with the ability to perform the tasks of government; but if, then, we were to take the evidence to date of recruitment of scientists into the ranks of government, we would be bound to conclude that scientists lacked either the disposition or the capacity for government, and indeed lacked both, and therefore that the original proposition is false.

We could argue that the facts of the case are what they are because capacity to govern requires, apart from disposition and temperament, a training and experience which few scientists have opportunity to get, and many of them eschew.

The decisions of government (political and administrative) must take account of matters other than the purely rational, and if a scientist has only his rationality to offer, he is unfit for the higher decisions of government.

He is further disqualified if his rationale (his account of the system he has studied) is deficient and defective in any respect. He is still further disqualified if the non-scientific parts of his mind give him a stubborn confidence in the correctness of his views.

The stubbornness of bigotry that made Cromwell write to the General Assembly of the Church of Scotland: "I beseech you, in the bowels of Christ, think it possible you may be mistaken" is no more a prerogative of churchmen (nor something from which scientists are exempt) than insight, logic, and other characteristics are a prerogative of scientists.

Perhaps it is unfair to single out the scientific community for these strictures. It is clear that there is no right-by-profession to government, and hence that, for example, a lawyer who had only his legalism to offer would not be fit to govern.

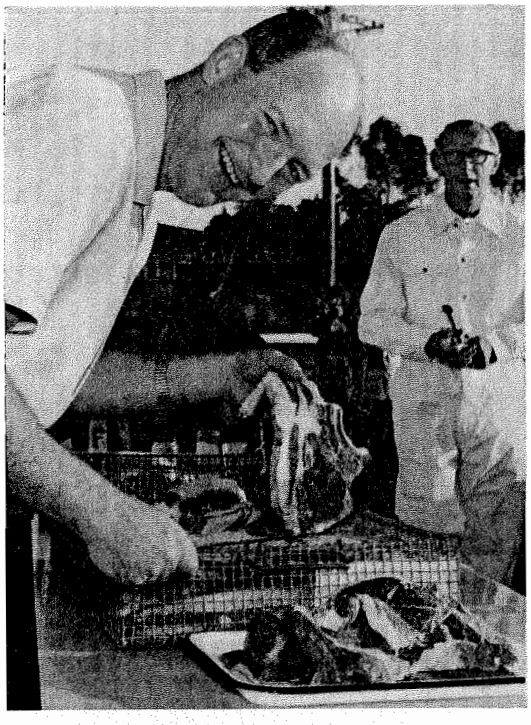
Yet is it not true that it is uniquely on behalf of scientists that it is claimed that their profession fits them for government? Military juntas do not

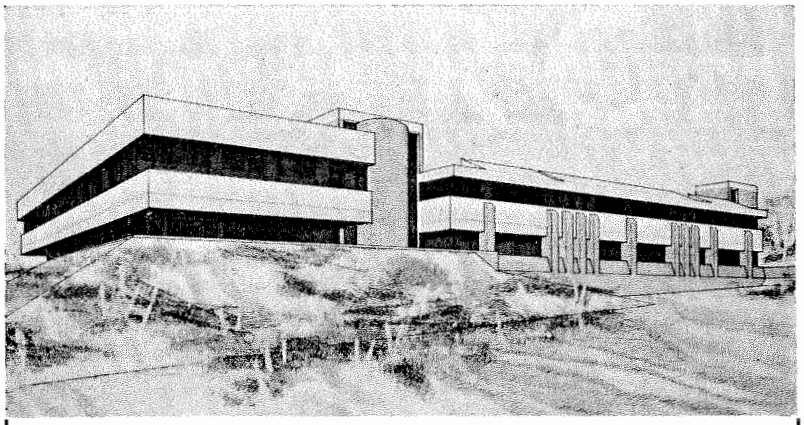
(Continued on page 4)

1. It is clear that often such hostility is not to planning or standardization in principle but to particular planners and co-ordinators, or to their particular proposals or objectives.

2. There is a question as to how far the use of manipulative practice also is required, or, according to some, is admissible.

3. Such confirmatory work is what Kuhn in his "Structure of Scientific Revolutions" calls convergent research, distinct from divergent research which seeks to show that matters can be explained in ways other than by current accepted theories. Kuhn's term for the current accepted set of theory (with its practices) is "paradigm".





Above is an Architect's impression of the view from Nicholson Crescent, of the proposed Agronomy Laboratory and Administrative Block to be built for the Division of Plant Industry at the CSIRO Black Mountain site in Canberra. Some $500,000 will be provided for Wool Funds for the Agronomy Laboratory and $200,000 from Treasury for the Administrative Block. The Commonwealth Department of Works, Canberra office, are the Architects for the project and it is expected that tenders will be called for the construction of the building next March.

The News In Brief

Professor

Mr. M. Feughelman of the Division of Textile Physics has been appointed to the Chair of Textile Physics at the University of New South Wales.

Doctorate

Mr. J. L. Corbett of the Division of Animal Physiology has been awarded the degree of Doctor of Science by Massey University for his work on the nutrition of grazing ruminants.

Engineering Prize

Mr. R. N. Morse, Chief of the Division of Mechanical Engineering, and **Mr. W. R. W. Read** of the same Division, have been awarded the Mechanical Engineering Prize for 1967 of the Institution of Engineers, Australia, for their paper, "The Development of a Solar Still for Australian Conditions".

The prize is awarded annually for the paper deemed to be the most important contribution to the literature of the engineering profession on a mechanical engineering or allied subject.

Overseas Visits

Dr. W. G. Kauman, Assistant Chief of the Division of Forest Products, leaves shortly on a six-month visit of forest products research laboratories in the Philippines, Japan, the United States, Canada, Europe, Britain, Russia, Israel and Thailand.

Dr. C. H. B. Priestley, Chief of the Division of Meteorological Physics, leaves this month for the United States to attend a meeting at Princeton University of the Joint Global Atmospheric Research Programme Organizing Committee. He will return next month.

Ski Club

At the Annual Meeting of the C.S.I.R. Ski Club last November, the following office-bearers were elected for 1969:

Chairman, **J. B. Ross** (Chemical Research Laboratories); Secretary, **R. R. Hughan** (Chemical Research Laboratories); Treasurer, **G. F. Flanagan** (Protein Chemistry); Assistant Secretary, **R. Johnson** (Protein Chemistry); Lodge Manager, **J. Kulkens** (Tribophysics).

Deadline

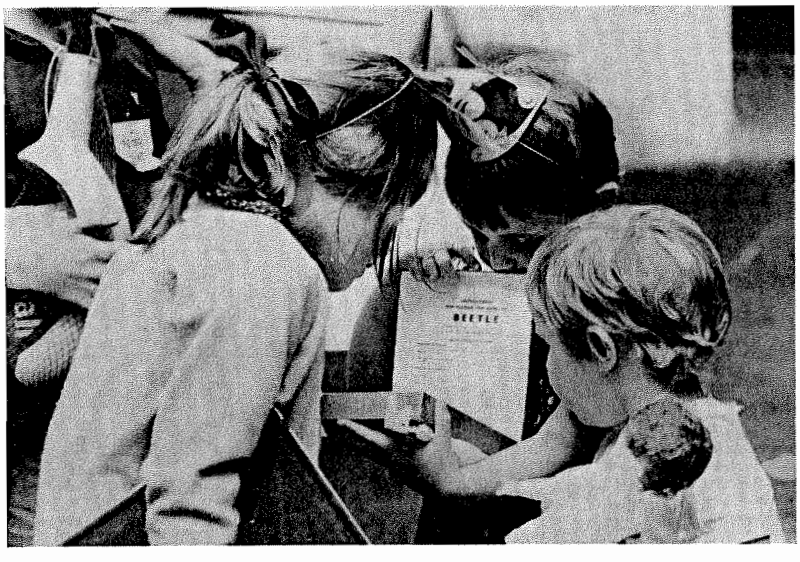
Contributions for the February issue of Coresearch should reach the Editor at 314 Albert Street, East Melbourne, by Wednesday, 15th January.

Christmas Parties

Top left. Somehow or other, the Parkville Laboratory of the Division of Animal Health is always able to produce the most succulent steaks for its annual Christmas barbecue. Arthur Rowlatt selects his T-bone while Social Club President and Chief Cook, Norm Southern, prepares to go into action.

Left. Screams of delight herald the arrival of Father Christmas (alias Jock Currie) at the Forest Products children's party.

Below. "Look what I got from Santa". Three of the youngsters who attended the Head Office children's party.



SAFETY NOTES

Rocket Propulsion

An unusual incident which could have had disastrous results occurred in a scrap yard in Britain last year when a worker was removing some brass valve fittings from oxygen cylinders to recover the brass scrap.

The cylinders weighed 78 lb. and were 4 ft. 6 in. long and 5 in. in diameter.

The man tried to screw off the valves, but found that the screw threads were seized. He placed the cylinders on the ground in the open yard and tried to break off the valves with a hammer.

He had broken off four valves without incident, but the fifth cylinder must have been under pressure because when he struck the valve it blew off.

The cylinder spun round on the ground, then flew through the open gates of the yard, across a pavement and the main road, to strike a car parked on the other side of the road, and then cleared a 7 ft. high chain link fence to land in a school playground.

The total distance which it travelled was about 120 ft.

It must have hit the car with considerable force, because the bumper was driven back and damaged the chassis as well as the wing. There were two large holes in the asphalt playground where the cylinder landed.

This incident illustrates what can happen if the valve is knocked off a cylinder of compressed gas.

You don't need to use a hammer to achieve dramatic results. The valves of a gas cylinder can break off at the neck if a cylinder falls and the valve strikes a solid projection or even a wall.

Make sure all gas cylinders are securely fastened to a stable structure.

"Flammable" or "Inflammable"

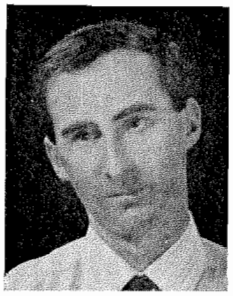
Anyone who has not been exposed to the peculiarities of the English language from birth, could be excused for thinking that an "inflammable" liquid was the opposite to a "flammable" liquid.

The Oxford Dictionary notwithstanding, current practice in industry is to use the words "flammable" and "non-flammable" rather than "inflammable" and "non-inflammable". This avoids any ambiquity.

J. W. Hallam, Safety Officer.

New Appointees

Mr. D. M. C. Ball has joined the Division of Textile Industry to work on the evaluation of new mechanical processes. Mr. Ball graduated B.A. from the University of Cambridge in 1959 and M.A. from the same



Mr. D. M. C. BALL

university in 1963. Since 1960 he has been a director of the cotton spinning firm of Bowker and Ball Ltd., Cheshire, and in charge of production planning.

Mr. J. Czech has been appointed to the Division of Mechanical Engineering to carry out research and development on equipment for comfort

Mr. J. CZECH

cooling and the utilisation of solar energy. Mr. Czech obtained his Diploma in Agricultural Engineering from the College of Agricultural Machinery, Prague, in 1959. After working as an engineer on a co-operative farm from 1960 to 1964 he studied for the degree of Master of Agricultural Engineering at the Research Institute for Agricultural Engineering, Prague. Mr. Czech left Czechoslovakia for Australia last year following the Russian invasion.

Mr. J. R. Eley has been appointed to the Division of Textile Industry to study the mechanical action of machines on wool fibres with a view to developing new techniques for processing wool. After gradu-

Mr. J. R. ELEY

ating B.Sc. from the University of Adelaide in 1946, Mr. Eley spent four years as a geologist with the South Australian Mines Department. Since 1950 he has been with the wool firm of G. H. Michell and Sons Pty. Ltd.

Mr. D. J. Carpenter has joined the Division of Fisheries and Oceanography to study submarine light energy in relation to the growth of marine plants. Since graduating B.Sc. with honours from the University of Sussex in 1966, Mr. Carpenter has worked as an engineer with the British firms of Submarine Cables Ltd. and Trico-Folberth Ltd.

Dr. Maureen Franek has joined the Division of Food Preservation to carry out research on the possible effects of the state of water and its structure on the course of

Dr. MAUREEN FRANEK

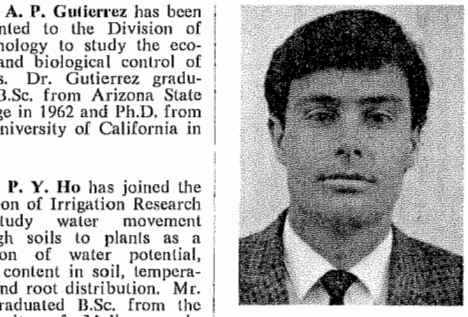
action of hydrolytic enzymes. Dr. Franek graduated M.Sc. from the University of Queensland in 1965, and Ph.D. from the Australian National University in 1968.

Dr. A. P. GUTIERREZ

Dr. A. P. Gutierrez has been appointed to the Division of Entomology to study the ecology and biological control of aphids. Dr. Gutierrez graduated B.Sc. from Arizona State College in 1962 and Ph.D. from the University of California in 1968.

Mr. P. Y. Ho has joined the Division of Irrigation Research to study water movement through soils to plants as a function of water potential, water content in soil, temperature and root distribution. Mr. Ho graduated B.Sc. from the University of Melbourne in 1965 and M.Sc. from the same university in 1968.

Dr. I. B. Lambert has been appointed to the Division of Applied Mineralogy and will work at the Baas Becking Geobiological Laboratory on the origin of ore-bodies, particularly stratiform sulphide ores. Dr. Lambert graduated B.Sc. with honours from the Australian National University in 1963, and Ph.D. from the same university in 1967. Since then he has been a research associate



"Who will get paid more in 1982 — computer programmers or nurses?"

Courtesy "Saturday Review"

Dr. I. B. LAMBERT

in the Department of Geophysical Sciences, University of Chicago.

Dr. J. K. Martin has joined the Division of Soils to undertake research on the interactions occurring at the root-soil interface. Dr. Martin graduated M.Sc. from the University of Otago in 1948, and Ph.D. from the same university in 1955. From 1953 to 1960 he was a microbiologist at New Zealand Breweries Ltd., and from 1960 to 1961 was Product Development Officer with Tasman Vaccine Laboratories Ltd.

Dr. J. K. MARTIN

In 1961 he became a biochemist with the Soils Bureau of the D.S.I.R. and for the last two years he has held a postdoctoral fellowship at the NASA Ames Research Centre, California.

Dr. L. Shain has been appointed to a fellowship in wood science with the Division of Forest Products. He will study transition phenomena between sapwood and heartwood and aspects of mycorrhiza formation. After graduating M.Sc. from Pennsylvania State University in 1960, Dr. Shain spent three years with the United States Forest Service as a plant pathologist. He obtained his Ph.D. from North Carolina State University in 1966, and

Dr. L. SHAIN

since then has been working with the Norwegian Forest Research Institute.

Dr. A. R. Toakley has joined the Division of Building Research to work on the development of new techniques in the field of civil engineering systems. Since graduating B.C.E. from the University of Mel-

Dr. A. R. TOAKLEY

bourne in 1953, Dr. Toakley has been with the Victorian Office of the Commonwealth Department of Works. He obtained the degrees of M.Eng.Sc. from the University of Melbourne in 1961 and Ph.D. from the University of Manchester in 1966.

PARADOXES OF SCIENCE

(Continued from page 2)

constitute evidence in denial of this proposition: they seize power because they are in a position to do so, but I doubt they ever bother to claim that they have done so because their profession fitted them for government.

President Kennedy is reported to have lamented at the time of the Bay of Pigs incident that, having spent his life learning to distrust the expert, he had at that critical time forgotten his lessons.

I take him to have meant that an expert, who by definition has only part of the story, is disposed by nature to believe that the part he has is the important part, and to forget about the other parts.

I see this incident as reflecting a fundamental truism, that an irrational element in the conduct of human affairs is both inevitable and necessary.

The expert himself is in some degree irrational, and he compounds the irrationality inherent in the situation of which he himself is part.

Yet the matter goes still deeper. It is often asserted of "science" (without being clear which of the above four categories is meant) that it takes nothing for granted.

The fact is, however, very much to the contrary: the nature of convergent science is that its practitioners assume the current models (Kuhn's paradigm) to be valid, and the nature of divergent science is that *its* practitioners show the models to be invalid, if only in small degree.

Nevertheless, both types of activity are scientific.

Moreover, Bentley Glass and others have been writing lately about the selection that scientists make of their material and about the very acts of faith from which they launch their ideas.

If we add to this the evidence on the great importance of imagination and intuition in scientific activity we find ourselves applauding the title to Beveridge's book — *The Art of Science*.

Then we see scientific activity as something human, achieving its progress, as Man does in all his activities, by its mistakes as well as its successes.

And even more, we see that the layman non-scientist's view of "science" — test-tubes and white coats, relentless logic and inhuman indifference — is not of science.

Quotes for the Month

"He uses statistics as a drunken man uses lamp posts — for support rather than for illumination."

Andrew Lang, 1844-1912.

"History records the names of royal bastards, but cannot tell us the origin of wheat."

Jean Henri Fabre, 1823-1915.

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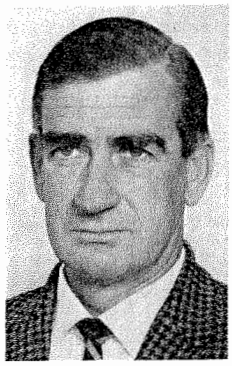
CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 119, MELBOURNE, FEBRUARY 1969

Death of Dr. Wadsley

On Monday, 6th January, Dr. A. D. Wadsley, Assistant Chief of the Division of Mineral Chemistry, suffered a severe coronary occlusion while chairing the opening session of the International Conference on the Chemistry and Physics of the Earth's Mantle in Canberra. He died later in the day in hospital.

David Wadsley gained his M.Sc. at the University of Tasmania in 1941 and, after a period as physicist at the Munitions Supply Laboratories, joined the Division of Industrial Chemistry in 1943.



Dr. A. D. WADSLEY

His early work on manganese dioxide formed part of the late Allan Walkley's programme of war-time research on dry cells, but Wadsley soon developed a line of research which was to become characteristically his own during the next twenty years.

In 1956 he was awarded a D.Sc. by the University of Tasmania for work which included his early approaches to the concept of crystallographic shear.

Dr. Wadsley was a brilliant scientist of first-class international standing. He gave many invited lectures overseas and was the recipient of a large number of requests from scientists who wished to work in his research group.

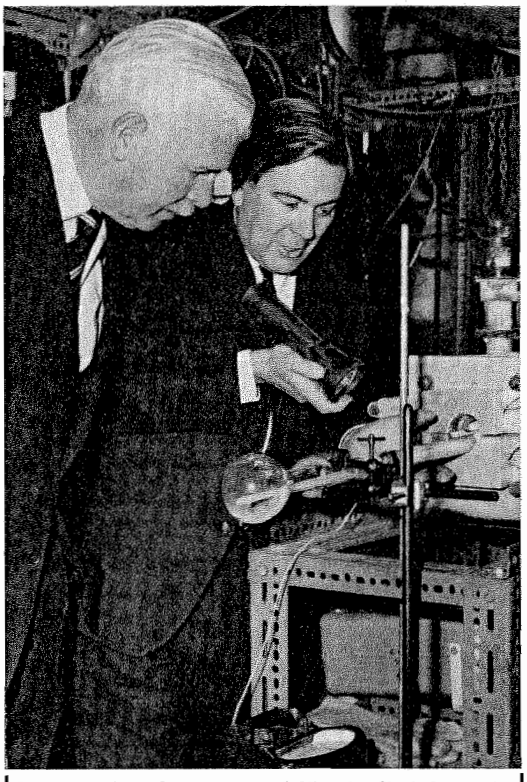
He was notable for the independence and adventurousness of his scientific thinking, but he enjoyed nothing more than the reasoned questioning and probing of his ideas by other scientists and collaborators.

In 1965 he was awarded the H. G. Smith Memorial Medal of the Royal Australian Chemical Institute.

In 1967 he became Assistant Chief of the Division of Mineral Chemistry, but his administrative duties seemed only to act as a spur to his prolific publication rate.

David Wadsley died at the peak of his career; his Division will miss the impact of his keen intellect, but a far greater loss will be the friendship and warmth of a personality which was held in the highest regard by scientists throughout the world.

I.E.N.



Last December, the Governor of Victoria, Sir Rohan Delacombe, visited the Divisions of Mineral Chemistry and Protein Chemistry in Melbourne to see something of their research activities. Our picture shows Dr. W. T. Denholm of the Division of Mineral Chemistry explaining to the Governor the essential features of the condensation of aluminium chloride.

Melbourne half-back flanker Neville Stone received a hose-down at the Division of Protein Chemistry recently in a test that showed that reinforced wool football guernseys were superior to 100% acrylic guernseys in their ability to repel and shed water. In earlier tests at the Division an acrylic guernsey, 1½ oz lighter than a reinforced-wool garment, finished up 5 oz heavier after both were drenched for seven minutes. The tests were conducted for the Australian Wool Board to counter claims that wool took up water at five times the rate of the acrylic.

The News In Brief

New Year Honours

Dr. J. Griffiths Davies, Chief of the Division of Tropical Pastures, was created a Commander of the Order of the British Empire in the New Year Honours.

Also honoured were: **Mr. C. R. Bunning,** a member of the Western Australian State Committee, C.B.E.; **Mr. V. G. Burley,** Chairman of the Tasmanian State Committee and a member of the Advisory Council, C.B.E.; **Dr. J. Melville,** a member of the South Australian State Committee and the Advisory Council and a former member of the Executive, C.M.G.; and **Mr. F. M. Read,** a member of the Victorian State Committee and the Advisory Council, I.S.O.

Imperial Service Medal

Mr. J. A. Redpath, who retired from CSIRO last August after 37 years with the Division of Plant Industry, was awarded the Imperial Service Medal last December in recognition of his long public service.

Doctorate

Mr. A. Howard of the Division of Food Preservation's Meat Research Laboratory at Cannon Hill, Brisbane, has been awarded the degree of Doctor of Philosophy by the University of Queensland for his work on the measurement of eating quality with special reference to meat.

Aldermen

Dr. R. Jones of the Division of Plant Industry's Riverina Laboratory at Deniliquin was elected to the Deniliquin Municipal Council last December.

Mr. F. J. Whitty, Regional Administrative Officer, Sydney, was elected to the Lane Cove Municipal Council last December. Mr. Whitty topped the poll in first preferences against the sitting East Ward alderman.

Laboratory Fire

A fire in one of the Sydney laboratories of the Division of Animal Genetics last month caused damage to the building and equipment estimated at some $50,000.

Community Aid Abroad

The latest Division to support Community Aid Abroad is the Division of Mineral Chemistry, Melbourne.

Last June the Divisional group undertook to provide five "Ambar charkha" spinning machines for families in District Bhavnagar of Gujarat State, India.

These machines provide productive work during the dry season when there is no agricultural employment.

The required $165 was subscribed by members of the Division in less than six months.

The group has now adopted a second project, which is to provide scholarships to enable three villagers from the Thana District north of Bombay to attend the Science College at Bhiwandi.

Walk on Want

Miss Jean Conochie of Central Library raised $130 last December when she took part in a "Walk on Want" organized by Community Aid Abroad, Inter-Church Aid, and Australian Catholic Relief.

Miss Conochie covered the full course of 25 miles from Melbourne to Frankston in 7½ hours.

Nearly 5,000 people took part in the walk which raised over $72,000.

Retirements

Mr. R. Atkinson retired last month after serving as foreman of the Architects' Joinery Shop which was started by Head Office in 1950 at a time when it was difficult to obtain high quality laboratory joinery. Over the last 19 years, Mr. Atkinson supervised the construction and installation of laboratory and office fittings in many of the Organization's buildings and established a reputation for the high standard of his workmanship.

Mr. L. Brown retired from CSIRO last December after 21 years with the Records Section at Head Office. In conjunction with Mr. P. Knuckey, he established the present system used for recording files relating to buildings and land. Mr. Brown also helped in the training of Records Clerks, many of whom have now risen to senior positions in Head Office and the Divisions.

Quotes for the Month

'It seems to be characteristic of all great work, in every field, that it arises spontaneously and unpretentiously, and that its creators wear a cloak of imprecision. Wordsworth had matters right when he spoke of Newton: "The index of his mind, voyaging strange seas of thought, alone".

'The man who voyages strange seas must of necessity be a little unsure of himself. It is the man with the flashy air of knowing everything, who is always on the ball, always with it, that we should be beware of. It will not be very long before his behaviour can be imitated quite perfectly by a computer.'

Fred Hoyle

"Do what we can, summer will have its flies."

Ralph Waldo Emerson

"Never argue at the dinner table, for the one who is not hungry always gets the best of the argument."

Richard Whately

Deadline

Contributions for the March issue of Coresearch should reach the Editor at 314 Albert Street, East Melbourne, by Wednesday, 12th February.

SCoR)

FOOD AND FLAVOUR

The flavour of a food is important because it affects its acceptability. An ill-flavoured food of excellent nutritive quality will not normally be eaten if a well-flavoured food of possibly negligible nutritive quality is available.

As acceptability to the individual largely determines market price, food flavour is of great economic importance.

The flavour must be not only acceptable in itself but appropriate to the food; though we like onions we would regard asparagus tasting of onions with suspicion, and strawberries with an onion flavour with aversion.

Because we have very strongly conditioned ideas of the exact taste a particular food should have, any alteration, diminution or even marked intensification of flavour as a result of processing is very undesirable.

Unfortunately there are only too many opportunities for changes to occur in processing by loss of flavour components through leaching or evaporation, or by chemical alteration, to products which may be either without flavour or of an undesirable flavour.

We judge the quality of a food by many senses.

Taste, smell, sight and feeling in the mouth all play a part in the final judgment and even hearing may be involved in foods such as celery and ginger snaps.

Of these what is commonly called taste is the most important, but we have known for a long time that in fact smell is the really important component of taste.

With the nose out of action ham and lamb are indistinguishable, claret is like weak vinegar and port like sugared water.

The true sense of taste is located in the tongue and palate and is limited to the sensations of bitterness, sourness, sweetness and saltiness.

Since the sense of smell is so very important in judging the quality of a food it is necessary to know something about its possible limitations or peculiarities if we are to ensure that the results of food processing are to be satisfactory.

The sense of smell is, in favourable circumstances, the most sensitive method we have of determining the presence of a compound.

In order to smell the smelliest compounds about 100 million molecules must enter the nose. Of these only a very small fraction reach the cavities off the nasal passages containing the sensitive cells.

It has been calculated that less than one in a million of the molecules sniffed reach the nerve ending of the sense organ so less than a hundred may produce a sensation of smell.

One hundred million molecules of a flavour will weigh about 10^{-14} grams and to be perceived at least this amount must be present in a mouthful of food — weighing about ten grams.

This is a concentration of 1 in 10^{15}.

It gives a measure of the extent of the problems that may arise in flavour research.

In the most difficult circumstances we may have to detect substances at a level of 10^{-15}.

It seems very unlikely that the presence of substances occurring at lower concentrations could be perceived.

To isolate a substance occurring at such a low concentration is bound to be difficult.

Gold occurs in sea water at a concentration of 10^{-9}—a million times the concentration at which we can detect a highly flavoured component of food.

A million tons of food might contain only a milligram of the material responsible for its flavour.

Although in the last decade a milligram of material has become a reasonably adequate amount of material to analyse and identify, there seems little doubt that knowledge of some flavours may remain beyond our technical grasp for many years to come.

It is, however, remarkable what can be done with modern instruments.

With the use of sophisticated gas chromatographs a compound's presence can be detected in a sample containing only a nanogram of the material (10^{-9}g) at a concentration of one in a million.

This article is based on a talk given to the Advisory Council last November by Mr. M. V. Tracey, Chief of the Division of Food Preservation.

A few nanograms are enough to give a mass spectrum, but several thousand are needed to give an infrared spectrum, though there are possibilities that this limit may be lowered in the near future.

This then is the position today using the most recent developments pushed to their present limits as they have been in the Division of Food Preservation.

We can detect the presence of a flavour component by gas chromatograph and mass spectrograph at a level of a few nanograms and can extract flavours from 100 kilos of material.

This means we have the ability under ideal conditions to work on flavours occurring at a concentration of 1×10^{-13} assuming minimal losses in extraction.

Having detected a flavour and separated it from other components by high resolution gas chromatograph the mass spectrometer gives broad hints at its structure.

If this is all the information available, as it will be at this level of occurrence, then the organic chemist must make intelligent guesses from the hints provided by the mass spectrum and synthesize likely compounds until he succeeds in making one with the right smell and the right mass spectrum.

If the flavour is a thousand times as abundant, information from infrared spectra can help enormously in simplifying the labours of the organic chemist by eliminating many of the possibilities suggested by the mass spectrum.

These achievements are impressive indeed, but we must not let ourselves be led astray by the extraordinary achievements of instrumentation and lose faith in our own sense of smell.

Not only is the nose in some circumstances a thousand times better as a detector than any instrument in use but it is capable of improvement by training or even by disease.

The feats of tea tasters and perfumers are well known, but it is less well known that the sense of taste can become very acute under some circumstances.

The heightened sensibilities of some pregnant women are familiar and, more remarkable, there is reliable evidence that sufferers from cystic fibrosis (a disease of the pancreas) may have their taste threshold lowered a thousand fold.

We need the nose as a detector to tell us where the compounds we are interested in are in the effluent from a gas chromatograph.

As each volatile compound emerges from the machine its presence is recorded on a chart by a suitable detector which of course is indifferent to smell.

Only the nose can tell which of a hundred or more recorded peaks is worth investigating and it may give us a signal at a point at which the sensitive detectors of the machine record nothing because they are not sensitive enough.

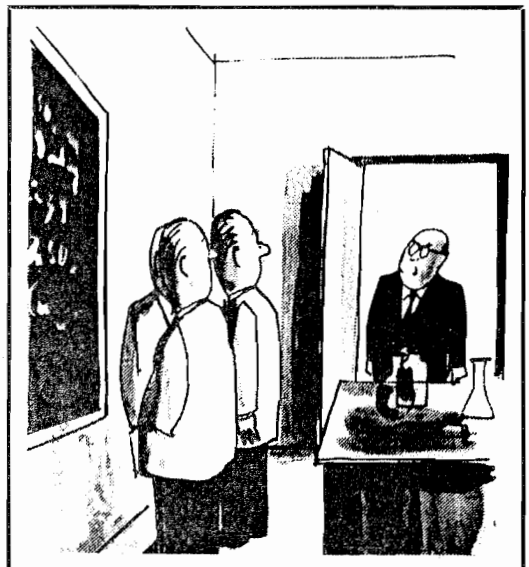
This ability of the nose to observe the presence of an odoriferous compound in the absence of a recorded peak has the uncomfortable corollary that if we smell a particular odour as a particular peak is coming off we have no certainty that the bulk of the material in the peak we record has that smell — a peak too small to record other than by the nose may be emerging at nearly the same time as the gross one affecting the recorder.

It is remarkable how long it has taken for many flavour workers to realise that the nose is and must be the final arbiter and that a great deal of unnecessary labour may be avoided if it is used to the full as a detector.

I have said a little about the theoretical background of flavour research and now I should like to discuss it in relation to the practical work of the Division of Food Preservation.

In food there are very many volatile compounds either formed during the life of the organism we choose to eat or formed by post mortem changes or by reactions during preparation and cooking.

The volatile compounds can be extracted from a food by methods which must be very gentle indeed if changes during the extraction are to be avoided.



"Formulae, Formulae, Formulae! What we want is action."

Courtesy "New Scientist"

A good deal of work on finding the best conditions was done in the Division as it was realised that this was an essential preliminary to flavour research.

The methods developed depend on the consistent maintenance of low temperatures throughout extraction and minimal exposure to oxygen, and I am happy to say that they represented such an obvious advance on previous methods that they have been widely adopted in other countries.

In the work on the flavour of fresh peas, for example, 50 lbs of frozen peas are freeze dried in a high vacuum over a period of 100 hours and all the volatile components collected.

Of these water accounts for 18 litres and from it a concentrate containing the volatiles is prepared.

Its volume is about 5 ml and 99% or more of it is ethanol and water.

One hundred or more trace components are present, of which a few have a noticeable smell and of which only one or perhaps two may be responsible for the typical flavour of fresh peas.

One component certainly responsible occurs at a concentration of 10^{-12} in peas so we can expect to isolate about 22 nanograms from 50 lbs of peas — more than enough for the nose, enough for the mass spectrometer but not nearly enough for infrared spectrophotometry.

The suggestions as to its structure provided by the mass spectrograph must now be followed up by the synthesis of likely compounds and by using the nose to find which has the characteristic smell at the appropriate concentration and has the proper mass spectrograph.

Not all flavour problems, of course, are as difficult as this— limonin, responsible for the bitter taste of orange juice, may be present at 5-20 parts per million in juice and can be assayed chemically.

There is no reason to suppose however that we may not in the future find flavour constituents present at even lower concentrations than in the pea and be impotent in attempts to identify them.

I should like now to relate the work I have described to the general programme of the Division and to both its short and long term benefits to industry.

There is no doubt at all that since flavour affects the acceptability and hence the market value of foodstuffs it is of the greatest importance to the food industry.

Any doubt as to the value of this work must come from a consideration of its expense in time, manpower and equipment in relation to its possible benefits.

It is expensive work, the work already done involves three Research Scientists, three Experimental Officers and four ancillary staff and a capital outlay in the past of about $100,000.

If it is to be given more emphasis, as I am convinced it should be, expenditure will increase.

What are the probable rewards?

If we know nothing of the structure and chemical nature of a flavour component we must work in the dark if we want either to preserve it, destroy it, or to replace it if lost.

If to preserve or destroy it is our aim, then a knowledge of its chemistry, which can only be acquired by isolation, can at once suggest some feasible methods and, more important, indicate a range of methods unlikely to be successful.

This means of course that the industry will be spared many fruitless experiments involving large batches of material and much time.

If the structure is completely known the material can be synthesized and even if the synthetic material is very expensive its use to replace lost flavour at parts per trillion or quadrillion may well be very much cheaper than methods of preserving that particular component which might involve quite special methods of processing.

Synthetic natural flavour materials will also be invaluable in the preparation of "fabricated" foods from new sources and would probably be unobjectional additives from the regulatory point of view.

I believe these economic advantages resulting from an increase in our knowledge of flavour components will in the near future be very considerable

If this were the only direction of the work it would be justified.

(Continued on page 4)

MORE CHRISTMAS PICTURES

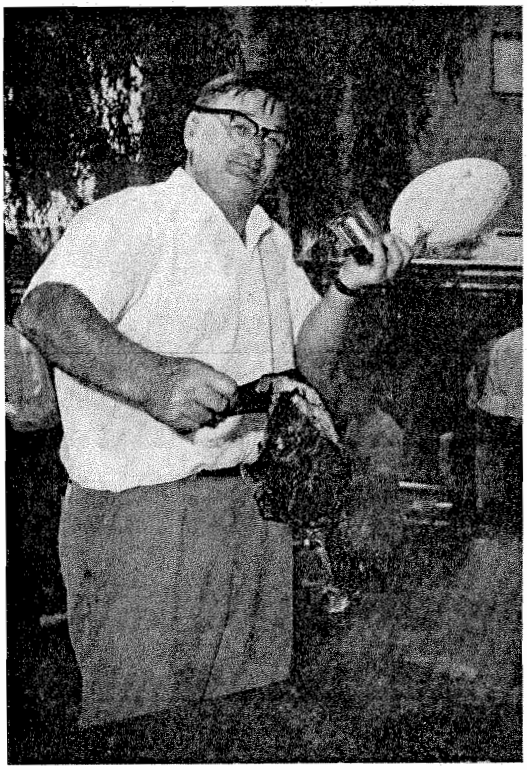
Top left. Blissfully unaware of the jealous passions aroused in his assistant Peter Hume, Alf Rees succumbs to the charms of Helen James (left) and Janne Lobb at the Building Research Christmas barbecue at Highett.

Centre left. Skilfully balancing a beaker of burgundy in one hand, Norm Buckley of the Division of Applied Mineralogy manhandles a king-size steak at the Chemical Research Laboratories barbecue at Fishermen's Bend.

Bottom left. Piper Eric Christie was on hand to help welcome Santa Claus at the Building Research children's party.

Top right. Cancan-dancers (from left to right) Pauline Dorrington, Yvonne Healy and Joan Hannam display their terpsichorean talents at the Textile Industry Christmas party at Geelong.

Bottom right. Pauline Caven (Chemical Engineering) and Eric Richardson (C.R.L. Workshops) listen entranced at the C.R.L. Christmas barbecue as Ken Reid (Chemical Engineering) on euphonium, David MacArthur (Applied Chemistry) on trombone, and Cliff Restarick (Chemical Engineering) on double-bass prove that "music hath charms".



"Forget it now, Harry — we'll get it figured out one day."

Courtesy "New Scientist"

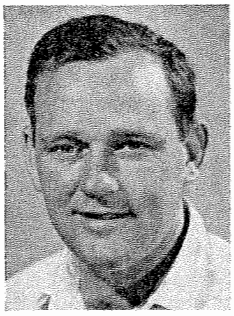
APPOINTMENTS TO STAFF

Mr. P. W. ATKINSON

Mr. P. W. Atkinson has been appointed to the Division of Entomology and will work on the synthesis of compounds required in research on insect biochemistry. Mr. Atkinson graduated B.Sc. from the Australian National University in 1965 and since then has been studying for his M.Sc. at the same university.

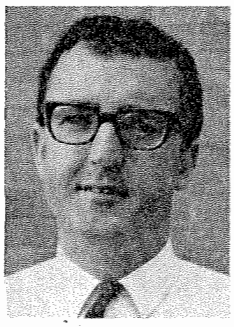
Dr. A. J. Moss has been appointed to the Division of Soils to study the transport of sediment in flumes. Dr. Moss graduated B.Sc. with honours from the University of Reading in 1951 and Ph.D. from the Australian National University in 1968. After spending seven years with the British Ministry of Housing as a geologist, Dr. Moss came to Australia in 1964 and since then has been with the Geology Department at the A.N.U.

Dr. N. R. Avery has been appointed to a Fellowship in Surface Chemistry with the Division of Tribophysics. He will study surface structure and its association with surface reactivity. Dr. Avery graduated B.Sc. with honours from the University of Melbourne in 1962 and Ph.D. from the same university in 1966. Since then Dr. Avery has worked at the School of Chemical Sciences, University of East Anglia, and the James Franck Institute, University of Chicago.



Dr. N. R. AVERY

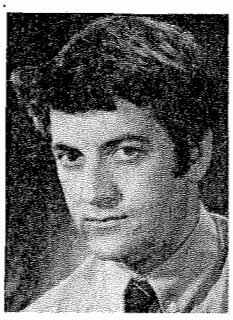
Mr. J. C. Bolto has joined the Central Library as Assistant Editor of "Scientific Serials in Australian Libraries". Mr. Bolto graduated B.A. from the University of Western Australia in 1959. After working in Britain and Europe for a number of years, Mr. Bolto returned to Australia and in 1967 was awarded a Diploma



Mr. J. C. BOLTO

of Librarianship from the University of New South Wales. He has spent the last two years with the National Library in Canberra.

Dr. R. Burley has been appointed to the Division of Textile Industry to investigate liquid/fibre relationships in wet processing of wool and to work on the design and development of new processing



Dr. R. BURLEY

machinery. Dr. Burley graduated B.Sc. from the University of Leeds in 1964 and Ph.D. from the same university in 1968.

Mr. J. A. Hamilton has joined the Division of Mineral Chemistry to work on the design, construction and maintenance of electronic equipment for use in research. Mr. Hamilton obtained his Diploma of Communications Engineering and his Diploma of Electronics Engineering last year

Mr. J. A. HAMILTON

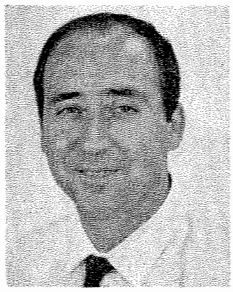
from the Royal Melbourne Institute of Technology and has spent the last twelve months as an engineer with the P.M.G.

Dr. P. V. Harris has been appointed to the Division of Food Preservation to study the physical and mechanical properties of meat. Dr. Harris graduated B.Sc. with honours from the University of London in 1956 and Ph.D. from the

Dr. P. V. HARRIS

same university in 1963. Since then he has been working in the Physics Section of Unilever Research Laboratories, England, on the measurement of texture in foodstuffs.

Mr. J. G. Miles has joined the Division of Mineral Chemistry to work on a pilot plant for the treatment of lead and zinc sulphide ores. After obtaining his Diploma in Mechanical Engineering from the Ballarat School of Mines in 1952, Mr. Miles spent three years with the Victorian Railways and three years at the Standard-Vacuum Oil Refinery. Since 1959 he has been a design



Mr. J. G. MILES

engineer with the Australian Atomic Energy Commission. Mr. Miles obtained his Certificate in Nuclear Technology from the Australian School of Nuclear Technology in 1965 and his Diploma in Industrial Engineering from the University of New South Wales in 1967.

SAFETY NOTES

CSIRO now has two Safety Officers. Last month Mr. Lyn Thompson joined the Organization to share with me in the "paper war" and to enable more frequent visits to be made to laboratories.

It is not proposed that we will be splitting the work down the middle, each concentrating on separate Divisions or particular problems; rather, we will be operating as interchangeable members of a team.

You can also look forward to regular contributions to "Safety Notes" from Lyn.

Mr. L. THOMPSON

Lyn graduated B.Sc. with honours from the University of Wales in 1958 and joined the British Ministry of Supply where he spent five years working on the production of propellants and high explosives.

This was followed by two years with Dunlop Rubber working on the development of polyurethane foams.

Since coming to Australia in 1965, he has been involved in research and development with explosives at the Defence Standards Laboratories.

I'm sure Lyn can look forward to the same co-operation and friendship which I have always enjoyed in my dealings with members of staff.

J. W. Hallam, Safety Officer

Food and Flavour

(Continued from page 2)

But I believe there are other aspects it would be very short-sighted to ignore.

At present we probably know less about the sense of smell and taste than about any of our other senses.

Work on flavour will be greatly hampered if it is not accompanied by work on how flavour is appreciated.

One difficulty is that of communication—you may have a vivid awareness of the individual taste of mango, claret or Stilton but how do you put it into words and, even more difficult, indicate the difference between the flavour of two varieties of the same food?

Panels of tasters must be trained to make these judgments and a great deal of work done on how best to train them and how to interpret their results.

For example if a panel decide one fruit essence solution is "twice as strong" as another does it mean there is twice as much of the flavour component in it, or less, or much more?

Another is that people vary not only in the intrinsic acuity of their senses of taste and smell but also in their ability to taste or smell some substances at all.

Since as I have emphasized earlier the nose is the final arbiter of flavour research, one must have trained noses on the job as well as delicate apparatus and there is no guarantee that a first class infrared spectroscopist will have a good nose or be able to be trained to have one.

Flavour research then is essentially a field for co-operation from the sensory psychologist, the physiologist, the biochemist, synthetic organic chemist and physicist, and is likely to be best done by a team working together.

Co-ordinated work of this kind may have benefits in directions quite other than those which may come from a knowledge of the chemistry of flavour components.

If we knew more about the physiology and psychology of smell it might be possible to mask undesirable flavours difficult to remove or destroy by adding other compounds synthesized for the purpose.

Already it appears that something like this may be possible with the sense of taste (in its strict meaning).

Workers at Monsanto have isolated proteins from the taste buds which react specifically with bitter and sweet substances and they hope that it will be possible to mask excessively bitter flavours by the use of tasteless substances reacting preferentially with the bitter receptors in the tongue.

Finally I should like to put flavour work into relation with the general pathway of advance in human nutrition.

There has been an interesting and predictable progression in the major preoccupations in nutrition and food research.

In the last century interest centred on calories and then on proteins and mineral components such as calcium and phosphorus.

Just before and during the first war, vitamins were a major interest to be followed in their turn by trace elements.

Those concerned with food preservation in general followed a similar sequence of interests and it is significant that the quantitative importance of each food component decreased by one or more orders of magnitude.

Rough figures are: calorie yielding component of the order of 1 kg: protein 10^{-1} kg; nitrogen 10^{-2} kg; calcium and phosphorus 10^{-3} kg; vitamins 10^{-4}—10^{-6}; trace elements 10^{-7}—10^{-9} kg; flavour constituents 10^{-4}—10^{-15} or less.

In a sense all the components of a food listed are more important nutritionally than flavour for they are essential to life while savour is not, yet without savour one of the most dependable and durable pleasures of life would vanish.

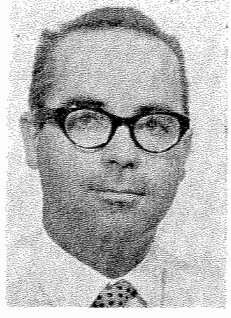
Mr. C. G. Blunt has joined the Division of Land Research. He will be located at the Kimberley Research Station and will investigate the feeding of beef cattle on irrigated forages and grain crops. Mr. Blunt graduated B.Agr.Sc. with honours from the University of Queensland in 1967 and has spent the last 12 months in Britain.

Miss Tatiana Orlova has joined the Division of Food Preservation to analyse Australian honeys in connection with a honey quality survey. After graduating B.Sc. from the University of New South Wales in 1964, Miss Orlova spent 12 months as an analytical chemist with Taubmans Paints and three years as an

Miss Tatiana ORLOVA

analytical chemist with Cadbury Fry-Pascall. Last year she undertook a diploma course in biochemical engineering at the University of New South Wales.

Dr. O. Sitnai has been appointed to the Division of Chemical Engineering to work on process design and evaluation. Dr. Sitnai is a graduate of the Slovak Technical Uni-



Dr. O. SITNAI

versity, Bratislava and the University of Chemical Technology, Prague. From 1956 until 1966 he was head of the research group at the Petroleum Research Institute, Bratislava, and from 1966 to 1968 he was Visiting Professor in the Faculty of Mechanical Engineering at the Slovak Technical University. Dr. Sitnai came to Australia last year following the Russian invasion of Czechoslovakia.

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CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 120, MELBOURNE, MARCH 1969

Minister Opens Visitors Centre

A Visitors Centre at the Australian National Radio Astronomy Observatory at Parkes was officially opened last month by the Minister for Education and Science, Mr. Malcolm Fraser.

During the opening, Mr. Fraser said that the work done with the 210 foot radio-telescope had put Australia in the forefront of radio-astronomy.

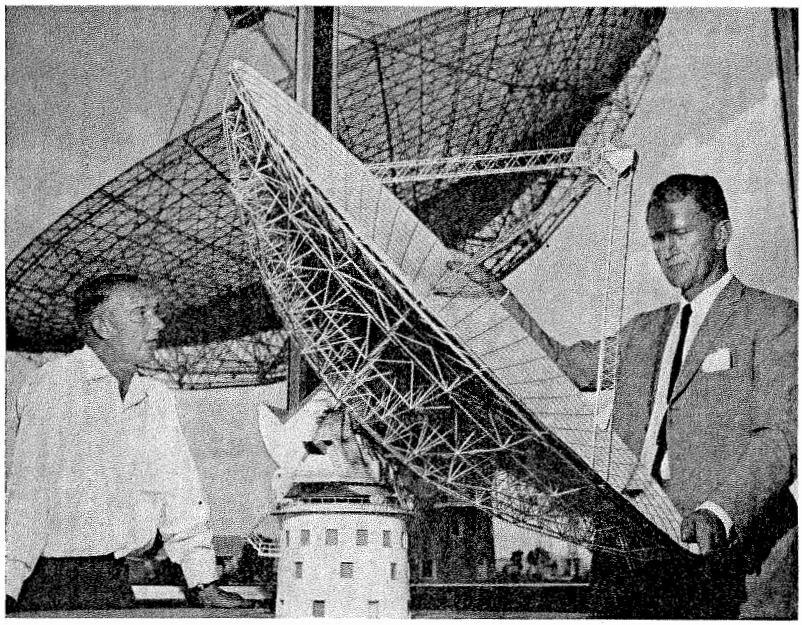
The international co-operation that had been generated by the work done at Parkes had been notable, he continued, particularly that generated with the United States.

This was one of the things that had prompted some people to believe that Australia and the United States could both profit by closer scientific liaison and which had led to the signing of an agreement between the two countries to foster and encourage scientific co-operation.

The Visitors Centre, which covers some 2,800 square feet, comprises a large viewing area, a theatrette and toilet facilities.

It is expected to cater for some 100,000 tourists a year.

The viewing area contains a large working model of the radiotelescope and several of the talking chairs which were used in the Australian Pavilion at Expo 67.



Our picture shows Mr. Fraser (right) and the Director of the Observatory, Mr. J. G. Bolton, examining the working scale model of the radiotelescope at the Visitors Centre. Visitors can operate the model both in altitude and azimuth by a simple push button arrangement.

ASSOCIATE MEMBER

Mr. V. D. Burgmann, Chief of the Division of Textile Physics, has been appointed Associate Member of the Executive.

A graduate in science and electrical engineering from the University of Sydney, Mr. Burgmann joined the Division of Radiophysics in 1939 to work on radar. During the war he spent some time as liaison officer in London and Washington where he was responsible for collecting information for Australia on developments in radar research. He also spent a period at the Radiation Laboratory of the Massachusetts Institute of Technology.

After the war Mr. Burgmann led a research team which developed navigation aids for civil aviation, a field in which Australia led the world for many years. The team's main achievement was Distance Measuring Equipment which is now standard installation on all domestic airlines. Mr. Burgmann shared the 1951 Bronze Medal of the Institute of Navigation in Britain for a paper entitled "An Investigation into Air Traffic Control by a Simulation Method".

In 1949 he became Officer-in-Charge of the Physics and Engineering Unit of the newly-formed Wool Textile Research Laboratories. The Unit became the Division of Textile Physics in 1958.

TRIBOPHYSICS CHIEF RETIRES

Dr. W. Boas, Chief of the Division of Tribophysics, retired last month after twenty-two years with CSIRO.

One of the pioneers of metal physics, Dr. Boas has received international recognition for his work on plastic flow in metals.

A textbook on crystalline plasticity of which he was joint author has become a classic in its field.

Dr. Boas obtained his Diploma of Engineering at the Technische Hochschule of Berlin in 1928 and his Doctor of Engineering from the same institution in 1930.

From 1928 to 1938 he carried out research in Berlin, Fribourg, Zurich and London.

In 1938 he became Carnegie Lecturer in Metallurgy at the University of Melbourne and in 1940 Senior Lecturer in Physical Metallurgy.

He gained his M.Sc. at Melbourne in 1943 and in the same year was elected a Fellow of the Institute of Physics.

Dr. Boas became engaged in part-time collaboration with the Division of Tribophysics the following year and at the end of 1946 joined the Division.

In 1949 Dr. S. H. Bastow, who was then Chief of the Division of Tribophysics, was appointed a Member of the Executive, and Dr. Boas succeeded him as Chief of the Division.

Dr. Boas was made a Fellow of the Australian Academy of Science in 1954 and served as a member of the Academy's Council from 1964 to 1966.

In 1962-63 he became Federal President of the Australian Institute of Metals and in 1965 he was elected a foreign scientific member of the Max-Planck Institut für Metallforschung and of the Gesellschaft.

He was elected to the Executive Committee of the International Union of Pure and Applied Chemistry in 1966.

Below: Dr. L. M. Clarebrough (seated) watches as Dr. A. Moore (right) presents Dr. Boas with an album of photographs of past and present members of the Division of Tribophysics. The presentation was made last month at a farewell dinner arranged by the Division.

Wheat Research Leader Appointed

Dr. D. H. Simmonds, a research scientist with the Brisbane brewing firm of Castlemaine Perkins Ltd., has been appointed Leader of the Wheat Research Unit.

He succeeds Mr. M. V. Tracey, who was appointed Chief of the Division of Food Preservation in 1967.

Dr. Simmonds graduated B.Sc. with honours from the University of Adelaide in 1946 and Ph.D. from the University of London in 1951.

Dr. D. H. SIMMONDS

From 1949 to 1958 he worked with the Division of Protein Chemistry on the development of suitable techniques for estimating amino acids in proteins.

Before joining Castlemaine Perkins in 1961, Dr. Simmonds spent three years as a Senior Lecturer in the Department of Agricultural Chemistry at the Waite Agricultural Research Institute, Adelaide.

One of his principal research interests in the last few years has been the separation and characterization of barley proteins and their behaviour during the malting and brewing processes.

Retirement of Dr. Ratcliffe

Dr. F. N. Ratcliffe, O.B.E, retired last month from the position of Assistant Chief of the Division of Entomology.

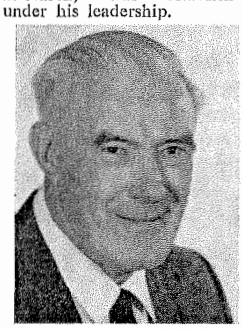
After graduating with first class honours in Zoology from Oxford University, Dr. Ratcliffe spent a year at Princeton University as a Proctor Fellow before coming to Australia to work for CSIRO in 1929.

Since then he has been involved in a wide range of investigations, including studies of mosquitoes, rabbits, giant fruit bats, and soil erosion of the inland.

The two latter subjects formed the basis of his book "Flying Fox and Drifting Sand".

As a member of the Division of Entomology from 1937 to 1949, he worked on termites and pests of stored wheat. He also served for some time with the RAAMC as a malariologist investigating mosquito control techniques.

In 1949 the Wildlife Section (now the Division of Wildlife Research) was established under his leadership.



Dr. F. N. RATCLIFFE

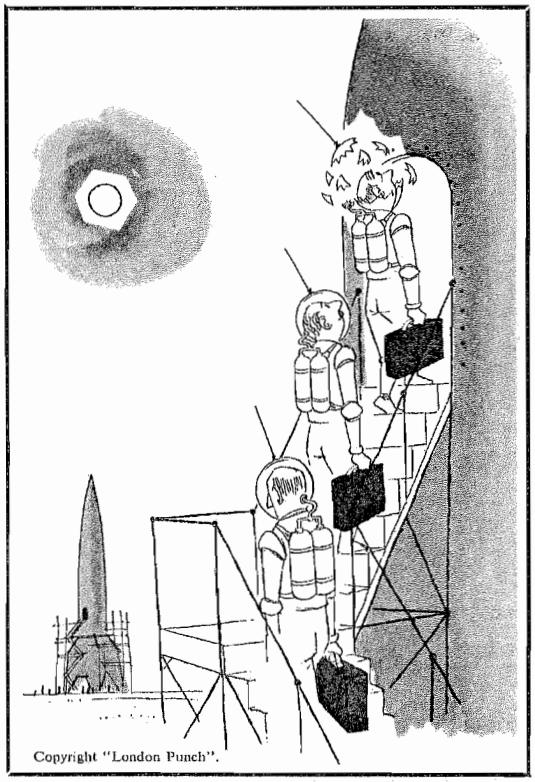
In the next 10 years his collaboration with Professor Frank Fenner, Head of the Department of Microbiology in the John Curtin School of Medical Research, brought positive results in the use of myxomatosis.

For the past eight years Dr. Ratcliffe has been Assistant Chief of the Division of Entomology.

He was awarded an honorary degree of Doctor of Science by the Australian National University in May last year.

Dr. Ratcliffe is Honorary Secretary of the Australian Conservation Foundation and was a member of the original committee which organized the establishment of the Foundation.

His interest in conservation is a natural outcome of his early introduction to the problems of a dry country and of a lifelong interest in animals.



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OBITUARIES

Mr. A. L. Gunn, the Senior Translator at Head Office, died last January.

Mr. Gunn joined the Division of Forest Products as a laboratory assistant in 1932.

Although lacking in formal qualifications he had considerable inherent linguistic ability and in 1942 he was transferred to the Information Section where he became the nucleus of the Translation Section.

He was fluent in eight languages and familiar with many more and had an extraordinarily wide knowledge of etymology.

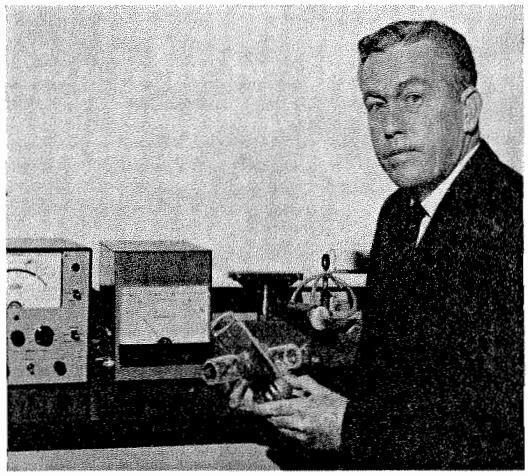
Mr. Gunn was a foundation member of the CSIRO Officers' Association.

Mr. H. Irzykiewicz of the Division of Entomology died suddenly last month.

Mr. Irzykiewicz was a member of the Polish Forces forming part of the Allied Armies in Italy. After the war he served for a period with the British Army before migrating to Australia.

He joined the Division of Entomology in 1949 and was co-author of a number of papers dealing with insect physiology and biochemistry.

Lynne Gough of the Parkville Laboratory of the Division of Animal Health is a blues singer of no small talent. She appeared in a national television contest and impressed the station so much that they asked her to join their singing group, the Channel Nine Singers, who appear regularly in the programme "In Melbourne Tonight". Lynne has now decided to make the change from Toxicology to Popsicology.



SYME RESEARCH PRIZE

Mr. J. V. Sullivan of the Division of Chemical Physics has been awarded the David Syme Research Prize for 1968. He will share the prize with Dr. R. M. May, Department of Physics, University of Sydney, and Dr. T. A. O'Donnell, Department of Chemistry, University of Melbourne.

The David Syme Research Prize was founded in 1904 and is awarded by the University of Melbourne for the best original research work in biology, physics, chemistry or geology produced in Australia during the preceding two years, preference being given to work of value to the industrial or commercial interests of the country.

The award provides a medal for each recipient and shared prize money of $250.

The award for Mr. Sullivan is for the development of resonance detectors and their application in atomic absorption spectroscopy.

Mr. Sullivan is the author or co-author of 13 papers in this field and with Dr. A. Walsh is co-inventor of over 60 patent applications on 12 basic inventions lodged in Australia and overseas.

Mr. Sullivan was recently elected Honorary Secretary of the Victorian Branch of the Institute of Physics.

Our picture shows Mr. Sullivan holding a resonance monochromator. In the background is the first atomic absorption spectrophotometer incorporating this type of monochromator.

Perils of Modern Living

'A kind of matter directly opposed to the matter known on earth exists somewhere else in the universe, Dr. Edward Teller has said. He said there may be anti-stars and anti-galaxies entirely composed of such anti-matter. Teller did not describe the properties of anti-matter except to say there is none of it on earth, and that it would explode on contact with ordinary matter.'

San Francisco Chronicle.

Well up beyond the tropostrata
There is a region stark and stellar
Where, on a streak of anti-matter,
Lived Dr. Edward Anti-Teller.

Remote from Fusion's origin,
He lived unguessed and unawares
With all his antikith and kin,
And kept macassars on his chairs.

One morning, idling by the sea,
He spied a tin of monstrous girth
That bore three letters; A.E.C.
Out stepped a visitor from Earth.

Then shouting gladly o'er the sands,
Met two who in their alien ways
Were like as lentils. Their right hands
Clasped, and the rest was gamma rays.

Courtesy "New Yorker". **Harold P. Furth**

POSITIONS VACANT

The following vacancies for professional appointments are current:

DIVISIONAL EDITOR (SSO 2/3) — Division of Radiophysics — 790/7.

EXPERIMENTAL OFFICER — ARCHITECTURAL ACOUSTICS (EO 1/2/3) — Division of Building Research — 390/399 (8/3/69).

LIBRARIAN — MEAT RESEARCH LABORATORY (Librarian 1/2) — 305/117 (12/3/69).

EXPERIMENTAL OFFICER (EO 1/2) — Division of Animal Genetics — 675/236 (22/3/69).

PHYSICAL CHEMIST (REACTION KINETICS) (RS) — Division of Mineral Chemistry — 601/82 (22/3/69).

RESEARCH SCIENTIST (CATTLE TICK) (RS/SRS) — Division of Entomology — 180/499 (22/3/69).

News In Brief

Doctor of Science

Dr. K. R. Norris of the Division of Entomology has been awarded the degree of Doctor of Science by the University

Dr. K. R. NORRIS

of Western Australia. Dr. Norris's thesis was entitled "History, Bionomics and Control of Pests of the Australian Pastoral Industry".

Ski Club

The CSIR Ski Club has now finalised a number of activities for 1969. They are:

March 15, B.Y.O. Beach Bonanza; March 20, First General Meeting at Division of Protein Chemistry Theatrette (7.45 p.m.); May 22, Second General Meeting at Division of Protein Chemistry Theatrette (7.45 p.m.); Late May, Pre-Season Supper Dance (venue to be arranged); November 29, Annual Dinner Dance, No. 9 Darling Street.

Further information may be obtained from the Club Secretary, **Mr. R. Hughan,** Division of Applied Mineralogy (Box 4331, G.P.O., Melbourne; Telephone 64-0251).

Professor

Dr. E. T. LINACRE

Dr. E. T. Linacre of the Division of Irrigation Research has been appointed Associate Professor in the School of Earth Sciences at Macquarie University.

Open Days

The Aeronautical Research Laboratories at Fishermen's Bend, Melbourne, are holding a series of open days from 30th April to 2nd May. It is ten years since the laboratories were last shown to the general public.

Exhibits will include the Ikara anti-submarine guided weapon system, assessment of safe life of aircraft structures, tests on Mirage aircraft, wind tunnel displays, new engine intakes, and development of new materials for aircraft.

Anyone wishing to attend the open days may obtain an invitation by writing to the Chief Superintendent, Aeronautical Research Laboratories, Box 4331, G.P.O., Melbourne, or by ringing 64-0251 (extension 654).

Deadline

Contributions for the April issue of Coresearch should reach the Editor at 314 Albert Street, East Melbourne, by Wednesday, 12th March.

Research Director

Dr. L. S. WILLIAMS

Dr. L. S. Williams of the Division of Applied Mineralogy has been appointed Director of Research and Development with A.C.I.

Student Power

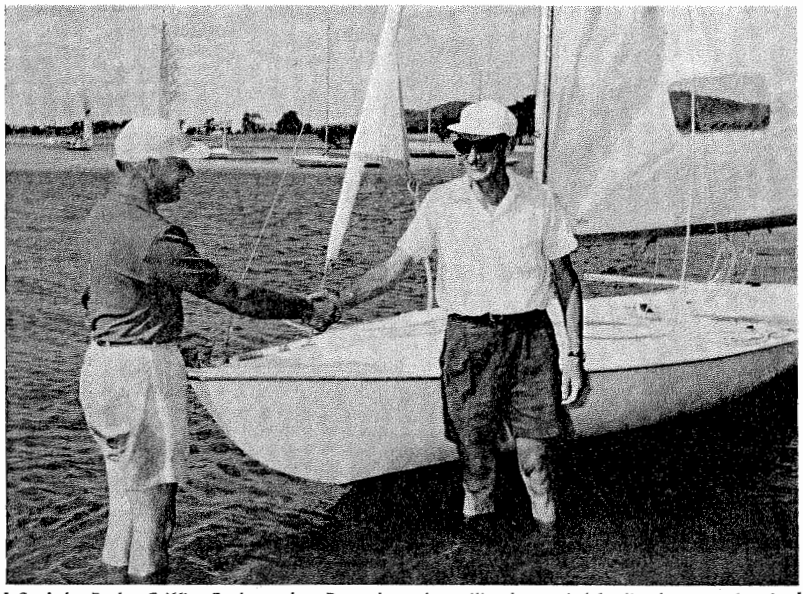
The Division of Chemical Physics certainly knows how to pick university students for vacation work.

Eight students from Melbourne and Monash Universities were engaged by the Division in early December.

A fortnight later, the examination results came through. No less than half of the students finished first in at least one subject.

Between them, the students shared nine high distinctions and first class honours as well as other miscellaneous credits, distinctions and honours.

Last month the Sydney Laboratory of the Division of Mineral Chemistry was visited by a coking-coal study team from Japan. Our picture shows Dr. P. L. Waters of the Division describing a fluidization rig to (from left to right) Mr. J. Sato (M.I.T.I.), Professor S. Iki (Tokyo University), Dr. K. McG. Bowling (Mineral Chemistry), Mr. B. Ikeda (Interpreter for Mitsui Mining), Mr. H. Ifuku (Mitsui Mining), Mr. H. Kamiya (Mitsubishi Mining), and Mr. T. Mizunoue (Japanese Consul-General).



On Lake Burley Griffin, Canberra, last December, nine sailing boats vied for line honours plus the Stewart Pot Trophy. The race, which promises to become an annual event within the Division of Land Research, was contested by one flying fifteen, two seaflies, three northbridges, and three mirrors. All boats were handicapped according to class. The race was won by the Chief of the Division, Mr. G. A. Stewart, in a flying fifteen. In second place was Mr. V. Dawson in a northbridge and third place went to Mr. R. Munyard in a seafly. Our picture shows Mr. Stewart being congratulated by his crew, Mr. E. Eversons.

Quotes for the Month

"The flowering of scientific discovery and its application to practical affairs has constituted one of the major revolutions in the narrative of man. But the revolution has happened and is beginning to dwindle into the perspective of history. It remains to use wisely what it has achieved."

Magnus Pyke.

"Unprovided with original learning, unformed in the habits of thinking, unskilled in the arts of composition, I resolved — to write a book."

Edward Gibbon.

"By working faithfully eight hours a day, you may eventually get to be a boss and work twelve hours a day."

Robert Frost.

OVERSEAS VISITS

Mr. I. K. Harvey of the Division of Applied Physics leaves later this month for North America, Britain, France, Germany, Switzerland, Italy and Japan where he will survey developments relating to the intercomparison and dissemination of standard frequency and time. He will also study the a.c. Josephson effect and its possible application to the maintenance of the standard volt. Mr. Harvey will be away for four months.

Mr. N. Tamblyn of the Division of Forest Products leaves shortly on a seven week visit to Zambia as an F.A.O. consultant on wood preservation.

SAFETY NOTES

Explosive Combination

Freons, the halogenated varieties of methane and ethane of which certain members form the common working liquids used in domestic refrigerators, are pretty inert chemically.

Yet, according to a report made recently by the National Aeronautics and Space Administration, one of them caused an explosion which killed two men, injured eleven, and ran up a bill for capital damage of $14,000.

The accident occurred while finely ground metallic barium was being mixed with trichlorotrifluoroethane.

Barium has a tendency to catch fire when it is ground dry in air and in this case it was being ground in oil under an inert atmosphere of argon.

The freon was introduced as a solvent to remove the oil and protect the ground metal from air.

The explosion arose from less than half a pint of the barium-freon mixture as it was being transferred from beakers to metal cans and was said to be equivalent in power to three eight inch sticks of dynamite.

According to the accident board, the cause was most probably a frictional or impact force created in the slurry of metal with freon.

Although freons are relatively inert in organic chemistry, they are fairly reactive with metals in general, particularly finely divided alkali and alkaline earth-metals.

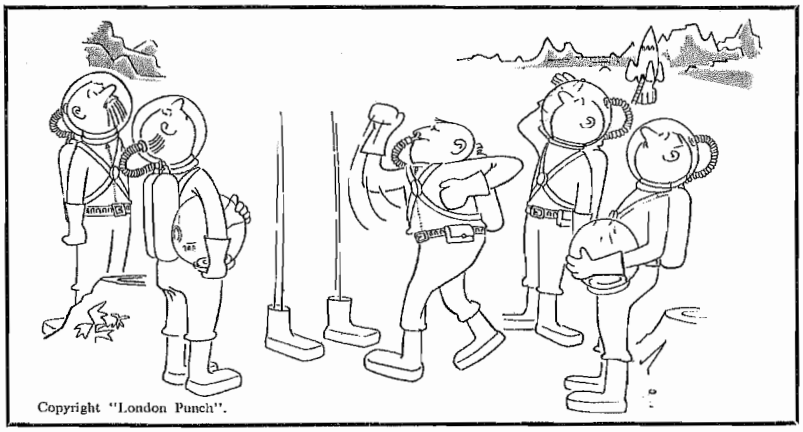
Minor incidents have occurred in such combinations as aluminium-fluorolube, magnesium-teflon and barium-carbon tetrachloride.

Equipment Design

It is not commonly known that combinations of aluminium and mild steel can give rise to hazardous situations. The trouble arises when iron oxide is formed and impact or rubbing occurs between the oxide and the aluminium.

The combination of aluminium with iron oxide gives rise to a thermite reaction from which a considerable amount of heat is evolved in the form of sparks. Beware of this combination where flammable solvents are being used.

L. Thompson, Safety Officer.



APPOINTMENTS TO STAFF

Mr. C. D. Beaton has been appointed as an electron microscopist to the Division of Entomology. After graduating B.Sc. from the University of Melbourne in 1962, Mr. Beaton joined the Commonwealth

Mr. C. D. BEATON

Serum Laboratories, where he has been in charge of the Electron Microscope Laboratory and the Biophysics Department.

Mr. A. W. Bell has joined the Division of Animal Physiology to study factors promoting the survival of

Mr. A. W. BELL

new-born lambs. Mr. Bell graduated B.Rur.Sc. with honours from the University of New England last year.

Dr. D. N. Cooper has been appointed to a research Fellowship in radio astronomy with the Division of Radiophysics. Dr. Cooper graduated in electrical engineering with honours from the University of Adelaide in 1962, and Ph.D. from the same university in 1968.

Mr. J. D. Coleman has been appointed to the Division of Forest Products to carry out research on the structure and properties of fibreboard and its components. Mr. Coleman obtained his Diploma of

Mr. J. D. COLEMAN

Chemical Engineering from the Royal Melbourne Institute of Technology in 1958 and for the last 12 years has been with Australian Paper Manufacturers Ltd.

Dr. B. R. Champ has joined the Division of Entomology to study stored products pests and their control. Dr. Champ graduated B.Agr.Sc. with honours from the University of Queensland in 1953 and Ph.D. from the University of London in 1958. Since then he has been with the Entomology Branch of the Queensland Department of Primary Industries.

Dr. B. R. CHAMP

In 1966 Dr. Champ spent a term in Britain as a visiting research worker at the Pest Infestation Laboratory.

Dr. D. B. Inglis has joined the Division of Applied Physics where he will investigate the application of modern physical techniques to standards of measurement of electrical current, voltage, power, and related quantities. Dr. Inglis graduated B.E. with honours from the University of New South Wales in 1962 and Ph.D. from the same university in 1966. Since then he has been a research officer with Muirhead and Co. Ltd., Britain.

Dr. W. Dall has joined the Division of Fisheries and Oceanography to carry out research on the physiology of moulting and growth in the Western Australian crayfish. Dr. Dall graduated M.Sc. from the University of Queensland in 1954, and Ph.D. from the same university in 1964. Dr. Dall previously worked with the Division from 1955 to

Dr. W. DALL

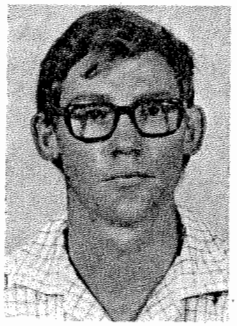
1957, when he carried out research on marine plankton. He spent from 1958 until 1967 with the Department of Zoology at the University of Queensland, and since then has been Associate Professor of Zoology at the University of Guelph, Ontario, Canada.

Mr. L. Konicek has joined the Division of Mechanical Engineering to work on thermal behaviour of buildings and air conditioning thermal loads.

Mr. L. KONICEK

After graduating from the Faculty of Civil Engineering, Prague, in 1964, Mr. Konicek worked at the Department of Thermotechnology, Institute of Civil Engineering. He came to Australia last year following the Russian invasion of Czechoslovakia.

Mr. C. Lucas has been appointed to the Division of Fisheries and Oceanography to write computer programmes and handle data from surveys of prawns on the east coast of



Mr. C. LUCAS

Australia. Since graduating B.Sc. with honours from the University of Queensland in 1965, Mr. Lucas has been studying for his Ph.D. at the University of New South Wales.

Mr. A. I. Marfatia has joined the Division of Textile Industry to work on the evaluation of fibre assemblies and fabrics for specific end uses. Mr. Marfatia obtained

Mr. A. I. MARFATIA

his Diploma in Textile Technology from Baroda University India, in 1959, and his Diploma in Textile Industries from the University of Leeds in 1962. Since 1963, he has been working as a textile technologist with the British firm of John Heathcot and Company Limited.

Mrs. Katrine Porra has been appointed to the Division of Mathematical Statistics where she will be concerned with the mathematical aspects of general contributions to statistical theory. Mrs. Porra graduated B.Sc. with honours from the University of Tasmania in 1957 and worked for several years as a research assistant in the Department of Geophysics, Australian National University. Last year she taught mathematics at Canberra Girls' Grammar School.

Mrs. Lynette Pratt has been appointed to the Division of

Mrs. Lynette PRATT

Protein Chemistry to study the regeneration of proteins extracted from wool, skin and

Courtesy "New Scientist".

hide, and to study new applications for regenerated protein products in industrial and medical fields. Mrs. Pratt graduated B.Sc. from Monash University last year.

Dr. D. Proctor has joined the Division of Mechanical Engineering to carry out research on the utilisation of solar energy for comfort cooling devices. Dr. Proctor graduated B.Chem.Eng. with honours from Heriot-Watt University, Scotland, in 1964, and obtained his Ph.D. last year from the University of Edinburgh.

Dr. D. PROCTOR

Mr. J. W. Stamper has joined the Division of Fisheries and Oceanography where he will be concerned with computer processing of fisheries data, including catch studies of the Southern Crayfish. Mr. Stamper graduated B.Sc. from the University of Sydney in 1961, and from 1962 to 1965 worked as a physicist in the Radiotherapy Department at

Mr. J. W. STAMPER

St. Vincent's Hospital, Sydney. Since 1965 he has been with the School of Physics at the University of New South Wales.

Mr. R. I. Baxter has joined the Division of Mathematical Statistics to assist with statistical aspects of research in the Division of Food Preservation. Mr. Baxter graduated B.Agr.Sc. from the University of Melbourne in 1964 and M.Sc. (Agric.) from the University of Sydney in 1965. Since then he has been studying for his Ph.D. at the University of Sydney.

Mr. P. A. Tulloch has joined the Division of Protein Chemistry to investigate the application of electron diffrac-

Mr. P. A. TULLOCH

tion as an aid to the study of fibrous proteins such as wool. Since graduating M.Sc. from the University of Queensland in 1967, Mr. Tulloch has been studying for his Ph.D. at the University of Melbourne.

Miss Elizabeth Wardle has been appointed to the Division of Food Preservation to carry out research on the properties and structure of bacterial spores and to investigate micro-

Miss Elizabeth WARDLE

bial spoilage of food. Miss Wardle graduated B.Sc. from the University of Adelaide in 1963. Since then, except for two years in Britain and Europe, she has been with the Biochemistry Department at the University of Adelaide.

Mr. M. R. Thornber has been appointed to the Division of Applied Mineralogy to carry out research on the crystal chemistry of economically important sulphide minerals. Since graduating M.Sc. from the University of Western Australia in 1964, Mr. Thornber has been studying for his Ph.D. at the same university.

Printed by CSIRO, Melbourne

CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 121, MELBOURNE, APRIL 1969

APPROACHES TO SCIENCE

The Federal Government did not favour setting up a committee of experts to advise the Government on national science policy, the Minister for Education and Science, Mr. Malcolm Fraser, told a group of leading scientists, industrialists and community leaders at Thredbo, New South Wales, last month.

Mr. Fraser was speaking on Government approaches to science, at a meeting of the Science and Industry Forum of the Academy of Science.

The Minister's remarks were directed at a report by a Forum working group entitled "Science Policy Machinery for Australia".

This report was prepared as a synthesis of the views of the working group and was not meant to be necessarily representative of the views of all members of the Forum or of the Academy. Its publication was, however, authorised by the Council of the Academy to encourage discussion.

The report said that, *"the problem of priorities in science and technology lies at the heart of national science policy . . . if this is accepted it follows that the best possible advice should be available before priorities are determined"*.

It also said that *'the Academy has not attempted to interpret the relative merits of projects proposed to the Government and it would not be easy for it to do so'.*

'The Government can readily obtain advice on the scientific merit of an individual project but it is difficult or even impossible to obtain advice on the relative scientific merits of a series of proposed projects . . . the final decision must be a political one at ministerial level and must involve judgements on non-scientific matters as well as on the scientific merit of the project'.

The report then went on to recommend the creation of an Advisory Committee of Science and Technology of about fifteen members.

Commenting on the report, Mr. Fraser said that the establishment of an advisory body did not mean that one then had a national science policy.

He said that if the Academy, which contained our most distinguished scientists, was unable to interpret the relative scientific merits of different projects, one could hardly expect another body of 10 or 15 scientists to accomplish this task.

There was, he continued, another and perhaps more important reason for reservation.

'A number of overseas countries have developed formal machinery of the kind envisaged in the Forum's report to provide advice to governments, but the present turmoil in the scientific world in Britain, Canada, and I think also the United States has not really convinced me that their path is the right one for us.'

He pointed out that Canada, for example, had a Science Council designed to offer public advice to the Government and a Science Secretariat which was to service the Council and also provide confidential advice to the Government.

In Canada both the 150-inch optical telescope and the intense neutron generator (ING) were first accepted and then rejected.

While Canadian scientists were arguing about the 150-inch optical telescope in British Columbia and were still believing a benevolent Government was going to provide a second instrument in Chile, the Government abandoned the first after an expenditure of nearly $5 million and had not yet made any decision about the second.

Mr. Malcolm FRASER

'ING' met with a similar fate in the sense that this project, which had been assessed at a capital cost of between $150 and $200 million and at an annual recurrent cost of $20 million was recommended by the Science Council.

Despite this, notes released by the Office of the Canadian Prime Minister late last year indicated that there was still *'considerable controversy within the scientific and industrial community about the priority which should be accorded this project'.*

In any event the Government rejected the recommendation. In other words, the existence and recommendation of the Science Council did not achieve unanimous support for the project or Government acceptance of its recommendation.

These two issues and there were no doubt others had led to criticism in Canada of both the Government and the Science Council.

Again, experience in Britain had not provided any reason for greater confidence in the advisory machinery that had been developed there.

Recent numbers of 'Nature' indicated that there should have been a significant re-organization of the U.K. Atomic Energy Authority some considerable time ago but, because of the inflexibility of inbuilt constitutions, this re-organization had not taken place.

Britain also had a Science Research Council, in fact several such councils, but the advice it gave had not prevented the British Government from ignoring it in relation to British participation in the Cern 300 GEV accelerator.

The point was, said Mr. Fraser, that there was no easy answer and there was no simple solution to the problems of priority. The machinery specially established to help determine these problems did not seem to have worked particularly well.

The Minister emphasized that these were not just his criticisms, they were criticisms that had emanated from the countries concerned.

'We may be wisest, then,' he said, *'to continue our pragmatic evolutionary approach, seeking advice from different people as different projects arise.'*

'In this way we can establish a network of informal and ad hoc relationships'.

'Having obtained such advice, the decision needs to be made, as the Forum report recognises, at the ministerial and governmental level'.

Mr. Fraser then referred to a section of the Forum report which dealt with the problem of co-ordination of the national research effort.

The report stated that there *'may be a considerable volume of research and development which is not co-ordinated, where the overall aim is not well defined and its relationship to national objectives by no means clear'.*

'Although there are undoubtedly exceptions, most university research is not co-ordinated with that in government establishments. Moreover, few attempts have been made to encourage research in matters of national importance.'

This statement touched, said Mr. Fraser, on a large and delicate area which, in its full implications, could affect the autonomy of universities and the right of noted scientists to select their own fields of research.

He was deeply conscious, he continued, of the growing resources required in scientific research and would particularly value the views of the Forum or of the Academy in achieving amplification of what precisely was meant by this statement.

Mr. Fraser then referred to the need for research organizations to maintain flexibility within their ranks.

He pointed out that scientists were often recruited for a certain purpose and for a certain development, but that Government employment at the moment demanded continuity.

We needed, he said, to be able to shut down projects in government institutions which no longer had a relationship to a national objective, and we needed to be able to maintain our ability to switch our resources to areas of concern.

Transferability of personnel between Government, universities, and industry was clearly desirable, and the Government was examining a report which could have some effect on the portability of superannuation rights.

Mr. Fraser then went on to say, *'Those who are gathered in this Forum have one common belief — the proper development of science and technology and its application to Australia's scientific problems is going to play an ever increasing part in Australia's destiny.'*

'Thus we have a common objective; however, we may differ in our views on the approach that should be adopted in getting the best possible advice to the decision making machinery of the government.'

'We are open to suggestion. We want to seek advice and we want to develop closer relationships with both science and industry. If we can all co-operate in this, Australia will prosper.'

Mr. Fraser then concluded by quoting from a speech made by Mr. Gorton at the opening of the Solar Astronomy Laboratory at Narrabri:

'We cannot from our own resources take the steps which are necessary to put a man on the moon, or to send our own astronauts into space. This is beyond us. I am not sure it is very sensible anyway, but it is beyond us.

'But what we can do is to take those fields for which we are pre-eminently suited and which we can afford to develop — to develop not as quickly as the scientists would like, but those which we can afford to develop and are developing.

'These are fields such as astronomy, tropical veterinary science, tropical agriculture, . . . The fields of scientific endeavour for which Australia is most suited are those which we should develop first; develop to excellence and not stop developing until we are better than anyone else in the world.'

STOP PRESS

Dr. A. Walsh, Assistant Chief of the Division of Chemical Physics, has been elected a Fellow of the Royal Society.

Death of Dr Davies

Dr. J. Griffiths Davies, Chief of the Division of Tropical Pastures, died in hospital in Brisbane on Saturday, 15th March.

Dr. Davies, who has been described as 'the father of Australian pasture research', was born at Aberystwyth in May, 1904.

After obtaining his Ph.D. from the University of Wales, Dr. Davies came to Australia in 1927 to take up a position as agrostologist at the Waite Agricultural Research Institute at Adelaide.

By the mid-1930's the vigour, originality and success of his work on pastures was becoming widely recognised and in 1938 he was appointed by CSIRO to establish an Agrostology Section in the Division of Plant Industry.

Dr. J. G. DAVIES

While headquartered in Canberra in the period 1938-52 he established groups of pasture workers at Canberra, Perth, Deniliquin, Armidale and Brisbane.

In 1952, again following his pattern of moving to an environment offering great challenge and the prospect of greater achievement, he transferred his headquarters to Brisbane to devote his energies to building a programme of pasture research for the tropics and sub-tropics of Australia.

He was then 48, an age by which many men of science have already given their best, yet because of his insight, the continued youthful vigour of his approach, and his ability to attract and retain talented colleagues, he was able to build up and inspire a new research group which has achieved world leadership in the theory and practice of pasture science in the tropics.

Dr. Davies became an Associate Chief of the Division of Plant Industry in 1951 and was appointed Chief of the Division of Tropical Pastures on its formation from the Division of Plant Industry in 1959.

The quality and importance of his contribution to agriculture have been recognised in Australia and overseas.

He was Federal President of the Australian Institute of Agricultural Science in 1951-52, its medallist in 1957, and was one of its foundation Fellows.

In 1964 he was awarded the $10,000 Britannica Australia award for natural and applied sciences for 'his outstanding contributions to pasture science and hence to the pastoral industry and economy of Australia'.

He was Vice-President of the Sixth International Grassland Congress in 1952, and was later appointed Chairman of the Eleventh Congress which will be held in Australia next year.

There have been numerous invitations from foreign governments and F.A.O. for him to visit tropical countries and advise on pasture research and he has made such visits to South East Asia, Pakistan, and several South American countries.

In a eulogy delivered on the occasion of the conferment on Dr. Davies of the honorary degree of Doctor of Science of the University of New England in 1958, Professor Mc. Clymont said:—

'It is given to few men, in their lifetime, to develop a new philosophy of approach to a major scientific and economic problem, to put that philosophy into practice, see it so widely accepted that it becomes difficult for later workers to conceive that it was not always so accepted, and see the practical application of that philosophy result in immeasurable benefits to mankind. John Griffiths Davies has been one of such few.'

It is noteworthy that this could be said of him before the success of his work in the tropics was fully apparent.

Dr. Davies, who was to have retired next month, will be succeeded as Chief of the Division by Dr. E. M. Hutton.

SCIENCE IN PLANT IMPROVEMENT

There are many aspects to the study of plant improvement, for a large number of people in several Divisions are concerned in one way or another, and often in very different ways, with producing better plants or obtaining increased yields from them.

Perhaps the best way to treat the subject is to discuss in a general manner the principles of plant improvement as we practise it at present.

Most of the examples will refer to pastures and this is because the importance of animal production to the Australian economy has resulted in intensive work on pasture plant improvement particularly in the Divisions of Tropical Pastures and Plant Industry.

Since the native vegetation is mostly unsuited to intensive grazing, we rely for improvement on the introduction of new plant material, testing and selection amongst these introductions, and the crossing and breeding of new varieties.

The Division of Plant Industry's Plant Introduction Section has been operating now for about 36 years and during this time over 40,000 plants have been brought into the country.

About 52 of these have been used as commercial varieties and altogether about one in 300 has been used directly or in breeding programmes.

This is a level of utilization about comparable with American experience.

Up to about 1950 the bulk of the introductions comprised temperate legumes and grasses reflecting the active pasture development in southern Australia.

Since that time, the proportion of tropical legumes and grasses has increased until these now form the majority of introductions and reflect the extensive work that is in progress in northern Australia.

We had hoped that our experience in the introduction of plants would lead to general principles or criteria which could be used in making future introductions.

Thus a good deal of research has been done on comparing environments in various parts of the world so that we could seek new plants from climates similar to those in which we hope to grow them.

However, plants seem to be adapted to their environments for purposes of survival rather than yield, and in fact, these survival mechanisms may severely limit yield.

For example, our native grasses and legumes are adapted to low fertility levels, particularly to phosphorus and nitrogen and they respond poorly to increased soil fertility.

It would be unproductive to introduce plants from similar climatic areas if they also had soils of low fertility because the plants would be adapted to this low level.

Subterranean clover and white clover are more useful than any native clovers because they have the capacity to respond more readily in high production to the application of phosphate.

The present situation with regard to plant introduction is that in northern Australia we are seeking to introduce in particular, summer-growing grasses such as Rhodes and Buffel grass and also tropical legumes such as Desmodium and Townsville lucerne which fix nitrogen, grow rapidly in the wet season and provide a valuable protein supplement in the winter.

In some respects, Western Australia is also at the stage where new introductions can be used directly as in the case of rose clover and cupped clover which have been found valuable in the drier wheat belt.

However, in south-eastern Australia this stage is practically over, since we now have well adapted legumes like subterranean clover, white clover and lucerne and grasses such as cocksfoot, ryegrass and *Phalaris*.

Forage yields can still be improved, of course, but now we require very close definitions of the limits to yield so we can have specific objectives to be met by selection and breeding.

In fact, the very foundation to plant improvement, whatever the plant, is the accurate determination of objectives.

By objectives, we mean the characters required in a new plant or the limitations to be overcome in an existing one.

In regions just being opened up, the attributes required in pasture plants may be fairly obvious.

This article is based on a talk given to the Advisory Council last year by Dr. J. B. Langridge, Assistant Chief of the Division of Plant Industry.

In North Australia where the rainfall is above 25 inches a year, we need legumes to provide protein in stock feed during the dry season because native pastures have only about 2% protein and stock maintenance is said to need about 10%.

Much of the legume protein comes from the seed, so the timing of flowering is important.

If it is too early, the period of summer growth is limited, and if it is too late, the low temperatures of the late autumn may interfere with successful seed development.

Hence the introduction and physiological adjustment of legumes such as Townsville lucerne and *Dolichos*.

Since these legumes are annuals, weed regrowth and erosion need to be overcome by providing a grass to grow with them.

Yield in the grass is not at this stage as important as the ability to bind the soil and stabilize the pasture, such as in Buffel grass and Angleton grass.

On the other hand, the established pastures of south-eastern Australia present greater problems in defining the objectives in improvement.

We are not now so much concerned merely with greater yield because other limitations of the plant may often result in low stocking rates and much of the present yield may not be used.

Instead we are considering matters such as uniformity in yield over the year or characteristics of plants to compensate for non-uniformity.

Such a problem, which we hope to solve by simple selection, occurs in the Krawarree area at the headwaters of the Shoalhaven river.

Red clover grows well there throughout spring and summer, but the winters are too cold (30-40°F) for active growth of pastures and the problem is to provide forage for the winter.

We are selecting for strains of red clover which, when ungrazed, will give high yields by the autumn and selecting again amongst the high yielders for a low rate of decline in digestible organic matter.

Many of the characters that we find limiting are not very obvious ones and, although they may not be directly related to yield are still of great importance because they bear directly on the cost of providing plants for animal food.

Seedling establishment is one of these, for in many areas the cost of seed and sowing inhibits the further development of pastures.

We have been studying the various aspects of establishment; such things as how soon the seed picks up nutrients, when photosynthesis starts, ease of penetration of root into soil and so on.

One of the main characters in establishment may well be the ability of the seed to germinate under moisture stress.

Ryegrass, for example, readily becomes established because its seeds will germinate at 60% moisture content, whereas legumes appear to require 90-100% moisture.

If these results are confirmed, we will select amongst otherwise well-adapted grass and legume species for ones which will germinate and develop under moisture gradients set up in the laboratory.

This work is also of relevance to the aerial sowing of what would otherwise be non-arable or marginally-arable land.

One of our most important tools in the understanding of components and limits to yield is the set of controlled environments provided by the phytotron.

The phytotron is not usually used directly for plant breeding purposes because of limitations of space and the problem of extrapolating back into the field.

Its main use is a diagnostic one, to pinpoint the weaknesses in our cultivated plants and to identify important climatic factors responsible for these weaknesses.

A recent example is sterility in rice. A major field problem is the high incidence of sterility in panicles which set rather late in the season in the irrigation area of New South Wales.

The exact cause of sterility could not be unravelled in the field, but phytotron experiments quickly showed that the causal factor was low night temperature at two specific stages during the differentiation of the panicles, particularly low temperatures just before pollen shedding.

Some varieties from northern Japan appear to have the ability to get through this bottleneck and a crossing programme has been started to insert this character into Australian commercial rice.

On a more physiological level, we have recently used the phytotron to examine the question as to whether the plant breeder should be putting his efforts into increasing the photosynthetic rate of domesticated plants, as has been advocated by some people.

This was done by studying what had happened during the evolution of wheat to give its present high yield.

Wild grasses and primitive wheats ancestral to domestic wheat, as well as certain intermediate species, were examined.

We found that the photosynthetic rate of the leaf had apparently gone down during the evolution of bread wheat; a very primitive ancestral species had about twice the photosynthetic rate of today's wheat.

On the other hand, the rate of growth of leaves in modern wheats is far faster than in old ones, and a much higher proportion of the sugar formed in modern wheat is transported to the developing grain.

This work showed that the photosynthetic rate in temperate cereals seems not to be limiting, the movement of sugars being far more important.

Now that we know one of the characters that determines high grain yield, we may be able to devise means of selecting for it.

As well as quantity of forage, we are also concerned with the quality. So palatability, digestibility and food value are very important.

However, our study of digestibility in *Phalaris* was not very encouraging. The differences we found were quite small and varied greatly with the season; they were too small, in fact, to provide useful genetic variation for plant breeding.

Similarly, the variation in digestible dry matter (between 30 and 40%) and nitrogen content was too restricted for a successful breeding programme.

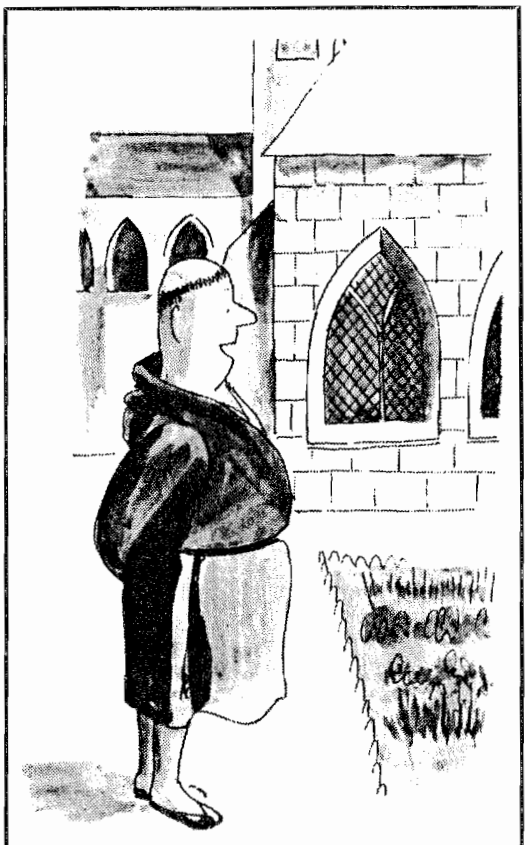
We have done rather better with another aspect of quality; that of removing from the plant, compounds which are toxic or physiologically damaging to the animal.

Tryptamine alkaloids in *Phalaris*, which causes "staggers" and death in sheep and oestrogens in subterranean clover, which cause infertility in ewes, are examples.

In the case of the alkaloids, work by the Division of Animal Health suggested they were the cause of sheep poisoning, so we began selection for low alkaloid strains.

At present we have varieties with a negligible alkaloid content (less than 10% of the commercial variety) and are testing them on sheep before incorporating the low alkaloid character into high-yielding *Phalaris*.

(Continued on page 4)



"You've certainly got the gardens looking nice, Brother Mendel!"

Courtesy "New Scientist".

POSITIONS VACANT

The following vacancies for professional appointments are current:

EXPERIMENTAL OFFICER (EO 1/2) — Division of Food Preservation — 305/127 (4/4/69).

EXPERIMENTAL OFFICER — GRAIN STORAGE INVESTIGATIONS (EO 2/3) — Division of Mechanical Engineering — 430/275 (4/4/69).

EXPERIMENTAL OFFICER — HEAT AND MASS TRANSFER (EO 1/2) — Division of Mechanical Engineering — 430/276 (4/4/69).

RESEARCH SCIENTIST IN PLANT BREEDING AND GENETICS (RS) — Division of Tropical Pastures — 850/319 (4/4/69).

ELECTRON MICROSCOPIST (RS/SRS/PRS) — Division of Animal Health — 201/325 (4/4/69).

RESEARCH SCIENTIST — EXPERIMENTAL PATHOLOGY (RS/SRS) — Division of Animal Health — 202/340 (11/4/69).

AGRONOMIST (RS/SRS) — Division of Irrigation Research — 500/235 (11/4/69).

RESEARCH SCIENTIST (RS/SRS) — Division of Animal Genetics — 675/237 (19/4/69).

News In Brief

Professors

Dr. F. J. Kerr of the Division of Radiophysics has been appointed Professor of Astronomy at the University of Maryland, United States.

Dr. J. S. Shannon of the Division of Entomology has been appointed Professor of Chemistry at the University of New South Wales.

President

Mr. A. F. A. Harper of the Division of Physics was installed last month as President of the Australian Institute of Physics.

Doctorates

Mr. G. B. Jones of the Division of Nutritional Biochemistry has been awarded the degree of Doctor of Science by the University of Auckland.

Mr. A. D. Warth of the Division of Food Preservation has been awarded the degree of Doctor of Philosophy by the University of Wisconsin, for his research on the chemical composition of the cortex of bacterial spores.

Master of Science

Mr. I. M. Coggiola of the Division of Food Preservation has been awarded the degree of M.Sc. by the University of New South Wales for his research on farnesene chemistry.

Chairman

Mr. J. D. Mellor of the Division of Food Preservation has been elected Chairman of the Vacuum Physics Group of the Australian Institute of Physics.

Visitor

Dr. Thadis W. Box, Director of the International Centre for Arid and Semi-Arid Land Studies at the Texas Technological College, Lubbock, is spending a sabbatical year with the Rangelands Research Unit. During his stay he is preparing a book on Australia's rangelands with **Dr. R. Perry,** Leader of the Rangelands Research Unit.

Last February, Dr. Box conducted a school in range management at Alice Springs. The school was organised by the Assistant Director of the Primary Industries Branch of the Northern Territory Administration and was attended by more than 20 people from the Administration's Agriculture and Animal Industry Sections and from the Division of Wildlife Research and the Rangelands Research Unit.

Our picture below shows Dr. Box (right) and Dr. Perry working on the manuscript of their book.

Retirement

Mr. A. J. Higgs of the Division of Radiophysics retired recently after 27 years with CSIRO.

After graduating B.Sc. with honours from the University of Sydney in 1926, Mr. Higgs spent 15 years with the Commonwealth Solar Observatory (now Mt. Stromlo) in Canberra.

He was seconded to CSIRO in 1941 for secret war work with the Division of Radiophysics. In 1945 he became Technical Secretary of the Division and in later years was Assistant to the Chief.

Mr. A. J. HIGGS

During 1952/53 he was Scientific Attache in Washington, and in the period from 1963 to 1968 he served as a member of various official Australian Government delegations to conferences on the allocation of radio frequencies, in order to advise on the requirements of Australian radioastronomers.

Mr. Higgs also played a major part in the establishment of the Australian National Radio Astronomy Observatory at Parkes and the Solar Radio Astronomy Observatory at Culgoora.

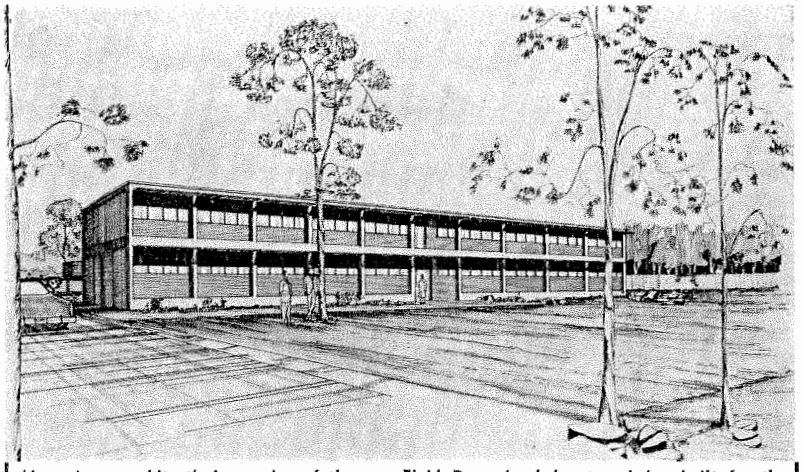
Nauru Appointment

Mr. P. J. Kelly of Head Office has been appointed chief Administrator in the Chief Secretary's Department of Nauru where he will be concerned mainly with formulating policy for the development of the Nauruan Public Service.

Back from Baghdad

Mr. R. E. Winkworth returned recently to the Rangelands Research Unit after spending three years in Baghdad advising on the establishment of the UNESCO sponsored Institute for Applied Research on Natural Resources which is under the control of the Iraqi Council for Scientific Research.

During this time he set up an ecological laboratory and a plant introduction programme including field trials for the study of reseeding the degenerated rangelands of Iraq.



Above is an architect's impression of the new Fluid Dynamics Laboratory being built for the Division of Mechanical Engineering at Highett. Architects for the project are the Victorian Office of the Commonwealth Department of Works. The building is expected to be completed next month.

Golf Day

The Amenities Committee of the Division of Forest Products is organizing the D.F.P.-Cup Golf Day on Wednesday, 16th April, at the Patterson River Country Club, Carrum. For enquiries, ring **A. Stashevski** (69 5831).

Ski Club Notes

The CSIR Ski Club has arranged work parties at Mt. Buller and Falls Creek for April 4-7 and April 25-27. Laggards should ring **John Eltham** (64 1614) and book in immediately.

A pre-season Dinner Dance has been organised by the Ski Club at "Starclub", Marine Parade, St. Kilda, on the evening of 30th May. Cost is $3 a head. Smorgasbord, band, casual dress, B.Y.O. Book now with your Divisional representative or ring **Miriam Wailes** (92 8937).

Overseas Visits

Dr. J. D. Esdaile of the Division of Chemical Engineering leaves later this month on an 11 week visit to South Africa, Zambia, Britain and North America. Dr. Esdaile will visit laboratories and attend the 9th Commonwealth Mining and Metallurgy Congress in London.

Dr. A. K. Head of the Division of Tribophysics left recently on a one month visit to Britain and the United States where he will visit laboratories and attend conferences on dislocation theory and fracture.

Mr. D. E. Henshaw of the Division of Textile Industry leaves later this month for Japan, Europe, Britain, Ireland, the United States and New Zealand where he will visit wool processing and textile mills and research centres. He will be away for two months.

Mr. F. Penman of Head Office will leave shortly on a two month visit of irrigation and water conservation bodies and research establishments in Mexico and North America.

Mr. S. M. Sykes of the Division of Food Preservation leaves shortly for North America, Britain and Europe where he will visit laboratories and factories concerned with the processing of fruit and vegetables. Mr. Sykes will be away for three months.

Dinner Dance

Melbourne Divisions and Sections will hold their Annual Dinner Dance at Sergio's Rendezvous, St. Kilda, on the evening of Friday, 2nd May.

SAFETY NOTES

The Current That Kills

Off hand it would seem that a shock of 10,000 volts would be more deadly than a shock of 100 volts, but this is not necessarily so. Cases have been reported where individuals have been electrocuted by appliances using ordinary household voltages of 110 volts and by electrical apparatus in industry using as little as 42 volts direct current.

The real measure of a shock intensity lies in the amount of current (amperes) forced through the body and not the voltage. Any electrical device used on a house wiring circuit can, under certain circumstances, transmit a fatal current.

While any amount of current over 10 milliamps (0.01 amps) is capable of producing painful to severe shock, currents between 100 and 200 milliamps are lethal.

Currents above 200 milliamps, while producing severe burns and unconsciousness, do not usually cause death if the victim is given immediate attention. Artificial respiration will usually revive the victim.

Danger — Low Voltage

The victims of high voltage shock usually respond to artificial respiration more readily than the victims of low voltage shock. The reason may be the merciful clamping of the heart owing to the high current densities associated with high voltages. However, lest these details be misinterpreted, the only reasonable conclusion that can be drawn is that 75 volts are just as lethal as 750 volts.

The actual resistance of the body varies depending on the points of contact and the skin condition (moist or dry). Moist skin has a much lower resistance to current than dry skin. If the skin is punctured, by an electric spark say, the body fluids have a very low resistance to the passage of electric current and the shock will be more severe.

Keeping Out Of Trouble

When working around electrical equipment, move slowly. Make sure your feet are firmly placed for good balance. Do not lunge after falling tools. Isolate all power and earth all high voltage points before touching wiring. Make sure that power cannot be accidentally restored. Do not work on unearthed equipment.

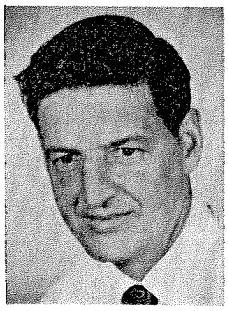
Do not examine live equipment when mentally or physically fatigued. Keep one hand in pocket while investigating live electrical equipment. Above all, do not touch electrical equipment while standing on metal floors, damp concrete or other well-earthed surfaces. Do not handle electrical equipment while wearing damp clothing (particularly wet shoes) or while skin surfaces are damp.

Do not work alone. Remember, the more you know about electrical equipment, the more careless you are apt to become. Do not take unnecessary risks.

L. C. R. Thompson, Safety Officer.

APPOINTMENTS TO STAFF

Mr. B. C. Bautovich has been appointed to the Division of Plant Industry where he will undertake work on the design and development of equipment and facilities for research. He will also take charge of the Division's workshops and associated services at Black Mountain. Mr. Bautovich obtained his Diploma of Mechanical Engineering at the Ballarat School of Mines in 1953 and since then he has worked as an engineer with Kraft Foods, C.I.G. Equipment Ltd., the State Electricity Commission of Victoria and Brick and Pipe Industries Ltd.



Mr. B. C. BAUTOVICH

Dr. P. J. Crawford has joined the Staff Section at Head Office where he will be concerned with recruitment and classification evaluation of staff. After graduating B.Sc. with honours from the University of New England in 1962 and Ph.D. from the Australian National University in 1966, Dr. Crawford spent 1966/67 at the Max-Planck Institute for Physical Chemistry in Germany. Since then he has been a research chemist with E. I. du Pont de Nemours and Co., in the United States.

Dr. P. J. CRAWFORD

Dr. R. A. Date has been appointed to the Division of Tropical Pastures to carry out research on *Rhizobium* ecology. Dr. Date graduated M.Sc.Agr. from the University of Sydney in 1959 and Ph.D. from the University of Maryland in 1962. From 1962 to 1964 he undertook an F.A.O. assignment in Uruguay and since then he has been officer-in-charge of the Agriculture Laboratory Service, Department of Microbiology, University of Sydney.

Mr. K. T. Fell has joined the Division of Textile Physics to investigate the significance of measurable parameters in wool fibre processing from bale to cloth. Mr. Fell graduated B.Sc. with honours recently from the University of New South Wales.

Mr. M. A. Foale has been appointed to the Division of Plant Industry's Tobacco Research Institute at Mareeba to study the effects of legumes and other rotational crops on the nitrogen and fertility status of tobacco-growing soils. Mr. Foale graduated B.Ag.Sc. from the University of Adelaide in 1956 M.Ag.Sc. from the same university in 1966. He obtained his Diploma of Agricultural Science from the University of Cambridge in 1958 and his Diploma of Tropical Agriculture from the Imperial College of Tropical Agriculture, Trinidad, in 1959. He has spent the last ten years with the Department of Agriculture of the British Solomon Islands.

Mr. V. Gardavsky has joined the Division of Textile Physics where he will work on improved methods of raw wool testing. Mr. Gardavsky is a graduate in instrumentation and electronics from the University of Prague. From 1958 to 1964 he worked as a designer in the Chemical Engineering Laboratory of the Czech Academy of Science and from 1964 to 1968 as a section leader in the Instrumentation and Electronics division of the Academy's Chemical Technical Institute.

Mrs. Jennifer Loh has been appointed to the Editorial and Publications Section where she will assist in the editing of the biological journals. Mrs. Loh graduated B.Sc. from the Australian National University in 1967.

Mrs. Jennifer LOH

Mrs. Winsome Harrison has joined the Division of Soil Mechanics where she will be responsible for the complete programming requirements of a series of projects in which theoretical models will be used to provide predictions of soil behaviour. Mrs. Harrison graduated M.Sc. from the University of Queensland in 1966. Since then she has been carrying out research on computer programming with the English Electric Co., Britain.

Miss Jane Henderson has been appointed to the Division of Dairy Research to work on the development of new milk products and on new uses for milk products. Miss Henderson graduated in food technology last year from Massey University, New Zealand.

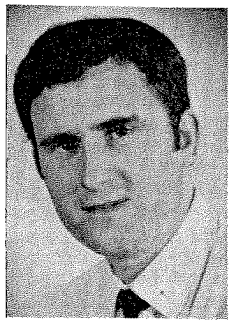
Miss Jane HENDERSON

Dr. T. H. Goh has been appointed to the Division of Textile Industry to study the role of polymers and polymerisation in chemical treatments of wool. Dr. Goh graduated B.Sc. with honours from the University of Adelaide in 1965 and Ph.D. from the same university in 1968.

Mr. P. Hyson has been appointed to the Division of Meteorological Physics where he will be concerned with the measurement of atmospheric humidity. Since graduating B.Sc. from the University of Adelaide in 1959, Mr. Hyson has been with the Commonwealth Bureau of Meteorology. Mr. Hyson obtained his Diploma of Space Science from the University of London in 1966 and since then has been studying for his Ph.D. at the same university.

Miss Kathleen King has joined the Division of Animal Physiology to study the effects of management practices on reproduction, body growth and wool growth in sheep. Miss King graduated B.Sc. with honours from the University of Queensland in 1966 and for the last two years has been a Demonstrator in Biology at Flinders University.

Dr. R. Sharpe has been appointed to the Division of Building Research where he will be concerned with the development and application of mathematical programming, information science, and systems techniques to the optimal planning and design of civil engineering and urban projects. Dr. Sharpe graduated B.E. from the University of Melbourne in 1964 and M.Eng.Sci. from the same university in 1966. He recently obtained his Ph.D. from the University of Southampton.



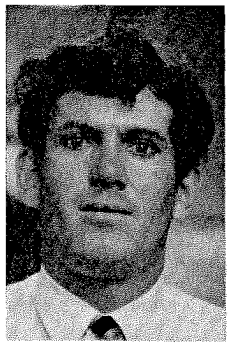
Dr. R. SHARPE

Dr. R. Muijlwijk has joined the Division of Physics to investigate the effect of relative isotope concentration on the realization of the near boiling point for the International Practical Temperature Scale. Dr. Muijlwijk gained his Ph.D. at the University of Leiden last year.

Dr. T. C. Parks has joined the Division of Applied Mineralogy to study dispersion haloes around ore bodies. Dr. Parks graduated B.Sc. with honours from the University of Western Australia in 1961 and Ph.D. from the same university in 1966. Since then he has been a research fellow with the Division of Applied Chemistry of the Canadian National Research Council.

Dr. C. M. R. Platt has joined the Division of Meteorological Physics where he will carry out research on atmospheric radiation. After graduating M.Sc. from the University of Rhodes, South Africa, in 1956, Dr. Platt spent a year with the East African Meteorology Department and four years as a lecturer at the University College of Nairobi. He obtained his Ph.D. from the University of London in 1967 and since then has been lecturing at Sunderland Technical College, Britain.

Dr. L. G. Sparrow has joined the Division of Protein Chemistry to study the conformation of the high-sulphur proteins of the wool fibre. After graduating M.Sc. from the University of Melbourne in 1960 and Ph.D. from the same university in 1964, Dr. Sparrow spent two years in the Biochemistry Department at the University of California. Since then he has been a visiting associate at the Laboratory of Biochemical Pharmacology at the U.S.A. National Institute of Arthritis and Metabolic Diseases.



Dr. L. G. SPARROW

Dr. M. A. Ross has joined the Rangelands Research Unit to carry out plant ecological studies of arid central Australia. Dr. Ross graduated B.Agr.Sc. with honours from the University of Adelaide in 1959 and M.Agr.Sc. from the same university in 1966. From 1960 to 1966 he worked with the South Australian Department of Agriculture and from 1966 to 1968 he studied at the University College of North Wales where he gained his Ph.D. last year.

Mr. R. L. Sandland has joined the Division of Mathematical Statistics to assist Divisions in Canberra with statistical aspects of their research programmes. Mr. Sandland graduated B.Sc. with honours last year from the University of Sydney.

Plant Improvement

(Continued from page 2)

As far as quality is concerned, the reason for our greater success in removing poisons than in increasing nitrogen content or palatability is that the poisons are very simply determined in the genetic sense.

If we can find a plant lacking the gene controlling the formation of the poison or if we can inactivate it by mutation, we have the character we want.

But the nitrogen content, for example, depends upon the inter-related action of many hundreds of genes and a change in any one makes little difference to the nitrogen level.

During his history, man has used at least 3,000 species of plants for food and has cultivated at least 150 of these to the extent that they have entered into the world's commerce.

The tendency through the centuries has been to use fewer and fewer species and to concentrate on the more efficient ones. So today the world is fed by about 15 species of plants.

These are: 5 cereals (rice, wheat, corn, sorghum and barley), 2 sugar plants (sugar cane and sugar beet), 3 "root" crops (potato, sweet potato and cassava), 3 legumes (the common bean, soybean and peanut), and two so-called tree-crops (the coconut and banana).

Many of these are grown in Australia, but often as straight introductions from overseas with little adjustment to Australian conditions.

However, with changes in economic conditions — decreasing demands for animal products, particularly wool, and the potential development of large markets for plant food in Asia — it is timely to consider the improvement of crop plants to decrease their cost of production.

Such a shift in emphasis would be directed primarily to south-eastern Australia.

Pasture work would still be required in northern Australia where beef production is likely to be most important for many years to come, and in the drier areas sheep are unlikely to be replaceable.

However, in areas of eastern Australia of relatively higher rainfall and fertility, increasing cost of wool production may tend to make crop growing more rewarding economically. Hence the need to improve crop plants.

Even wheat, which has received most attention, is nowhere near its production ceiling in traditional wheat-growing areas and for the higher fertility regions just mentioned, it is quite ill-adapted.

Other crops worth considering are sorghum for which there seems to be a growing demand in Asia as food for chicken, pigs, and so on, but the varieties mostly sown at present are imported American hybrids.

The agricultural and economic potentials of these and other crops are at present being examined in the Division of Plant Industry.

Many people think that the soybean is a crop of the future because it is a good source of nutritionally acceptable protein — our present varieties have deficiencies in their daylength sensitivity.

Most of the above remarks have been directed towards the science of establishing objectives, rather than the scientific techniques of plant improvement.

This is because, when we actually get down to improving a plant, the amount of known biological science we can bring to bear is fairly limited. The restrictions are set by the reproductive systems of plants.

Usually we can combine genes and characters within and between species, but it is very difficult to go beyond this in plants.

This is not so in some other organisms; in bacteria we can isolate the genes, purify them and put them into another bacterium; in animals, cells of different organisms can be fused together to give a mosaic tissue or even a single fusion cell containing the genes of both organisms.

These are the sorts of things that we shall need to do with plants in the future if we are ever to get outside the straitjacket imposed by the sensitivity of the reproductive mechanism.

We have tried to move chemically extracted and purified genes from one tomato plant to another and similarly with peas.

So far we have had no success, but the thing is theoretically possible and when it is eventually done, we shall advance from merely improving existing food plants to making entirely new ones.

DEADLINE

Contributions for the May issue of Coresearch should reach the Editor at 314 Albert Street, East Melbourne, by Friday, 11th April.

Printed by CSIRO, Melbourne

CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 122, MELBOURNE, MAY 1969

DR. SERVENTY RETIRES

Dr. D. L. Serventy of the Division of Wildlife Research, retired last month after more than thirty-one years with CSIRO.

A graduate of the Universities of Western Australia and Cambridge, he joined the Division of Fisheries and Oceanography in 1938 and transferred to the Division of Wildlife Research in 1951.

Dr. Serventy is part of both the old and the modern eras of ornithology in Australia and might be fairly termed one of its fathers.

He has been active in the field for over forty years and is highly regarded as an ornithologist both in Australia and overseas. His work on mutton birds will become a classic.

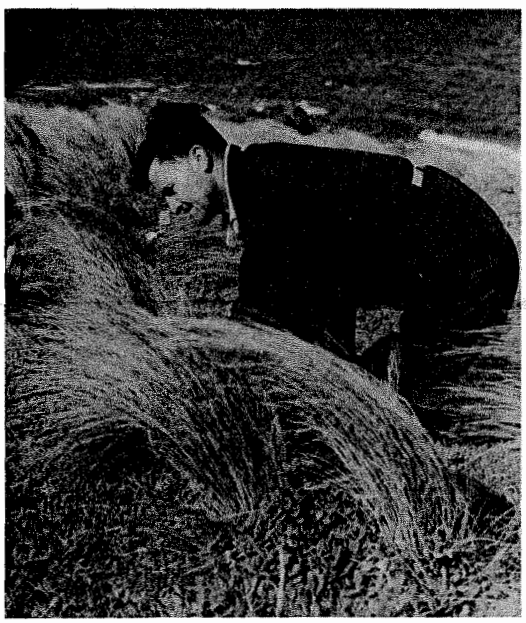
Dr. Serventy will spend his retirement writing up his work.

He also has two books planned, one of which, a biology of sea-birds, he hopes to finish by 1971.

Dr. Serventy is a past president of the Royal Australasian Ornithologists' Union, a member of the Western Australian Wildlife Authority, and a member of the Permanent Executive Committee of the International Ornithological Congress.

He was recently awarded the R. M. Johnston Memorial Medal of the Royal Society of Tasmania.

Below. Dr. Serventy checking mutton bird burrows on Fisher Island.



Triple Honour for Dr Walsh

In recent weeks, Dr. A. Walsh, Assistant Chief of the Division of Chemical Physics, has received three high honours for his distinguished contributions to emission and infra-red spectroscopy and for his development of the atomic absorption method of quantitative analysis.

As reported in last month's Coresearch he has been elected to the Fellowship of the Royal Society of London.

In addition, he has been awarded the Royal Society of Victoria Medal for 1968 and the Talanta Gold Medal.

The Talanta Medal is awarded by Pergamon Press Limited for outstanding contributions to analytical chemistry.

A graduate of Manchester University, Dr. Walsh joined CSIRO in 1946.

A few years later he became convinced that there were many advantages to be gained from using atomic absorption spectroscopy rather than emission spectroscopy.

At that time atomic absorption was considered to be unsuitable for general analysis.

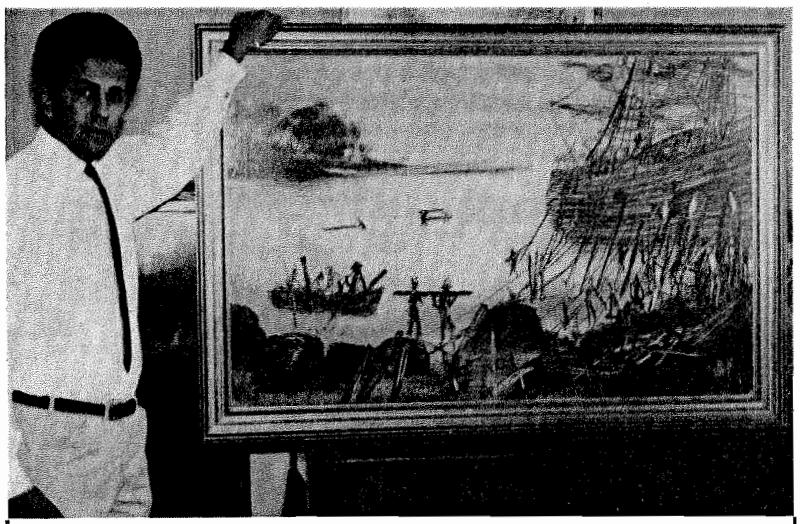
Dr. Walsh devised a simple and elegant apparatus to overcome the technical difficulties involved.

The technique of atomic absorption spectroscopy has proved to be so adaptable and versatile, and has reduced the cost of analyses to such an extent that it is providing completely new opportunities to obtain data that would have been too costly to obtain by any other means.

In research, in quality control in industry, in medical and agricultural practice, and in mineral exploration, atomic absorption has made possible new perspectives of enquiry.

Dr. Walsh's work has led to a substantial international industry manufacturing atomic absorption instruments based on a variety of his designs.

Our picture above shows Dr. Walsh (second from left) being congratulated on his F.R.S. by some of his colleagues from the Division of Chemical Physics. They are (from left to right) the Chief of the Division, Dr. A. L. G. Rees, Dr. A. Mc. L. Mathieson, Dr. B. Dawson and Dr. A. C. Hurley.



Mr. A. L. Chandica of the Division of Soils has a prize-winning idea for celebrating the 200th anniversary of Captain Cook's discovery of eastern Australia. His suggestion, a boating rally following the course taken by Captain Cook's ship the Endeavour from Point Hicks to Cooktown, won him the prize in a contest run by "The Australian" newspaper for suggestions for celebrating the bicentenary of Cook's voyage. Mr. Chandica is pictured with his prize, a $2,000 painting by Pro Hart depicting repairs being made to the Endeavour at a river near Cooktown. Mr. Chandica is located at the Cunningham Laboratory, Brisbane, where he is engaged in soil survey and mapping work.

STOP PRESS

Dr. J. P. Wild, Director of the Division of Radiophysics' Solar Radio Observatory at Culgoora, has been awarded the Henryk Arctowski Medal of the United States National Academy of Sciences. The medal was presented to Dr. Wild in Washington on April 28th.

Overseas Visits

Mr. J. E. Coaldrake of the Division of Tropical Pastures leaves shortly on a three month visit to Russia, Scandinavia, Britain, and North America to study developments in plant ecological research.

Mr. B. V. Fennessy of the Division of Wildlife Research left last March on a six month visit to New Zealand, the United States, Britain, Europe and India. Mr. Fennessy will visit organizations concerned with the management of wild animals affecting agriculture, particularly rabbits.

Mr. I. Langlands, Chief of the Division of Building Research, leaves early this month on a four month visit to South Africa, Europe, North America and Asia to study current developments in building research. In South Africa he will attend the Second South African Building Research Congress at which he will deliver an invited paper entitled "The Changing Scene in Australasia".

Mr. I. E. Newnham, Chief of the Division of Mineral Chemistry, left last month on a six week visit of mineral research centres in South Africa, Britain, Europe and North America. Mr. Newnham will also deliver a paper at the 9th Commonwealth Mining and Metallurgy Congress in London.

Mr. D. E. Roney of the Division of Mineral Chemistry left last month on a six week visit to Europe, Britain and North America. Mr. Roney will attend the 9th Commonwealth Mining and Metallurgy Congress and will study economic aspects of mineral research.

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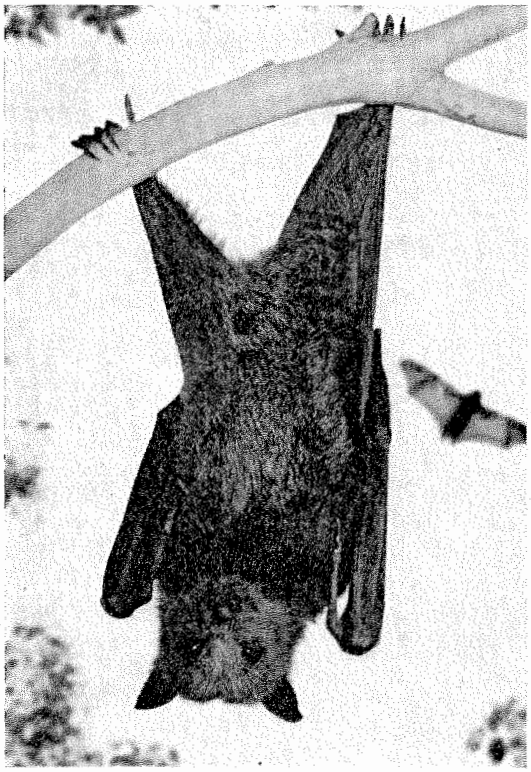
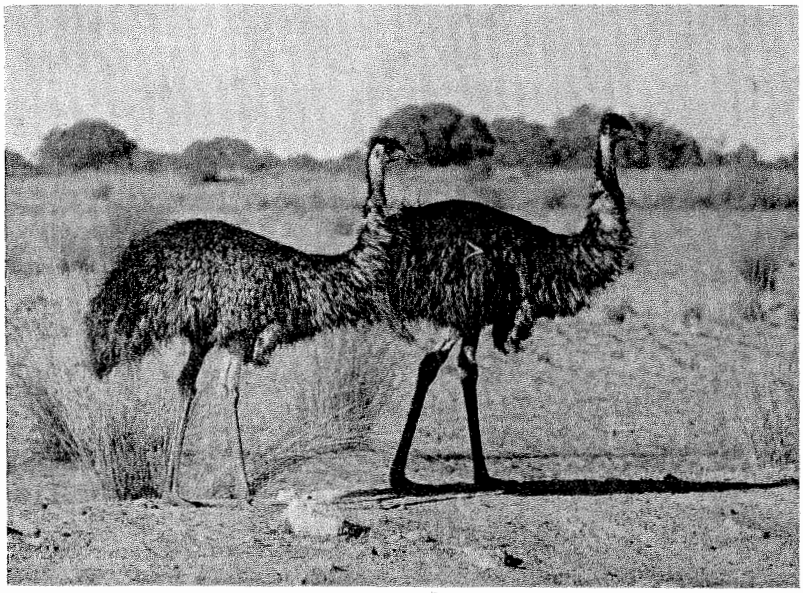


WILDLIFE IN AUSTRALIA



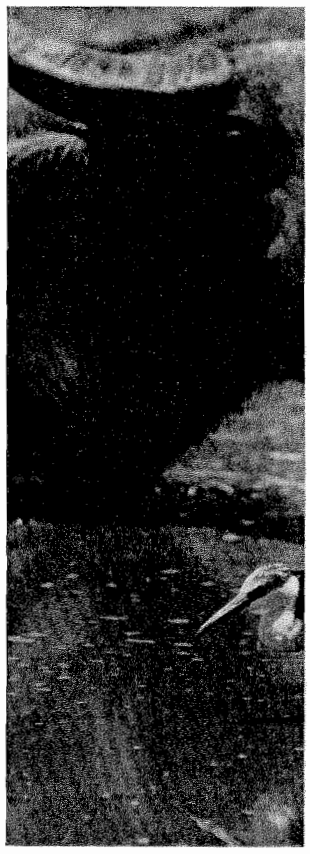
These pictures of Australian animals and birds were taken by one of Australia's leading wildlife photographers, Mr. Ed Slater of the Division of Wildlife Research.

Mr. Slater joined the Division of Plant Industry in 1956 and transferred to the Division of Wildlife Research in 1960.

His photographs have been exhibited widely and have been used in a number of books and films.

He made a substantial contribution to the award-winning CSIRO film "Birth of the Red Kangaroo".

Mr. Ed SLATER

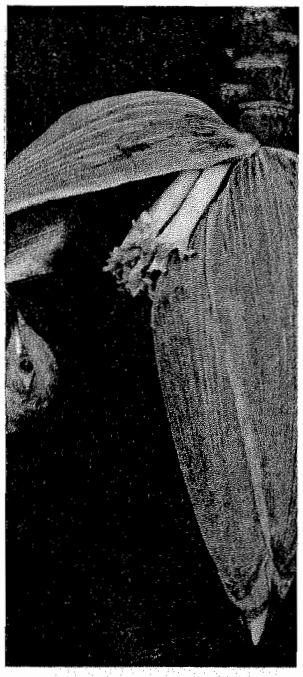


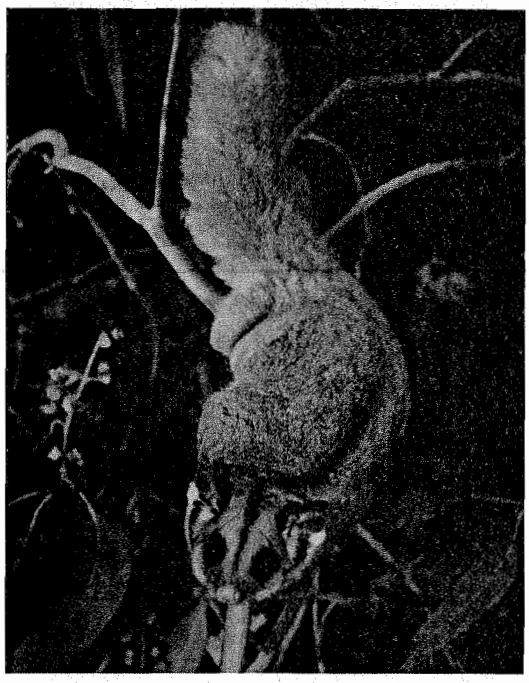
Mr. Slater is an associate of the Royal Photographic Society of Great Britain and of the Artiste Federation Internationale d'Art Photographie.

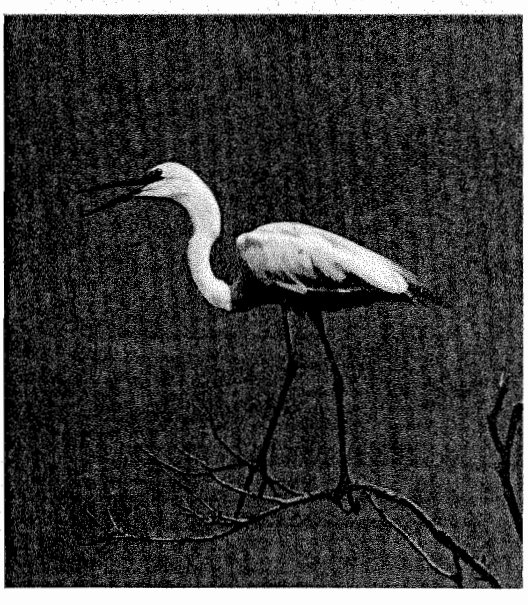
The top row of pictures shows a grey-headed flying fox, a koala, a brown honeyeater, and a black-browed albatross. This particular albatross breeds in the subantarctic and is found in winter off the Australian coast as far north as southern Queensland.

The middle row of pictures shows a pair of emus, a fat-tailed marsupial mouse, and a sugar glider. As small as a house mouse, the marsupial mouse devours grasshoppers nearly as big as itself. The sugar glider is one of Australia's most attractive marsupials and is common in the forests of the south-eastern, eastern and northern coasts.

Included in the bottom row of pictures are a group of red kangaroos, a pied heron with a water buffalo, and a white egret. The kangaroos have been fitted by the Division of Wildlife Research with plastic identification collars marked with patterns of reflective tape.







News In Brief

Honorary Doctorate

The honorary degree of Doctor of Science will be conferred on the Chairman, **Sir Frederick White,** at Monash University on Friday, 2nd May.

Doctor of Science

Mr. R. E. Loughhead of the Division of Physics has been awarded the degree of Doctor of Science by the University of Sydney for his research in solar physics.

Consultant

Mr. R. Ingpen of Head Office has left CSIRO to enter private practice as a Consultant Visual Communication Designer.

Director

Dr. N. S. Snow of the Division of Dairy Research has been appointed Director of Technical Development of the Australian Dairy Produce Board.

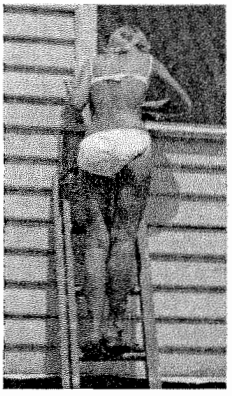
Advisory Council

Professor R. N. Robertson, Professor of Botany at the University of Adelaide; **Dr. R. G. Ward,** Director of Research, Broken Hill Proprietory Company Limited; and **Professor B. R. Williams,** Vice-Chancellor of the University of Sydney, have been appointed to the Advisory Council.

Ski Club Notes

The C.S.I.R. Ski Club is holding a night for new members on Thursday, 22nd May. Highlights include an assessment by an expert panel of the 1969 equipment offered by Ski Shops and a "Paddy's Market" of used equipment.

On Friday, 30th May, the Club will hold a Smorgasbord Supper Dance at "Starclub", Marine Parade, St. Kilda. Casual dress. B.Y.O. Booking through Divisional representatives or **Miriam Wailes** (92 8937) at $3 a head. Guests welcome.



Our picture shows a typical worker at the Club's Ski Lodge at Mt. Buller (north aspect looking south).

Quotes for the Month

"I don't give a damn for a man that can spell a word only one way."

Mark Twain.

"The reason why worry kills more people than work is that more people worry than work."

Robert Frost.

SAFETY NOTES

Hot Spot — American Style

Investigation of a recent mishap with a piece of equipment designed to operate on 110 V. led to the belief that a fire was started by a step-down transformer.

American electric supply operates at a frequency of 60 c.p.s. compared with Australia at 50 c.p.s.

The following is an extract from Australian Standard Specification No. C45-1950.

"Voltage transformers designed for 50 c.p.s. should not be used at any lower frequency because of the resultant increase in the magnetising current. They may, however, be used on higher frequencies (up to 100 c.p.s.) without serious alteration in performance."

Another reference states that where frequency is altered, voltage should be altered proportionally.

Higher magnetising current leads to higher operating temperatures. If the transformer in the piece of equipment in question was designed to operate at 60 c.p.s., the input voltage should be 200 V. and not 240 V.

As this particular transformer was installed in a position in the equipment where ventilation would be poor, it is possible that the transformer overheated frequently, and led to an ultimate breakdown of the insulation, and thence to a short circuit and fire, particularly with a high ambient temperature.

It would be wise for Divisional engineers to check equipment incorporating step-down transformers to ensure that overheating is not taking place.

Keeping an Eye on the Job

Place: Maintenance Workshop.
Job: Attempting to remove a locking screw from an air-conditioning propeller.
Equipment: Electric drill.
Mishap: Drill broke. Piece of drill struck and broke safety glasses.
Equipment Loss: One drill, one pair of safety glasses.
Personal Injury: Nil.

I trust that other Divisions which have a similar mishap have a similar result.

Hammering Nails

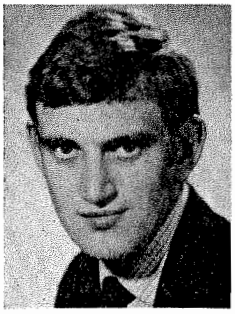
Place: Workshop.
Job: Holding window for carpenter.
Equipment: Hammer.
Mishap: Carpenter struck wrong nail with hammer.
Equipment Loss: Nil.
Personal Injury: Badly bruised finger on hand of carpenter's helper.

One of those cases where the person injured had no control over the accident. How many injuries have you caused to someone else, either directly or indirectly?

J. W. Hallam, Safety Officer.

New Appointees

Dr. J. Colley has joined the Division of Forest Products to undertake research on the application of physical principles to the manufacture and behaviour of paper. Dr. Colley graduated in paper science from the University of Manchester in 1965 and recently obtained his Ph.D. from the same university.



Dr. J. COLLEY

Mr. R. V. G. V. Lehane has been appointed to Head Office where he will assist with the Organization's public relations. Mr. Lehane graduated B.Sc. from the University of Sydney in 1965 and B.A. from the Australian National University in 1967. Since then he has been a journalist with the "Canberra Times".

Dr. A. W. D. Lepper has been appointed to the Division of Animal Health to conduct immunological research on bovine tuberculosis. Dr. Lepper graduated B.Vet.Med. from the Royal Veterinary College, London, in 1960 and recently obtained his Ph.D. from the University of London.

Dr. A. W. D. LEPPER

Mrs. Angela Giblin has been appointed to the Division of Mineral Chemistry where she will carry out hydrogeochemical investigations in relation to the genesis of ore bodies. After graduating B.Sc. from the University of Sydney in 1953, Mrs. Giblin taught science in schools for a number of years. Since 1962 she has been a chemist with the Department of Geological Survey of the British Solomon Islands.

Miss Louise Millar has been appointed to the Division of Entomology to study insect behaviour and general sensory physiology associated with pheromone activity. Miss Millar graduated B.Sc. with honours recently from the University of Queensland.

Miss Louise MILLAR

Mr. F. S. Pickering has been appointed to the Division of Animal Physiology to study energy metabolism in the grazing sheep and nutrition of the young lamb. Mr. Pickering worked with Cooper Nutrition Products Ltd., Britain, from 1951 to 1963 and became an Associate of the Royal Institute of Chemistry in 1962. Since 1963 he has worked as a chemist at the Ruakura Animal Research Station, New Zealand.

Mr. J. E. NICHOLSON

Mr. J. E. Nicholson has joined the Division of Forest Products to work on the utilisation of forest resources. Mr. Nicholson graduated B.Sc. from the University of California in 1953. After working as a forester with a Californian lumber company from 1956 to 1967 he became co-owner of a plant nursery.

CSIRO has provided funds for a post-graduate student at Monash University, Miss M. Harrison, to study Bedsoniae, a little-known group of disease organisms. She will work towards her Ph.D. at the Parkville Laboratory of the Division of Animal Health under the supervision of Professor S. Faine of the Department of Microbiology at Monash University and Dr. E. L. French, Assistant Chief of the Division of Animal Health. Our picture shows Miss Harrison discussing a model of an isohedral virus particle with Dr. French.

Mr. P. K. Prichard has been appointed to the Division of Animal Health to study host-parasite relationships in relation to helminth infections in sheep. Mr. Prichard graduated B.Sc. with honours from the University of New South Wales in 1966 and since then has been studying for his Ph.D. at the same university.

Miss Helen Rebbechi has joined the Division of Applied Chemistry to carry out research on the synthesis of biologically active compounds. Miss Rebbechi graduated B.Sc. last year from Monash University.

Miss Susan O'Hare has been appointed to the Division of Plant Industry where she will carry out research on the synthesis of compounds of

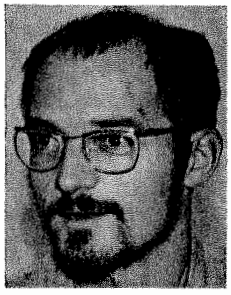
Miss Susan O'HARE

potential biological activity. Miss O'Hare graduated B.Sc. from the University of Sydney in 1967 and obtained her Diploma of Education from the same university in 1968.

Dr. E. A. Schwinghamer has been appointed to a Research Fellowship with the Division of Plant Industry to study aspects of legume nodulation. Dr. Schwinghamer graduated B.Sc. from the University of Minnesota in 1949 and Ph.D. from the same university in 1954. From 1955 to 1961 Dr. Schwinghamer was a plant pathologist at the Brookhaven National Laboratory, New York, and from 1961 to 1964 he held a Research Fellowship with the Division of Plant Industry. For the last four years he has been an Associate Professor at the Radiation Centre, Oregon State University.

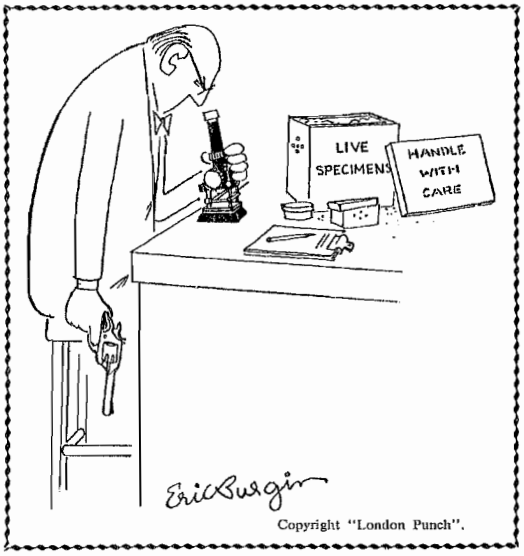
Dr. E. A. SCHWINGHAMER

Mr. D. J. Sandry has been appointed to the Editorial and Publications Section to assist in the editing of the Australian Journals of Physics and Soil Research. After qualifying in metallurgy at the University of New South Wales in 1962, Mr. Sandry spent five years in London and Brussels working in the fields of technical journalism, editing, and public relations. Since returning to Australia at the end of 1967 Mr. Sandry has been working as a public relations consultant.



Dr. A. K. SHARP

Dr. A. K. Sharp has been appointed to the Division of Food Preservation to study heat and mass transfer in relation to the storage, transport, and processing of foods. Dr. Sharp graduated B.E. with honours from the University of Melbourne in 1963, M.Eng.Sci. from Monash University in 1965, and Ph. D. from the University of London in 1968.



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DEADLINE

Contributions for the June issue of Coresearch should reach the Editor at 314 Albert Street, East Melbourne, by Tuesday, 13th May.

Printed by CSIRO, Melbourne

POSITIONS VACANT

The following vacancies for professional appointments are current.

CHIEF—Division of Textile Physics (2/5/69).
CHEMICAL ENGINEER (RS)—Division of Chemical Engineering—608/94 (2/5/69).
CHEMIST (SRS)—Division of Food Preservation—300/493 (2/5/69).
PHYSICIST (SRS)—Division of Food Preservation—300/494 (2/5/69).
LIBRARIAN/ASSISTANT LIBRARIAN (Assistant Librarian/Librarian Class 1)—Division of Food Preservation—305/131 (2/5/69).
SCIENTIFIC OFFICER FOR COMPUTER BASED INFORMATION SERVICE (SSO 2/3)—Central Library—118/195 (2/5/69).
EDITOR (SSO 1/2)—Division of Fisheries and Oceanography—320/393 (2/5/69).
SCIENTIFIC ASSISTANT TO LEADER (SSO 1/2)—Rangelands Research Unit—951/2 (2/5/69).
SECTION LEADER—CHEMICAL OR METALLURGICAL ENGINEER (PRS/SPRS)—Division of Chemical Engineering—608/95 (9/5/69).
RESEARCH MATHEMATICIAN (INFORMATION SCIENTIST) (SRS/PRS)—Central Library—118/194 (9/5/69).
RESEARCH SCIENTISTS (RS/SRS/PRS)—Division of Computing Research—900/119 (10/5/69).
POSTDOCTORAL FELLOWSHIP IN SOLID STATE PHYSICS—Division of Physics—770/383 (23/5/69).
POSTDOCTORAL FELLOWSHIP IN ORGANIC CHEMISTRY (RS/SRS)—Division of Entomology—180/501 (31/5/69).

CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 123, MELBOURNE, JUNE 1969

ACADEMY PRESIDENT

Dr. D. F. Martyn, Officer-in-Charge of the Upper Atmosphere Section, was elected last month to succeed Sir Macfarlane Burnet as President of the Australian Academy of Science.

In a research career spanning more than forty years, Dr. Martyn has made many important contributions to upper atmosphere and ionospheric physics and to our knowledge of the propagation of radio waves.

After graduating B.Sc. from the University of London in 1926 he undertook research at the University of Glasgow on oscillations in radio valves.

He obtained his Ph.D. from the University of London in 1929 and in 1930 came to Australia to take up an appointment with the Radio Research Board.

His research on the ionosphere soon gained world recognition and in 1936 the University of London awarded him the degree of Doctor of Science.

Early in 1939 Dr. Martyn was sent to England by the Commonwealth Government to obtain full information for Australia on the development of radar, then a matter of the highest secrecy.

On his return, CSIR established its Radiophysics Laboratory in Sydney to carry out research and development on radar, and Dr. Martyn was appointed Chief of the Laboratory.

In 1942 he was seconded to the Department of Army as Director of Operational Research.

Two years later he returned to the Radio Research Board and began a programme of research on atmospheric and solar physics at the Commonwealth Solar Observatory, Mt. Stromlo, near Canberra.

His work on tides in the upper atmosphere and on solar radiation together with his earlier research led to his election to the Fellowship of the Royal Society of London in 1950.

Dr. D. F. MARTYN

In 1956 he transferred his research activities to Camden and established a small laboratory there.

This became the CSIRO Upper Atmosphere Section in 1958 with Dr. Martyn as Officer-in-Charge.

Dr. Martyn has received a number of high honours for his contributions to science.

In 1947 he was awarded the T. K. Sidey Summer-Time Medal and Prize by the Council of the Royal Society of New Zealand for research on electro-magnetic radiation, and the Sir Thomas Ranken Lyle Medal by the Australian National Research Council for research on the ionosphere.

In 1951 he was awarded the Walter Burfitt Medal and Prize of the Royal Society of New South Wales and in 1954 the Charles Chree Medal of the Physical Society of London.

He became a Foundation Fellow of the Australian Academy of Science on its creation in 1953 and has served on many of its committees.

For the last ten years he has been Chairman of the Australian National Committee for Space Research.

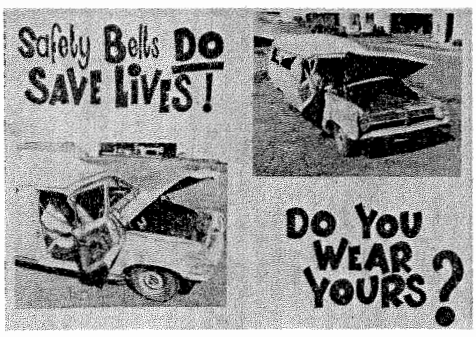
Since the war Dr. Martyn has played a leading role in the work of various international scientific organizations.

He has been Chairman of the United Nations Scientific and Technical Sub-Committee on the Peaceful Uses of Outer Space since 1962.

He is also a member of the Executive Committee of the International Council of Scientific Unions, and has been a Vice-President of the International Union of Radio Science, as well as president of its commissions on radio astronomy and the ionosphere.

In 1962 he was elected the first Australian Fellow of the International Academy of Astronautics.

SAFETY NOTES



A Sting in the Tail

The above poster was prepared by one of our Divisions to impress the importance of wearing vehicle safety belts.

The car belonged to the Division, and the driver lost control of the vehicle when stung by a wasp.
Had he not been wearing a safety belt, he would in all probability have suffered serious injury. As it turned out, he was unscathed. **So, belt up and live!**

J. W. Hallam, Safety Officer.

DEADLINE

Contributions to the July issue of Coresearch should reach the Editor at 314 Albert Street, East Melbourne, by Friday, 13th June.

News In Brief

Assistant Chief

Dr. D. F. A. Koch of the Division of Mineral Chemistry has been appointed Assistant Chief of the Division.

Doctorate

Professor E. J. Underwood of the Executive has been awarded an honorary degree of Doctor of Agricultural Science by the University of Western Australia.

Film Award

The CSIRO film "Birth of the Red Kangaroo" has received a blue ribbon award from the American Film Festival as the best adult science film for 1969.

Liaison Post

Mr. D. B. Thomas, Regional Administrative Officer, Brisbane, will leave this month for London where he will take up the position of Scientific Liaison Officer.

Mr. Thomas will succeed **Mr. G. D. McLennan** who will be returning to Head Office later this year.

Survival in the Service

A new production of the radio play "Survival in the Service" by **Robert Amos** (alias **Bob Schoenfeld** of the Editorial and Publications Section) will be heard over the A.B.C. Second Network on Monday, 9th June.

The play, which has at its centre a power struggle in an Australian Public Service Department, was first performed four years ago and has since been broadcast in Britain, Italy and Czechoslovakia.

Hundredth Trainee

Last month the Division of Forest Products farewelled the 100th overseas trainee to have passed through the Division since 1950.

Some 46 of these trainees have stayed for longer than two months. The remainder have been short term trainees.

Station Head

Dr. A. J. Millington has been appointed to the Division of Land Research as Officer-in-Charge of the Kimberley Research Station.

Dr. Millington graduated M.Sc.(Agric.) from the University of Western Australia in 1942 and D.Sc.(Agric.) from the same university in 1956.

Dr. A. J. MILLINGTON

From 1949 to 1952 he was Merchants Research Fellow in the Institute of Agriculture, University of Western Australia, and between 1952 and 1967 held the post of Reader in Agronomy at the Institute.

Since 1967 he has been Manager of Fielder Downs (W.A.) Pty. Ltd.

Retirement

Last month a presentation was made to **Mr. H. H. Wilson** of the Division of Animal Health to mark his retirement.

Mr. Wilson joined CSIRO in 1930 and after five years with the Divisions of Plant Industry and Entomology and eighteen months with Head Office transferred to the McMaster Laboratory of the Division of Animal Health.

Between 1941 and 1945 he served with the R.A.A.F. as a navigator.

He returned to the McMaster Laboratory in 1946 and from then until his retirement served as senior administrative officer and laboratory secretary.

During this time Mr. Wilson also provided valuable clerical assistance to other Divisions in the Sydney area.

Sixty Australian wool textile industry representatives held a one-day conference at the Division of Textile Industry, Geelong, last month to examine a number of new processes developed in the Division. Our picture shows Mr. M. Ball (right) of the Division discussing fibre length measurement with (from left to right) Mr. R. W. Furber (Director, John Vicars and Co.), Mr. S. S. Nevile (Managing Director, Port Phillip Mills), Mr. A. B. Oliver (General Manager, Felt and Textile Wool Division), Mr. C. Grimshaw (Director, Villawood Textile Company), and Mr. T. C. Wilkinson (Managing Director, Globe Worsted Mills).

APPOINTMENTS TO STAFF

Dr. D. R. Biggs has joined the Division of Plant Industry to carry out research on the physiological and biochemical basis of disease resistance in

Dr. D. R. BIGGS

plants. Dr. Biggs graduated B.Sc. from the University of Sydney in 1958 and Ph.D. from Monash University in 1967. Since 1967 he has worked as a research chemist at the Medical Center, University of California.

Mr. B. M. Bartlett has joined the Division of Radiophysics where he will be involved in the design, testing, and operation of scientific instruments to be installed in aircraft for studying ice crystals in clouds. Mr. Bartlett graduated B.Sc. from the University of Adelaide in 1948 and after working with the South Australian Department of Mines and the Department of Supply joined the Division of Radiophysics in 1955. He later transferred to the Division of Electrotechnology. Since 1961 he has been a research physicist at Philips Research Laboratories, South Australia.

Dr. W. V. Brown has been appointed to the Division of Entomology to analyse complex biologically active materials. Dr. Brown graduated B.Sc. with honours from the University of Durham in 1965 and Ph.D. from the Australian National University in 1968.

Mr. R. B. Cunningham has been appointed to the Division of Mathematical Statistics to work on statistical aspects of the research programmes of the Divisions of Nutritional Biochemistry, Horticultural Research and Soils. Mr. Cunningham graduated B.Sc. from the University of New England in 1965 and Dip.Ed. from the same university in 1966. Since then he has been teaching in New South Wales.

Mr. N. I. Fisher has joined the Division of Mathematical Statistics where he will be concerned with statistical aspects of the research programmes of the Divisions of Physics, Applied Physics and Radiophysics. Since graduating B.Sc. with honours from the University of Sydney in 1967 Mr. Fisher has been studying for his M.Sc. at the same university.

Mr. W. E. Fisher has been appointed to the Division of Land Research and will work in the Division's herbarium on plant collections from the New Guinea area. Mr. Fisher graduated B.Sc. with honours from the University of Sydney in 1968.

Dr. R. I. Cox has joined the Division of Animal Physiology to investigate aspects of steroid biochemistry and physiology relevant to the reproductive

Dr. R. I. COX

performance of ewes. Dr. Cox graduated B.Sc. with honours from the University of Edinburgh in 1949 and Ph.D. from the same university in 1952. He worked at the Fishing Industry Research Institute, Capetown, in 1954, and spent from 1955 to 1961 at the Department of Veterinary Physiology at the University of Sydney. Since 1962 he has been Reader in Endocrinology at the Department of Obstetrics and Gynaecology at the University of Adelaide.

Mrs. Carolyn Geczy has joined the Division of Animal Genetics to carry out research on purification and amino acid sequence analysis of proteins. Since graduating B.Sc. with honours from the University of New South Wales in 1966 Mrs. Geczy has been studying for her Ph.D. at the same university.

Dr. R. M. Daniel has joined the Division of Plant Industry to study the function of haemoproteins in nitrogen fixation.

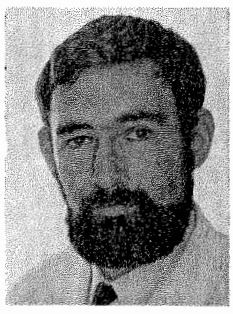
Dr. R. M. DANIEL

Dr. Daniel graduated B.Sc. with honours from the University of Leicester in 1965 and Ph.D. from the same university in 1968.

Dr. C. Hackett has been appointed to the Division of Land Research to study the growth and development of roots in soil. Dr. Hackett graduated B.Sc. from the Imperial College, London, in 1959 and Ph.D. from the Imperial College in 1962. He spent from 1962 to 1964 at Wye College, Kent, and since then has been studying the growth of cereal root systems at the Agricultural Research Council's Radiobiological Laboratory.

Mr. N. Jackson has joined the Division of Animal Genetics to work on the genetic improvement of sheep. Since graduating B.Sc. with honours from the University of New South Wales in 1965 Mr. Jackson has been studying for his Ph.D. at the same university.

Dr. A. B. Kriegler has joined the Division of Protein Chemistry to carry out research on the covalent attachment of synthetic macro-molecules to wool. Dr. Kriegler graduated



Dr. A. B. KRIEGLER

B.Sc. from the University of Stellenbosch, South Africa, in 1960 and Ph.D. from the University of Melbourne in 1967. Since 1966 he has held a Wellcome Trust Fellowship at the Imperial College of Science and Technology, London.

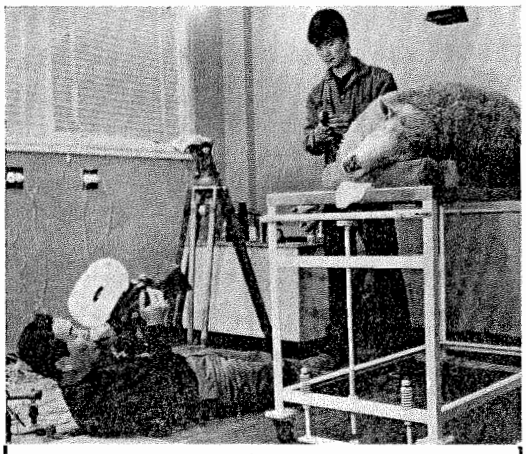
Mr. O. Johansen has been appointed to the Division of Applied Chemistry to carry out research on the synthesis of biologically active acetylenes and indanediones. After graduating from the Munich Institute of Technology in 1965, Mr. Johansen worked as a research chemist with the Norwegian firm of Ardal and Sunndal.

Mr. P. N. Jones has joined the Division of Mathematical Statistics where he will be concerned with the preparation of experimental data for processing and statistical analysis. Mr. Jones graduated B.Sc. from the University of New South Wales in 1968.

Dr. G. H. McIntosh has been appointed to the Division of Nutritional Biochemistry where he will carry out research on electrolyte balance in sheep, develop surgical techniques, and act as a veterinary consultant to the research staff. Dr. McIntosh graduated B.V.Sc. from the University of Sydney in 1964 and Ph.D. from the Australian National University in 1969. In 1964 and 1965 he was a veterinary research officer with the South Australian Department of Agriculture.

Mr. D. K. Pincus has joined the Buildings Section of Head Office where he will be concerned with the development of preliminary designs and the preparation of design briefs for major laboratory projects. Mr. Pincus graduated B.Arch. with honours from Melbourne University in 1954 and since then has worked as an architect in Australia and overseas.

Mr. M. F. Skinner has been appointed to the Division of Soils to study physiological and ecological aspects of the stimulation of plant growth by fungi. Since graduating B.Agr.Sc. from the University of Melbourne in 1967 Mr. Skinner has worked as a school teacher and as a plant pathologist with the Papua-New Guinea Department of Agriculture Stock and Fisheries.



A group of Japanese film makers visited the Ian Clunies Ross Animal Research Laboratory of the Division of Animal Physiology recently to shoot some film for the Japan Wool Spinners' Association. The film, which depicts research for the Australian sheep and wool industry, will be shown at Expo 70 in Tokyo next year. Our picture shows chief cameraman Mr. Hivoshi Kawamura (recumbent) shooting an anaesthetised sheep while his assistant Mr. Masahiro Ichikawa checks the light.

Overseas Visits

Dr. R. A. Durie, Assistant Chief of the Division of Mineral Chemistry, leaves shortly for North America, South Africa and England where he will spend two months visiting fuel research centres. He will also attend a conference on Coal Science in New Hampshire and an International Union of Pure and Applied Chemistry Conference on chemical control of the human environment in Johannesburg.

Mr. L. A. Edye of the Division of Tropical Pastures left last month for South America, the West Indies, the United States, and Britain to survey research in pasture and animal production, particularly in tropical and sub-tropical regions. He will return in mid-October.

Dr. G. N. Lance, Chief of the Division of Computing Research, left last month for North America, England, Europe and India. Dr. Lance will visit computer installations and factories before returning early next month.

Mr. L. Lewis of the Executive will return later this month from a seven week visit of industrial research centres in France, Britain and North America. Mr. Lewis also attended the 9th Commonwealth Mining and Metallurgy Congress in London.

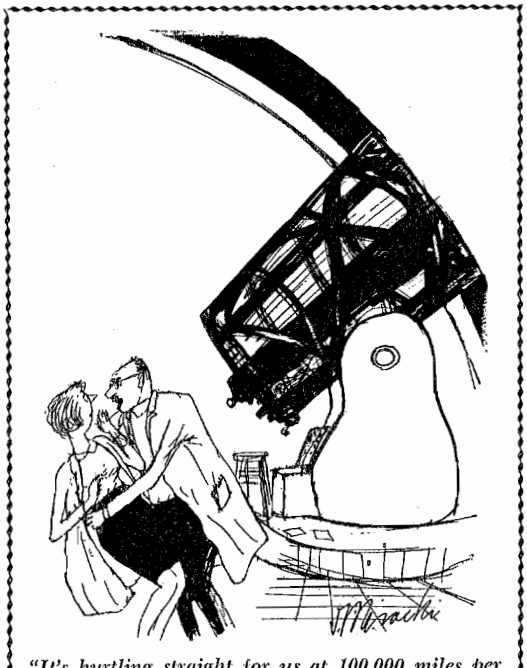
Mr. R. N. Morse, Chief of the Division of Mechanical Engineering, left recently for a month's visit to the United States and Mexico. He will attend an International Conference on Arid Lands in Arizona and a meeting of the Board of Directors of the Solar Energy Society in Washington.

Mr. R. A. Perry, Officer-in-Charge of the Rangelands Research Unit, left last month on a month's visit to the United States where he will attend an International Arid Lands Conference in Arizona and visit the Life Sciences Department of the University of California.

Dr. A. L. G. Rees, Chief of the Division of Chemical Physics, leaves late this month on a six week visit to Europe. He will attend a conference of the International Union of Pure and Applied Chemistry in Italy, meetings of the IUPAC Bureau and Executive Committee, and an IUPAC symposium on air pollution. He will also visit universities and research institutes in France, Britain and Holland.

Mr. I. C. R. Rowley of the Division of Wildlife Research left last month for Israel, Europe, Britain, and Africa to visit centres concerned with research on bird ecology and behaviour. He will return towards the end of October.

Dr. W. H. Steel of the Division of Physics left last month on a three month visit to research centres in North America, Britain, Europe and Japan.



"It's hurtling straight for us at 100,000 miles per second. We mustn't waste a moment."

Courtesy "Saturday Review".

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124##1969

CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 124, MELBOURNE, JULY 1969

MINISTER OPENS LONG POCKET LABORATORIES

Massive expansion of the beef cattle industry in Queensland was predicted by the Minister for Education and Science, Mr. Fraser, when he opened CSIRO's new Long Pocket Laboratories near Brisbane last month.

He said it was estimated that Queensland pastures could carry 20 million cattle by the end of this century and up to 50 million some time in the future.

Work by the Division of Tropical Pastures had opened up an immense pastoral and agricultural future for the State and the limiting factor for development of the beef cattle industry could well be the rate at which cattle could multiply rather than the availability of pastures.

Discoveries by the CSIRO Divisions of Animal Health and Entomology could be the final determinants of the rate of progress of the industry in Queensland and these Divisions were vital to the future development of the State, Mr. Fraser said.

The $2 million Long Pocket Laboratories house research groups from the Divisions of Animal Health and Entomology concerned mainly with cattle tick, the tick fever organism, and intestinal worms in cattle. Officers of the Divisions of Plant Industry, Applied Chemistry, and Mathematical Statistics are also accommodated in the Laboratories.

Mr. Fraser said an integrated approach by scientists in various fields should enable great advances to be made in the cattle industry.

He named the laboratories and field stations of the Division of Tropical Pastures, the National Cattle Breeding Station of the Division of Animal Genetics near Rockhampton, the Long Pocket Laboratories of the Divisions of Animal Health and Entomology, and the Meat Research Laboratory of the Division of Food Preservation at Cannon Hill, as contributors to this advance.

"In all this I recognise that the co-operation and help of the Queensland Department of Primary Industries at every stage will be important," he said.

Mr. Fraser said that he thought scientific research was becoming increasingly important for Australia. Primary and secondary industries looked to science to improve efficiency, reduce costs and solve problems.

He said the growing complexity and cost of science were creating problems for the Government in deciding which projects should be supported. It was important to be able to recognise projects which were important for Australia and to "pursue research in these areas, as well as we know how, to the highest possible world standards".

It was vital that the best possible advice should be available when projects were chosen.

He repeated a statement he made earlier this year that the Government was at this stage uneasy about the formalized approach which a special council to advise it on research priorities would involve.

He said that the adoption of this kind of approach in the United Kingdom and Canada had apparently not helped scientists, industry and governments reach real agreement on which research projects should be supported.

Australia's situation was to some extent unlike that of other countries. For example, Canada, while it had an advisory council, had no Department of Science.

He said the Australian Department of Education and Science had begun as its first task a survey of all Australian research and developmental expenditure.

"This has not been done before so it has just not been possible to make decisions on the quantity and value and volume of the work that is being undertaken in one particular field or another," he said.

The Government hoped the survey would indicate whether there were research gaps in some areas, whether there was too much research in some areas, and whether there were shortages of trained scientific personnel in some areas.

Another factor that made Australia's situation different from that of other countries was CSIRO.

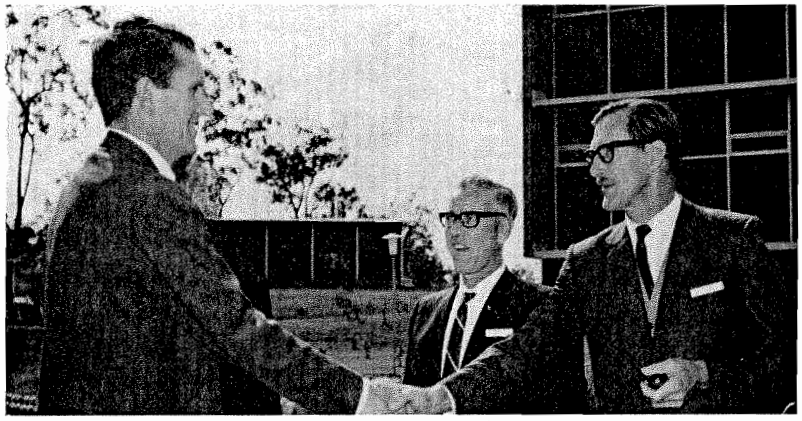
"This is an organization of immense experience and I believe of great wisdom," Mr. Fraser said.

It had given integrated advice to governments on a very wide range of activities over a long period of time.

"I think that the advice of this Organization has over a number of years enabled Australia to put a large part of its research effort into areas in which we have been able to get the best returns," he said.

"It has achieved good results and at the same time economy in the use of the public funds that have been made available."

He said CSIRO had added enormously to Australia's wealth and progress and would continue to do so.



The Minister for Education and Science, Mr. Fraser (left), is seen here being welcomed to the Long Pocket Laboratories by the Officer-in-Charge of the Entomology group, Dr. R. H. Wharton (right) and the Officer-in-Charge of the Animal Health group, Mr. P. H. Durio.

CSIRO Expands Research on Prawns

The Division of Fisheries and Oceanography is about to begin a major study of Australia's northern prawn fisheries.

About twenty people, half of them research and scientific officers, will be recruited for the project which will involve capital expenditure of about $600,000 over three years and recurrent expenditure of about $330,000 a year.

The aim is to gather the information needed to formulate management practices which will enable the maximum exploitation of the fisheries consistent with conservation of the prawn populations.

The project was announced by the Minister for Education and Science, Mr. Fraser, at the Australian Fisheries Council meeting in Darwin last month. Mr. Fraser said prawns were an important Australian resource with export potential amounting to millions of dollars.

The Division will investigate the growth, reproduction, and behaviour of prawns of different species, and the factors which influence their food supplies, and the size of their populations.

Studies of the size and age composition of individual and total prawn catches will provide basic information on seasonal changes in prawn catches.

The movement of prawns to and from different fishing grounds will be examined, and this will involve the tagging of individual prawns.

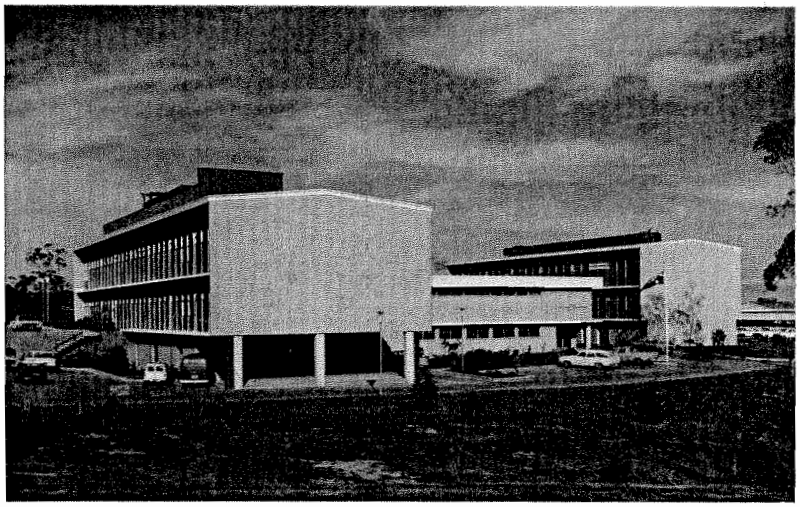
Oceanographic work will be undertaken to study the effects of ocean currents and changes in sea-water characteristics on prawn migrations.

An examination of the effects of different fishing intensities on the prawn stocks will be an important part of the project.

The scientific staff for the project will be based at the headquarters of the Division at Cronulla, Sydney, where a new laboratory will be built at a cost of about $300,000.

In addition, a new field laboratory will be built at Darwin at a cost of about $100,000.

Initially, chartered aircraft and fisheries vessels will be used for the field work, but plans for the project include the provision of two fisheries vessels for CSIRO.



The Long Pocket Laboratories occupy a 17-acre site in the Brisbane suburb of Indooroopilly. They consist of two large buildings providing separate accommodation for the two major research groups working there. The building on the left houses the Division of Entomology and that on the right the Division of Animal Health. A central block, housing administrative staff and common facilities, links the two buildings and also accommodates officers from the Divisions of Applied Chemistry and Plant Industry. The Division of Mathematical Statistics has representatives in the Entomology building. The main laboratory complex cost $1.2 million, while associated site development, the provision of animal accommodation, and the construction of ancillary buildings cost a further $800,000.

Officer-in-Charge

Dr. G. B. Tucker has been appointed Officer-in-Charge of the newly created Commonwealth Meteorology Research Centre.

After graduating B.Sc. with honours from the University of Wales in 1950 and Ph.D. from the University of London in 1954, Dr. Tucker spent ten years with the British Meteorological Office before coming to Australia as Assistant Director (Research and Development) for the Commonwealth Bureau of Meteorology.

The Commonwealth Meteorology Research Centre has been established under the joint agency of the Bureau and the Division of Meteorological Physics.

Its research and administrative staff will be appointed by CSIRO, and other professional, technical and clerical staff by the Bureau.

The Centre's research programme is aimed at obtaining a better understanding of the distribution of and variations in the earth's climate, and at improving the accuracy and time scale of weather forecasting.

It will include the formulation and testing of numerical hemispheric and global models, and the modelling of circulations of a more regional type.

Finance for the Centre is provided jointly by the Bureau of Meteorology and CSIRO.

S(COR)

Measuring the Size of Science

In the atomic and space era science is rapidly becoming far too important to be left to the scientists. Part of the reason for this is that scientists have displayed incredible ingenuity over the ages in furthering their self interests.

From the times of Archimedes and Leonardo onwards, they have been able to demonstrate conclusively to any government that maximum support of every need of scientific work was essential for the military and economic security of the state.

Unfortunately, the demands of scientists now begin to exceed the possibilities of support, the pinch being felt first in the largest and most developed countries.

We therefore begin to have a problem of "over-developed countries" where one must somehow learn to say no to at least some of the reasonable demands of the scientific community.

Another reason for the control of science passing out of the hands of the scientists is that there has begun to accumulate a considerable body of conventional wisdom and technical knowledge about the organization and the mechanisms of science in the structure of a nation's industrial, economic and educational life.

The time is passing when an experienced senior scientist or a managerial civil servant could pick up fairly quickly the small amount of previous literature and experience.

Essential material of heavy scholarly content now appears at the rate of several books a year. A couple of years ago a bibliography of bibliographies was published in "Science Policy Studies" which lists a few dozen monthly and annual bibliographies of the journal and thesis literature in this field.

I believe we are getting to the point where there must arise a fairly hard, respectable and useful academic discipline which does for science that which economics does for the economic life of nations.

We can no longer leave it to the businessmen of science, but we need a Keynesian type of theory, partly for its use in policy decision and in meeting crises before they burst upon us, and partly because we need to understand the machinery of why science acts the way it does and grows the way it grows.

It is the business of scholars to be knowledgeable about things that are important to society and it is not necessarily the business, nor even the competence of scientists, to be able to turn the tools of their trade upon themselves or to act as their own guinea-pigs.

Since the 1920s and 1930s when this sort of "science of science" began, it has been evident that the essential difficulty was in devising some reasonable measure of scientific effort or output.

The monetary inputs to science and technology have always been clear and rather readily available, but they have defied all efforts to discern any regular pattern or law in the mass of data.

Similarly, from the beginning it has been clear that almost all the figures available for scientific and technical manpower would not stand up to international comparison and, in short, no single measure of science could be related to any other measure of science.

This dismal state of affairs was due to two separate causes, as we can see now.

For one thing, science is such a competitive activity that its manpower is distributed in a very steep pyramid, with very few people of the highest calibre and rapidly more and more as one descends the scale of competence.

In comparing two different countries, a very small change of level of qualification can cause very large changes in the apparent size of the scientific and technical manpower.

For another thing, we can now begin to recognize that the scientific and the technical manpower groups do not form any sort of unity nor even a continuum.

There are quite different social groups in society of people who make new knowledge—the scientists, basic and applied—and those who make new things, new chemicals, new machines — the engineers and technologists.

The line is by no means clear, and there happen to be many people with scientific and technical skill and training who make nothing new, neither knowledge nor artifacts, but work, with their training, well behind the research front.

By D. J. de Solla Price, Avalon Professor of History of Science, Yale University.

During a brief visit to Australia last month Professor Price spoke to various groups from CSIRO, universities and industry and gave several public lectures. This article is based on material presented during these addresses.

In addition to these difficulties, one has the problems that attend any sort of international demographic and economic data.

Besides differences of definition, there are differences of purpose.

Sometimes figures are designed to be as large as possible, sometimes as small as possible.

Sometimes a country is at pains to show as much expenditure as it can in this sort of direction and, at other times, the figures are contrived to a minimum.

In the United States and some other nations, research expenses in the most scientifically sophisticated industries carry a certain tax advantage and it is important, therefore, that quite large expenses, in development of aircraft and electronic equipment particularly, are included under the heading "Research and Development".

Indeed, these categories dominate the whole national expenditure so that conventional figures for the R and D investment of the nations are dominated by this alone, leaving almost nothing to show whether one country is actually spending more or less than another apart from what is essentially part of the cost of making aircraft and electronic equipment.

The difficulties I have mentioned are considerable, but fortunately, there is a peculiarity of science that gives a way around all the troubles.

Science has an intrinsic quality of universality and internationality — one might even call it supranational in a remarkably strong sense.

Scientific knowledge is such that one cannot tell, apart from the name, whether Planck's Constant was found by a black man or a white, a Jew or an Arab, a German or a Mexican, rich or poor, socialist or capitalist.

Because of the utter impersonality of scientific creative knowledge, we have the paradox that Robert Merton has pointed out: one can only secure this private intellectual property of discovery and creativity by open publication.

The more open the publication, the more secure the private property.

It is for this reason, I think, that there has come about a certain international constancy in what constitutes a publishable and good scientific paper in a good journal in any particular field.

It might differ from field to field — I suspect, for example, that in every country it is rather easier to publish a chemistry paper than one in physics.

Clearly, too, papers differ enormously in their worth, the most important ones being a tiny fraction of the total.

It seems, however, that the lower limit of what is publishable in the good international journals is part of a rather effective international agreement—almost to the point of conspiracy—in order to keep the operation workable.

Because of the constancy of papers, most people concerned with the measurement of scientific outputs have been reduced to using counts of papers, the men who write them and the discoveries contained in them.

The accepted customary technique is to point to the availability of great masses of such data collected for other purposes (such as scientific bibliography) and to the attractiveness of using these by-products of the scientific life as a non-interfering and silent way of measurement.

One then points to all the inevitable inconveniences of it being much easier to make a measurement than it is to know exactly what it is that has been measured. After this one uses the numbers anyway.

I would suggest, however, that these numbers are not to be taken merely as empirical data to be correlated and projected in the usual way.

Instead, the paradigm should be the methodology of astrophysics in the days of Jeans and Eddington.

One took whatsoever observations were sent from heaven, since experiment and other sorts of measurement were out of the question, and then tried to find suitable generalizations and models that would explain why these observations had the form and the order of magnitude that they did.

In this light, if you tell me that a country spends 4 per cent of its Gross National Product on Research and Development, or if you say that a quarter of all scientific discoveries are rediscoveries, we can only admit that such a statement is meaningful if we know what we should expect and why.

One does not require the accuracy and technique of Boyle's Law, nor the laboriousness of regressions and correlations; one needs the same rough and ready methods, initially, as in asking how many stars there should be in a galaxy.

The chief limitation in the counting of papers and authors and discoveries is that one needs published listings of quite large selections of papers of a reasonable degree of uniformity and comprehensiveness.

For the earlier days, one has complete listings of all scientific journals through the eighteenth century and fairly good directories of the world's learned periodicals since that date.

For the eighteenth century one has a complete, but not easily countable, bibliography of all the scientific and medical literature due to Reuss.

For the nineteenth century one has the excellent and very complete *Royal Society's Catalogue of Scientific Papers*, 1800-1900, but that again is countable only by sampling and guessing.

For the more modern period, one has excellent sources for particular sciences in the comprehensive statistics available from *Chemical Abstracts, Physics Abstracts*, and a few similar publications that attempt comprehensive coverage of all significant publication in particular fields.

Working from such sources, there have been considerable advances in our knowledge about the statistical regularities of measurements of scientific output.

We know now that the average productivity of scientists—the number of scientists who write one paper, two papers, three, etc., in a given interval of time—does not vary from country to country very much nor hardly at all from century to century from the seventeenth century invention of the scientific paper right up to the present day.

This is a helpful confirmation of our supposition that the quantum of publication has stayed conveniently constant as an entity.

It is helpful, too, in formulation of the convenient definition that a scientist is any person who has ever published a scientific paper.

In terms of that definition one can convert to almost any other that may be suggested, particularly those with similar, but more stringent, terms: such as a scientist being any person who has published in an international journal at least once in the last two years.

At all events, it has long been known that, almost independent of the exact definition, anything of this sort results in the interesting finding that these measures of scientific production and manpower have all increased expotentially with a quite impressive and fatalistic regularity.

They grow at the prodigious rate of a doubling every 7 to 10 years depending on exactly what one is measuring.

It is a rate that is much faster than all the non-scientific and non-technical things in our civilization.

It leads, of course, to the now well-known conclusion that 90 per cent of all the scientists that have ever been are alive now.

It also leads to the fact that most scientists are young and that, therefore, most scientific discoveries must be made by young men.

It is perhaps worth emphasizing that all these statements are due to the expotential growth alone and are no more true today than they were a century or even two centuries ago.

If science appears to be especially burgeoning today, it is because of quite different factors. Indeed, many of these phenomena are not due to an increase in rate but quite the opposite.

In the over-developed countries, it is becoming difficult to keep up the sort of pace to which science has become accustomed.

In addition to the impressively exact and regular laws governing the distribution of scientific productivity and the expotential general growth, there are several other well-marked regularities that serve to confirm that the counting of papers and authors is a reasonable way to proceed.

A number of experiments have been made in weighting papers by their impact in terms of the number of citations they receive.

There have also been experiments in sharing the credit for papers amongst all the authors on the by-line instead of awarding an entire contribution to each as is perhaps more customary.

In both cases, one can show that the effect on the general law is negligible though naturally the score of any particular author might be much affected.

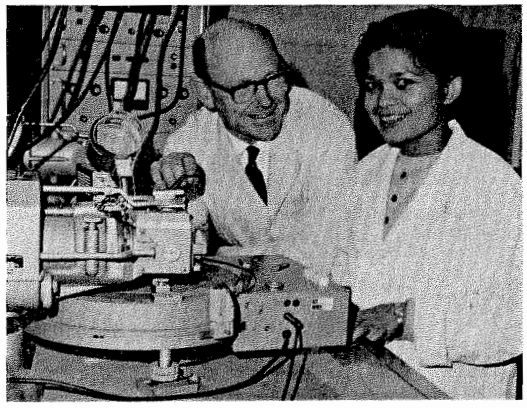
In other directions, we have been able to chart significant differences in the network structure linking paper to paper in different scientific fields, and there has been some interesting success in the analysis of the process of multiple discovery when two or more authors at the same or even different times discover and publish essentially the same thing without any conscious knowledge of the other person's work.

It can be shown that such duplication is normal and that it is a completely chance distribution following a Poisson distribution; about a quarter of all discoveries are rediscoveries — science is a highly redundant process and that may well be part of the essence of its self-checking character.

Perhaps the most interesting, and undoubtedly the most important, numerical data that we have concerns the way in which science is distributed amongst countries and fields of science.

The basic question of science policy is, after all, how much money to spend on each of the

(Continued on page 4)



Miss Ladawal Pothisri of the Applied Science Corporation of Thailand is spending ten months at the Division of Building Research under the auspices of the Colombo Plan to study research and development techniques in ceramics. Miss Pothisri is seen here with Dr. E. R. Segnit discussing the use of X-ray diffraction in the study of clay minerals.

Song of the Raw Prawn

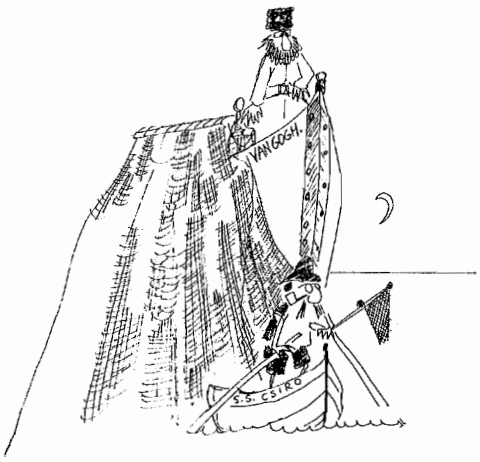
Tune: "Michael, Row the Boat Ashore"

This song was sung by folksinger Shirley Jacobs last month on the ABC television programme, "This Day Tonight".

A Soviet trawler named Van Gogh — *Alleluyah*
Awaits the CSIRO — *Alleluyah*
Both determined, come the dawn — *Alleluyah*
To catch the harmless little prawn — *Alleluyah.*

Chorus

Ivan, row the boat ashore — *Alleluyah*
Ivan, row the boat ashore — *Alleluyah.*



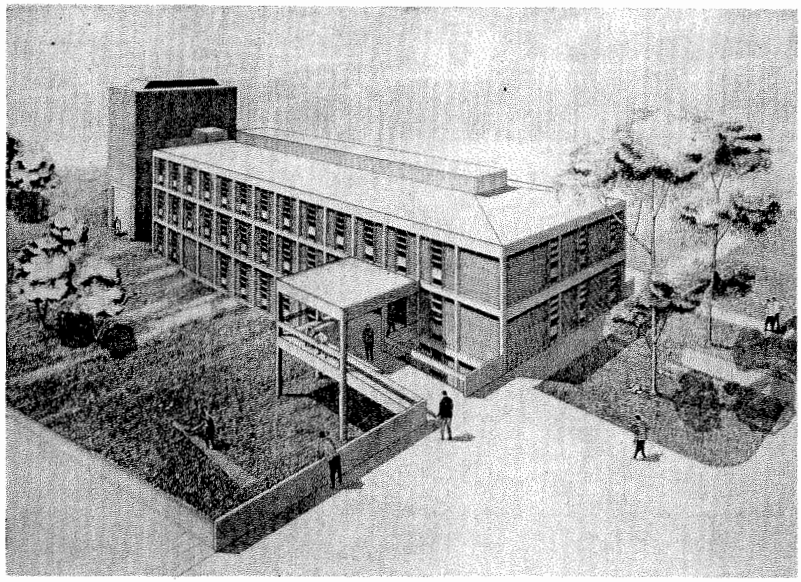
For years the Russians did abound — *Alleluyah*
On all our northern fishing grounds — *Alleluyah*
But now Australia wants its share — *Alleluyah*
Banana prawns are getting rare — *Alleluyah.*

Chorus

The CSIRO is sworn — *Alleluyah*
To investigate the lady prawn — *Alleluyah*
If they solve this deep sea code — *Alleluyah*
The population will explode — *Alleluyah.*

Chorus

But once the prawn is taught to breed — *Alleluyah*
I hope they never learn to read — *Alleluyah*
To study sex beneath the sea — *Alleluyah*
Might then be banned as prawnography — *Alleluyah.*



Above is an architect's impression of the new laboratory to be built for the Division of Soils in Canberra. It was designed by the Commonwealth Department of Works in Canberra and tender documents were prepared by the consultant architects Collard, Clark and Jackson. Tenders are expected to be let in August-September. The tower at the end of the building will be used for rain simulation experiments.

The News In Brief

Queen's Birthday Honours

Mr. E. P. S. Roberts, a part-time member of the Executive, was created a C.M.G. in the Queen's Birthday Honours and **Mr. R. W. Viney,** Finance Manager, was created an M.B.E.

Fellowship

Mr. J. D. Boyd of the Division of Forest Products has been made a Fellow of the Institution of Engineers, Australia.

Community Aid Abroad

Since last September, Community Aid Abroad groups in Head Office and the Divisions of Textile Industry, Forest Products and Chemical Physics have been working together to raise $1,100 to help an agricultural development programme in the east Indian village of Sokhodeora.

Earlier this year the Textile Industry group, together with other C.A.A. groups from Geelong, took part in a "Walk Against Want" which raised some $10,000.

The Textile Industry group received $1,350 as its share of the proceeds from the walk.

As a result of this substantial contribution the Sokhodeora project has now been paid off and the combined CSIRO-C.A.A. groups have a balance of $1,050 towards a new project.

This time, a project has been selected in Malaysia and the C.A.A. groups are setting about raising $3,500 to help the Kubang Sepat Farmers Association in Kelantan establish a credit co-operative for farmers.

The Farmers' Association is based on similar associations in Japan and Taiwan where they have provided the structure for remarkable increases in production and improvement in the living standards of small farmers.

Investing Your Tax Return

Don't squander your tax refund cheques. They could be earning you substantial interest at a rate of 6% a year, if you invest them in the CSIRO Co-operative Credit Society for twelve months or more.

If you are looking for a short term investment and want to invest your refund for less than twelve months, the interest rate is 4%.

Existing investors with the Society should also consider the advantages of reinvesting their interest cheques. The Society can arrange for the investor's interest to be automatically credited to his account each half year.

This would be an immediate advantage to the investor and would provide a valuable source of capital to enable the Society to carry on its valuable work.

The Society is also looking for new investors and will accept money on deposit, not only from members of CSIRO, but also from their relatives and close acquaintances.

Deposit forms are available from your local Administrative Officer.

Ski Club Notes

Friday, 13th June, was a red-letter day for the CSIR Ski Club. On this day the Club was given liquor permits for both of its lodges — thus ending six months "drought"—and it became a public company.

The first moves towards registration were made almost four years ago when a committee was formed to review the categories of membership. The need for an up-to-date constitution, and adequate legal protection of the Club's assets which are estimated at $50,000, was soon apparent.

A plebiscite of members in 1967 determined the main outlines of the new constitution, and also confirmed that the majority of members wished to retain the original name "CSIR".

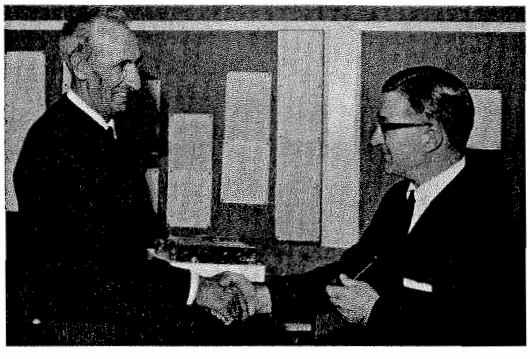
As a result of legal advice, the Club decided that incorporation would be the most satisfactory way of protecting members' interests. After many revisions of the necessary legal documents the Club has finally been granted registration.

Retirements

Miss A. G. Culey retired recently after serving for 23 years as Librarian at the McMaster Laboratory of the Division of Animal Health. In addition to developing a library service which attained a very high reputation, Miss Culey prepared the Bibliography of Beef Production in Australia and has just completed compiling an Australian Bibliography on the Biology of the Sheep and the Sheep Industry.

Mr. W. G. Jones retired recently from the Division of Chemical Physics after 23 years' service. Before joining CSIRO, Mr. Jones was employed as a scientific glassblower in industry in the U.K. In 1946 he joined what was then the Chemical Physics Section of the Division of Industrial Chemistry and was initially in charge of the Glassblowing Laboratory. He later transferred to the Spectroscopy Group to assist in the development of atomic spectral lamps associated with the atomic absorption spectroscopy investigations.

Below. Dr. A. L. G. Rees (right), Chief of the Division of Chemical Physics, presenting Mr. Jones with a tape recorder from members of the Division as a retirement gift.



NEW APPOINTEES

Mr. I. P. Dunn has been appointed to the Division of Building Research to carry out research in the field of architectural acoustics. Mr. Dunn obtained his Diploma of Applied Physics from the Royal Melbourne Institute of Technology last year.

Dr. A. Kanis has been appointed to the Division of Land Research to carry out taxonomic research in the Division's herbarium. He will be particularly concerned with plants from the New Guinea area.

Dr. A. KANIS

Dr. Kanis graduated M.Sc. from the State University of Leiden, Holland, in 1962, and obtained his doctorate from the same university in 1968.

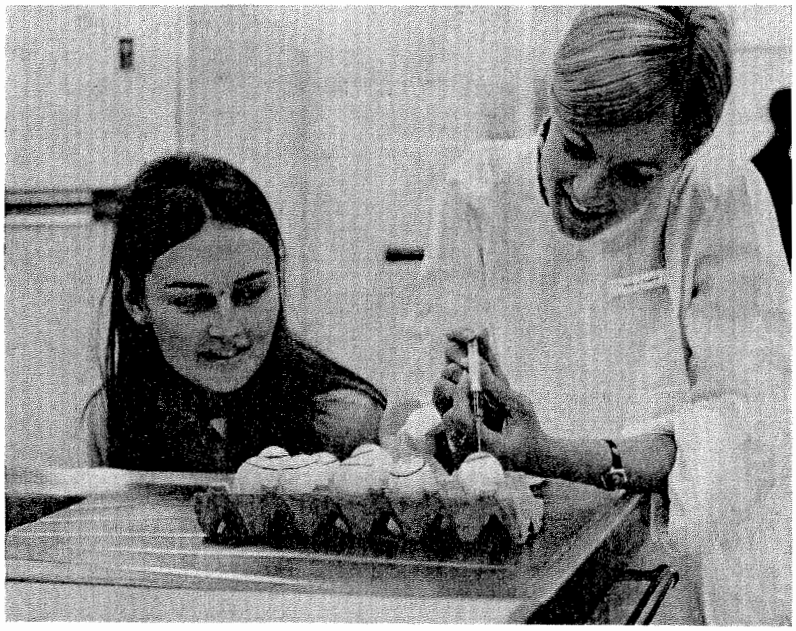
Mr. M. Kurzeme has joined the Division of Soil Mechanics to undertake theoretical and experimental studies of the deformation behaviour of earthen materials. After graduating B.E. with honours from the University of Melbourne in 1962, Mr. Kurzeme worked with the Victorian State Rivers and Water Supply Commission and with a firm of consulting engineers before joining the Institute of Highway and Traffic Research at the University of New South Wales in 1966. Since then he has been studying for his Ph.D.

Dr. J. F. O'Callaghan has joined the Division of Computing Research to carry out research on the development of techniques for interpretation by computer of pictorial and graphical data. Dr. O'Callaghan graduated in electrical engineering with honours from the University of Tasmania in 1965 and Ph.D. from the Australian National University this year.

Mr. N. H. Pilkington has been appointed to the Division of Applied Chemistry to work on the development of new techniques of microanalysis particularly in the field of organometallic chemistry. Since graduating B.Sc. with honours from the University of Melbourne in 1966, Mr. Pilkington has been studying for his Ph.D. at the same university.

Mr. J. Rungis has joined the Division of Applied Physics to investigate the application of modern physical techniques to high voltage measurements. Mr. Rungis graduated M.Sc. from the Australian National University in 1965 and since then has been studying for his Ph.D. at the University of Western Australia.

Dr. Helen Smith has been appointed to the Division of Animal Health to carry out research on virus diseases of cattle, sheep, pigs, and poultry. Dr. Smith graduated D.V.M. from Cornell University in 1954 and D.Sc. from John Hopkins University, Baltimore, in 1961. After working with the U.S. Public Health Service for 6 years she came to Australia in 1967 to work at the Department of Zoology, Australian National University.



At the opening of the Long Pocket Laboratories last month, Miss Jill Parkin of the Division of Animal Health's microbiology group was on hand to impress visitors with her egg-inoculating prowess.

Dr. J. L. Smith has joined the Division of Computing Research to carry out research into the development and improvement of operating systems. Dr. Smith graduated M.Eng.Sc. from the University of Sydney in 1961 and Ph.D. from the University of Michigan in 1967. From 1963 to 1967 he was a research engineer at the University of Michigan and since then has been an information scientist at the General Electric Research and Development Center at Schenectady, New York.

Dr. D. H. WOOD

Dr. D. H. Wood has joined the Division of Wildlife Research to study the ecology of rabbits in arid regions. Mr. Wood graduated B.Sc. from the University of Auckland in 1960, M.Sc. with honours from the same University in 1962, and Ph.D. from the University of Queensland in 1968. Since 1967 he has been carrying out ecological research at the University of Saskatchewan, Canada.

Dr. Y. Yazaki has been appointed to the Division of Forest Products to study the polyphenolic extractives and exudates of wood. Dr. Yazaki graduated in agriculture from Tokyo Kyoiku University in 1964, and D.Sc. from the same university this year.

Measuring the Size of Science

(Continued from page 2)

various scientific and technical activities.

Within the last few years there have been published breakdowns by country of publication for all of the many thousands of papers per year which are noted in the key journals, *Chemical Abstracts* and *Physics Abstracts;* in the latter case there exists also a breakdown by field of physics as well as country of publication.

The first notable general finding is that the shares of the countries are similar for chemistry and physics, and even between the various segments of physics.

One might, perhaps, have supposed that there would be considerable variation from country to country, but there are very few irregularities and those that exist are almost immediately explainable by some well-known peculiarity.

For a second finding it happens that the share each country has of the world's scientific literature by this reckoning turns out to be rather close — almost always within a factor of two—to that country's share of the world's wealth (measured most conveniently in terms of GNP).

The share is very different from the share of the world's population and related significantly more closely to the share of wealth than to the nation's expenditure on higher education.

The reason for the approximate equivalence is basically simple.

All other things being equal one would suppose that the scientific size of a nation must be proportional to its population — two equal countries added together would produce a double-sized country in science as well as in population.

It also seems reasonable that the scientific size must be related also to some function of the wealth of the country as might be measured by its per capita income.

Being proportional to both things, the scientific size is determined then by population multiplied by some function of per capita wealth.

Now this product must also be additive, so that the only simple function that can be used is the per capita wealth itself, and by multiplying by the total population, one gets back directly the total wealth.

This is most conventionally measured by GNP, the roughness of the present data making it useless to distinguish between the GNP at factor cost or any other reasonable variety expressed in constant currency.

An alternative statement of the proposition, in terms which may be more acceptable to some, is that for the countries of the world the per capita activity in science correlates well with the per capita wealth.

To give a particular example, the United States publishes about one third of the world's physics and chemistry, a third of the astrophysics, and gets about one third of the big prizes and discoveries because it is also about one third part of the world's wealth.

Its share is not anything near to 6 per cent, which is its share of the world's population, nor to the much more than one third which it has of the world's military expenditure or university population.

Australia with about one third per cent of the world's population has about one per cent of the world's GNP and is about one per cent of world science.

To take another telling comparison, Canada and India each possess about 2 per cent of the world's GNP and a similar amount of its science, even though the population of India is 25 times that of Canada.

The biggest fault in all of the previously available data on these lines has been that it went by country of publication rather than by the place in which the scientific work was actually performed.

This appeared to have relatively little effect on the expected figures for most of the larger countries, each of which has several internationally used journals.

There were, however, obvious distortions, such as that due to the publication in the Netherlands of several physics journals of international rather than national scope.

It also had the severe disadvantage of neglecting almost entirely the contributions of those smaller nations than the "Big Ten" and publishing the greater part of their good papers in journals based in the larger countries.

It was, therefore, not clear from the old figures whether there was in fact a sort of scientific desert in which hardly any scientific work was carried out.

Thanks to a new by-product of the constant quest of the scientist for better bibliographic tools, we can now correct this view and provide for the first time a set of figures for all the smaller scientific countries and towns.

(To be continued next month)

SAFETY NOTES

Any mad hatters in your lab.?

The following has been abstracted from an article in the Scientific Australian:

'Shaking hands and an uncertain temper are far from ideal equipment for a dentist. Yet, through no fault of his own, he may be suffering from both.

'A Glasgow doctor has issued a warning against what is called the "mad hatter" syndrome.

'Apparently the condition can be caused by mercury vapour from amalgams used in filling teeth, either by breathing it in or absorbing it through the skin.

'The test for "mad hatter" syndrome is to take a hair from a dentist's head and analyse it for mercury content. Bald dentists present no problem because similar tests can be made with a piece of fingernail.

'At Glasgow University, 20 dentists and dental assistants have been screened for a dangerous level of mercury in their bodies, but only one proved to be suffering from it.

'Nevertheless, if one in twenty is an average, a large number of dentists might be at risk.

'As far as is ever possible in a dentist's chair, however, patients can relax. The mercury makes the unfortunate dentist feel too unwell to carry on with the dental job. A bad-tempered dentist is likely, on the whole, to be that and no more.'

CSIRO Staff handling mercury are probably exposed to a greater mercury concentration than a dentist, so when handling mercury — take extreme care.

Pick a Box

A small test box has been designed and built by one of our larger Divisions to check the polarity and earthing of single phase power outlets.

The same box is also used to check the correct wiring and earthing of equipment.

Details of this small inexpensive unit will be sent on request to interested parties.

The choice is yours! The use of this small box could postpone the personal use of a larger more ornate one.

J. W. Hallam, Safety Officer.

Printed by CSIRO, Melbourne

CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 125, MELBOURNE, AUGUST 1969

Dr PRICE TO HEAD CSIRO

Dr. J. R. Price, D.Phil., D.Sc., F.R.A.C.I., F.A.A., will succeed Sir Frederick White as Chairman when Sir Frederick retires next May.

Dr. Price graduated B.Sc. with honours from the University of Adelaide in 1933 and M.Sc. from the same university in 1935. He then left for Britain where he worked at Oxford University under Professor Sir Robert Robertson.

After graduating D.Phil. he became Head of the Chemistry Section at the John Innes Horticultural Institution in 1937.

When war broke out he transferred to the Ministry of Supply and worked on propellants and explosives.

In 1945 he returned to Australia and joined the C.S.I.R. Division of Industrial Chemistry.

He was appointed Officer-in-Charge of the Organic Chemistry Section in 1960 and in 1961 the Section became a Division with Dr. Price as its Chief.

Dr. Price was awarded the degree of Doctor of Science by the University of Adelaide in 1954 and the H. G. Smith Memorial Medal of the Royal Australian Chemical Institute in 1956.

He was elected a Fellow of the Australian Academy of Science in 1959. In 1966 he was appointed a Member of the Executive.

Dr. Price's scientific work has centred on the chemistry of plant constituents.

His early association with biologists in Britain led to a life-long interest in the role of chemistry in biological research.

As Chief of the CSIRO Division of Organic Chemistry he developed a vigorous synthetic chemistry research group which has made important contributions in organo-metallic and hetero-atomic chemistry and which has developed new products of value to industry.

Natural products research has always meant more to Dr. Price than the isolation of new compounds and the elucidation of their molecular structure, and he has always emphasised the importance of studying the constituents of plant extracts for their potential value in medicine and agriculture.

On joining CSIRO in 1945, his interest turned to alkaloids as the class of plant constituents most likely to provide new compounds with useful pharmacological properties.

A spate of papers followed on the novel acridine, furoquinoline, and canthinone alkaloids of the family *Rutaceae* which proved to be one of the richest Australian sources of alkaloids.

In association with Dr. L. J. Webb of the Division of Plant Industry, he realized the scope in this country for a broad study of the chemistry of plants.

Their joint efforts to enlist the collaboration of many chemists in universities and other institutions ushered in a highly productive period of study of Australian natural products.

The activities of this large but informal group achieved international standing as the Australian Phytochemical Survey.

Dr. J. R. PRICE

Since becoming a Member of the Executive, Dr. Price has shown special interest in the organizations' research for the mineral industry.

He has also interested himself in the provision of adequate laboratory facilities for CSIRO's research programmes.

Dr. Price has been extremely active in the affairs of the Royal Australian Chemical Institute. He was President of the Victorian Branch in 1959 and Federal President from 1962 to 1964.

He was Association Editor of Institute publications (1919-53), a member of the Editorial Board (1954-55) and Editor of both "Proceedings" and "Reviews" (1956-58).

He is Chairman of the Organizing Committee for the XXIInd Congress of IUPAC to be held in Sydney this month.

IUPAC President

Dr. A. L. G. Rees, Chief of the Division of Chemical Physics, was installed as President of the International Union of Pure and Applied Chemistry (IUPAC) on 7 July at its 25th Conference held at Cortina d'Ampezzo, Italy.

He is the first Australian residing in Australia to be elected president of an international scientific organization. He will be President for two years and thereafter the immediate Past President for a further two years.

Dr. Rees succeeds Professor V. N. Kondratiev, a member of the USSR Academy of Sciences.

The presidency has been occupied by a number of very distinguished scientists including the Nobel Laureate, Lord Todd.

A graduate of the Universities of Melbourne and London, Dr. Rees joined CSIRO in 1944.

In 1954 he became Assistant Chief of the Division of Industrial Chemistry and in 1958 Chief of the Division of Chemical Physics.

In 1961 he was appointed Chairman of the Chemical Research Laboratories.

Dr. Rees was elected a Fellow of the Australian Academy of Science in 1954.

He has held various offices in the Academy including Chairman of the Australian National Committee for Chemistry during 1958-66, Member of the Council 1963-8, and Secretary (Physical Sciences 1964-8).

Dr. A. L. G. REES

He was recently elected the first Secretary (International Relations) of the Academy. He is also the immediate Past President of the Royal Australian Chemical Institute and was the Institute's H. G. Smith medallist in 1951.

Committee of Inquiry

Elections will be held shortly in connection with committees of inquiry set up to deal with any dismissals of officers from the Organization in Victoria, South Australia, Tasmania, Northern Territory, and Western Australia. (There will be no election in other States because candidates were returned unopposed.)

Head Office Circular 69/10 of 2nd June called for nominations for representatives willing to serve on these committees.

Details of the four officers nominated are as follows:

Mr. H. Kloot (Group I candidate), Principal Research Scientist, Division of Forest Products. Mr. Kloot has been with CSIRO for 35 years and has been active in the Officers' Association for 15 years. Hobby — Putting the finger on Administration.

Mr. J. Pattison (Group I candidate), Divisional Administrative Officer, Division of Forest Products. Mr. Pattison has been with CSIRO for 21 years and has been associated with the Administrative and Clerical Officers' Association for 15 years. Hobby — Talking to Harry Kloot.

Mr. H. F. Heath (Group II candidate), Senior Technical Officer, Division of Forest Products. Mr. Heath joined CSIRO in 1945. He has been active in the CSIRO Technical Association and has served as Divisional representative and as Branch Secretary and President. At present he is the General Secretary of the Association and has been its delegate to the High Council of the C.P.S. Organization since 1960.

Mr. P. O'Loughlin (Group II candidate), Senior Laboratory Craftsman, Division of Mechanical Engineering. Before joining CSIRO 17 years ago he served his apprenticeship with the Victorian Railways where he was a shop steward and President of the Victorian Railways Artisans' Society. He also spent five years in private industry. He is currently Federal Chairman of the CSIRO Laboratory Craftsmen's Association.

At a brief ceremony last month, the Chairman, Sir Frederick White, turned the first sod at the Head Office building site in Canberra to mark the start of work on the new building. Among those who took part in the ceremony were Mr. W. C. Andrews, Associate Commissioner of the National Capital Development Commission, who is seen here in the foreground watching as Sir Frederick launches his attack on the Canberra clay.

Measuring the Size of Science

Thanks to a new by-product of the constant quest of the scientist for better bibliographic tools, we can now provide for the first time a set of figures showing the production of scientific papers by each scientific country and town in the world.

The new tool we have used recently is the International Directory of Research and Development Scientists 1967, which is published by the Institute for Scientific Information in Philadelphia, who publish also the Science Citation Index, which has also been tremendously valuable as a source of statistical data.

The new Directory lists geographically by country, state graphically by country, State and town, as well as institution, the name of each scientist who got his name first amongst the authors of a paper listed in Current Contents during the year 1967.

The journal Current Contents covers, of course, a wide selection of all the world's major journals in all fields of science and technology, including medicine, and we know from tests that it covers somewhere between 80 and 90 per cent. of the impact value, as measured by citations, of the journal literature.

The biggest fault of the new data is that, by listing only first authors, one loses a lot of names and this happens particularly severely for those countries and sciences where one has the institutional and hierarchical convention of an institute chief or professor whose name automatically falls first.

As a result of the lack of an international convention, the figures for such countries may be reduced by as much as a factor of two below that for countries where the names are ranked in order sometimes of alphabet, sometimes of merit, sometimes of status, and sometimes by none of these principles.

The data does, however, supply for the first time fairly reliable figures for towns and countries for which no previous count has been sufficiently universal and large.

The numbers are, of course, valid only on a relative scale and have little absolute significance since only a fraction of the producing authors will actually publish within any given year, and because the location given is always that noted in the paper as the official address from which reprints might be obtained — it is, however, difficult to find a more adequate definition of country of production of science which can be applied so automatically.

The result of a computer count of the first year's production of this index, including several faults of proof-reading and de-bugging, which will improve no doubt from year to year, are now given in abbreviated form in the tables 1 and 2.

Part 2 of an article by Professor D. J. de Solla Price, Avalon Professor of History of Science, Yale University.

From the list of countries (Table 1) it can be seen that 90 per cent. of the world's science resides in the top 14 nations, and that 40 nations in all account for all but 1 per cent. of the world.

Australia is nation number 10 and its largest scientific city, Sydney (see table 2), is similar in size to Edinburgh, Orsay, Denver, Hamburg, or, to put it another way, that single city has as many scientific authors as South Africa.

Melbourne has as many as the United Arab Republic, Yugoslavia or Spain.

Probably the greatest interest in this new data arises from an investigation of the way in which the smaller countries compare in their shares of the world's science as against their shares of the wealth and of the population.

Again, for these small countries as for the big, it is evident enough that it is the share of the wealth that determines that of the science (see Fig. 1).

The outstanding positive deviation, not approached by any other country so far as I know, seems to be the case of Israel. This country has about 0.15 per cent. of the world's GNP which is about twice what it would have if the wealth were equally shared amongst all the earth's peoples.

The per capita wealth, however, only determines to some extent the per capita scientific strength. As is seen from Fig. 1, the total scientific strength is well correlated with the economic wealth for most of the countries of the world.

The most scientifically developed nations, from the biggest to the smallest, all cluster along a line which corresponds to one author on the International Index for every ten million dollars of GNP.

It must be remembered that this number of authors is only a relative, and not an absolute, index of the gross number of scientific workers.

We may normalize the data to some extent by noting that in 1964 or thereabouts most of the advanced nations big and small were spending about one per cent. of their GNP on scientific research (basic and applied, but not including any of the considerable expenditures in development research).

If we were to assume, just as a talking-point, that the International Index was listing for each country only about one quarter of all those scientists who are doing research and that the other three-quarters are doing work that will not be published this year (or perhaps at all!), then it will follow that each country was spending about $\$10^5$ for every four scientists — an amount which gives an expenditure of $25,000 per scientist to cover his salary and his expenses in equipment and overhead.

Only the better-known scientific nations reach anywhere near this limit; most of the lesser nations fall below it, and the smaller the nation the more it can fall below the standard.

China is, of course, a special case since the openly published scientific literature is vanishingly small.

The evidence would show, by the way, that if China published openly in keeping with its accepted present economic size, it would be a country of the same scientific magnitude as Japan, certainly not very much more or less.

The manpower figures we derive for USSR are also much lower than we expect on other evidence, chiefly because of the "first author" phenomenon discussed previously, where many names are subsumed by that of the institute director.

The other very low countries include those cases where the state has a more or less State has a more or less purposely non-scientific policy, giving priority to other political or economic or military purposes: Indonesia, Cuba, Vietnam, Korea.

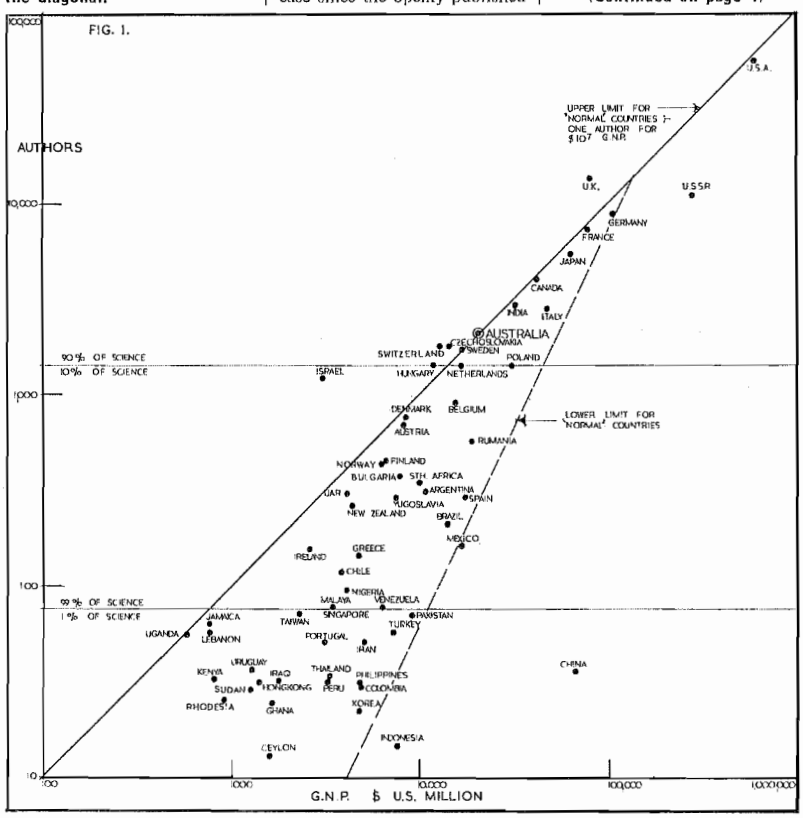
(Continued on page 4)

Table 1
NUMBER OF SCIENTIFIC AUTHORS BY COUNTRY

USA	ca. 52,195		Greece	147		New Guinea	9
England	11,186		Chile	113		Canary Islands	9
USSR	10,505		Nigeria	97		Saudi Arabia	8
Germany	8398		Venezuela	82	99%	Sierra Leone	8
France	6862					Vietnam	8
Japan	5202		Taiwan	72	1%	Guatemala	7 99.9%
Canada	3997		Pakistan	68			
India	2882		British W. Indies	63		[West Africa]	7 0.1%
Italy	2733		Lebanon	58		Congo	6
Australia	2038		Turkey	58		Cuba	6
Switzerland	1767		Uganda	57		French Morocco	6
Czechoslovakia	1718		Iran	52		Zambia	6
Sweden	1650		Portugal	51		Burma	5
Netherlands	1412	90%	Malaysia	41		Iceland	5
			Singapore	38		Morocco	5
Scotland	1332	10%	China	36		CA	4
Poland	1305		Thailand	34		Monaco	4
Israel	1125		Uruguay	34		Senegal	4
Hungary	1039		Kenya	34		Liechtenstein	4
Belgium	924		Iraq	32		British Honduras	3
Denmark	728		Peru	32		Libya	3
Austria	646		Philippines	32		Tunisia	3
Rumania	557		Hong Kong	30		Afghanistan	2
Finland	447		Sudan	28		Borneo	2
Norway	432		East Africa	27		Cyprus	2
Wales	384		Rhodesia	25		Ecuador	2
Bulgaria	376		Ghana	24		Fiji	2
South Africa	338		Algeria	22		Kuwait	2
Argentina	299		Korea	22		Luxembourg	2
United Arab Republic	293		French W. Africa	16		N. Sudan	2
Yugoslavia	288		Indonesia	14		New Caledonia	2
Spain	277		[Africa]	13		Syria	2
New Zealand	253		Ceylon	11		Virgin Islands	2
Brazil	206		Ethiopia	11		Once only mentions	33
N. Ireland	201		Costa Rica	10			
Ireland	156		Tanzania	10		World total	126,055
Mexico	152		Madagascar	9			
			Malta	9			

Miss Margaret Russell retired from CSIRO last June after 23 years as Librarian at the Division of Irrigation Research at Griffith. Miss Russell helped establish the Organization's libraries at Canberra, Deniliquin and Merbein. She has played a major role in the establishment of a regional inter-library service in the Riverina and is at present President of the Riverina Regional Group of the Library Association of Australia. Miss Russell is seen here cutting a cake, in the shape of a book, at a farewell party organised by the staff of the Division.

This logarithmic graph relates the output of scientific papers, as indicated by the number of first authors listed in the 1967 directory, to GNP. Military secrecy explains why the United States and U.S.S.R. fall below the diagonal.



News In Brief

Farrer Medal

Mr. C. S. Christian of the Executive has been awarded the Farrer Memorial Medal for 1969 for his outstanding contributions to agriculture in the field of utilisation of land resources.

Doctorate

Mr. R. Muncey, Chief of the Division of Forest Products, has been awarded the degree of Doctor of Applied Science by the University of Melbourne.

Demonstration

On July 3 and 4 the Division of Food Preservation, the Wheat Research Unit, and the Bread Research Institute of Australia co-operated in mounting five 2-hourly demonstrations on food science for senior secondary students in the Sydney metropolitan area.

The demonstrations dealt with the respiration and ripening of fruits, the inheritance of quality in wheat, the concentration of fruit juices, and the corrosion of tinplate. They were attended by over 600 students and teachers from nearly 80 schools.

OBITUARY

Mr. K. J. Fogarty, Administrative Officer of the Chemical Research Laboratories, died suddenly last month after suffering a heart attack.
His death came as a severe blow to his many friends and colleagues in CSIRO.

Mr. Fogarty joined the clerical staff at Head Office in 1941. He was released from service in 1943 and spent three years on active service with the R.A.N.

He returned to Head Office at the end of the War and in 1948 was appointed to the Plant and Soils Laboratory at St. Lucia, Brisbane, as senior clerical officer.

In 1952 he returned to Melbourne to take charge of all clerical services for the Division of Industrial Chemistry and in 1962 he became Administrative Officer for C.R.L.

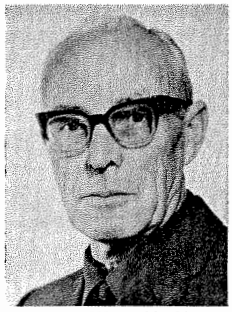
Mr. Fogarty was elected to the Board of Directors of the CSIRO Co-operative Credit Society in 1959 and served on the Board until his death.

It was largely due to his foresight that the Society introduced an insurance scheme for borrowers and this contributed considerably to the success of the Society in recent years.

Research Leader

Mr. C. W. E. Moore, at present Chairman of the Ecology Section of the Division of Plant Industry in Canberra, will shortly take up the position of Officer-in-Charge of the Division's Riverina Laboratory at Deniliquin.

Mr. Moore will go to Deniliquin with an already wide knowledge and experience of ecological and pasture problems in semi-arid Australia. His scientific papers on the native vegetation and pastures of the south-eastern Riverina published sixteen years ago are still regarded as authoritative accounts of the ecology of the area.



Mr. C. W. E. MOORE

His present main research programme, which he will continue from Deniliquin, is on the causes and control of the woody regrowth problem in north-western New South Wales and southern Queensland.

This project, both scientifically and geographically, forms a logical link with the work of the Riverina Laboratory, which is concerned with the economy of semi-arid and arid grazing lands in Australia.

Retirements

The Division of Protein Chemistry recently farewelled two officers of long standing in the Organization, **Mr. A. McKelvie** and **Mr. T. McMurtrie.**

Mr. McKelvie retired after nearly 30 years with the Divisions of Protein Chemistry and Industrial Chemistry.

As Head Carpenter he was responsible for converting the old residence "Quamby" into laboratories when the Division of Protein Chemistry moved to its present site in Parkville.

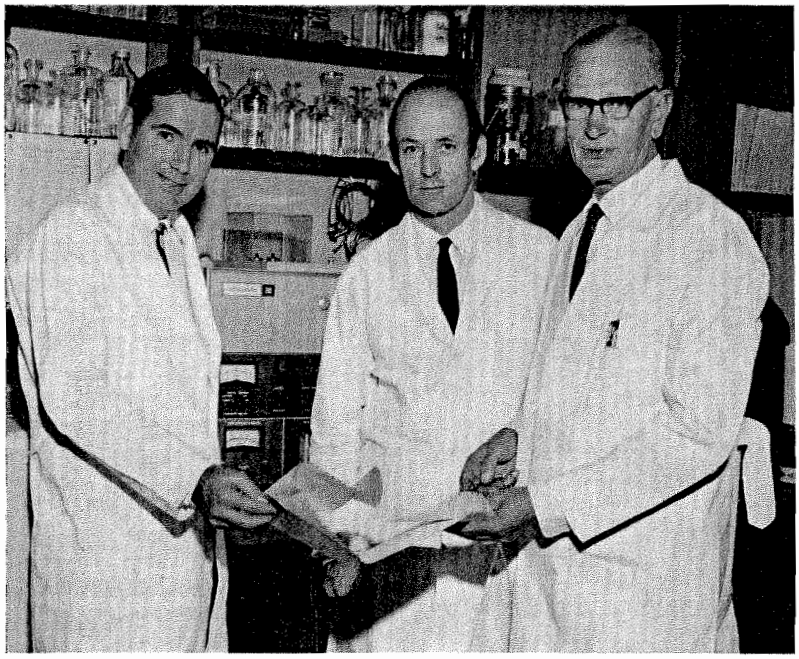
Mr. McKelvie will also be remembered for his feat of rebuilding a piano belonging to the Head Office Social Club after it had fallen from a truck in the middle of Melbourne.

Mr. T. McMurtrie retired after nine years in the Division's instrument shop.

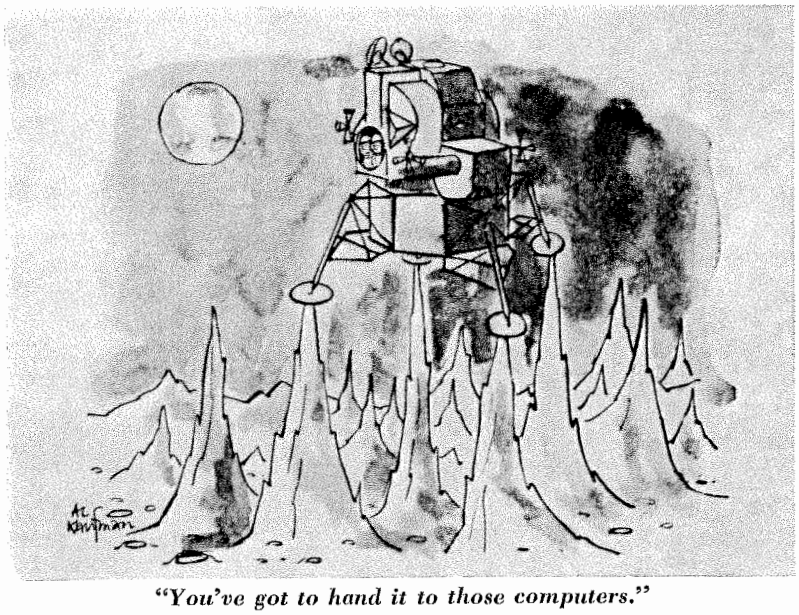
He first joined CSIRO in 1923 and after a few years resigned to open his own engineering business. He managed this business for over 30 years before rejoining CSIRO.

Mr. F. Trotter retired recently from the Division of Applied Physics after 28 years of service mainly as workshop foreman.

Before joining CSIRO, Mr. Trotter had wide experience in industry as a tool maker and engineer, including two years as a marine engineer with the Aberdeen White Star Line.



Professor V. M. Trikojus, an Honorary Research Professor at the University of Melbourne, is currently working at the Ian Clunies Ross Animal Research Laboratory of the Division of Animal Physiology at Prospect as a senior research fellow. He is collaborating with Dr. T. W. Scott of the Division, and Dr. K. A. Ferguson, Assistant Chief of the Division, on an investigation into the mechanism of the secretion of thyroid hormone. Our picture shows from left to right, Dr. Scott, Dr. Ferguson and Professor Trikojus.



"You've got to hand it to those computers."

SAFETY NOTES

Light is Right

A recent article by an English colour consultant has brought up a number of interesting points about road safety.

An important aspect of driving is the ability of the driver to identify all vehicles in the immediate area as rapidly as possible. At intersection crashes drivers are often heard to say "I just didn't see him coming", and there might be real truth in this statement.

In order to visualize what a driver does see, it is first necessary to imagine every colour in terms of its black and white or tone value because this is what your eyes do.

It is as if your eyes have taken a black and white photograph of the scene. What you first see is how light or how dark a vehicle is with respect to the road and not what colour it is.

As a primary safety factor all vehicles should preferably be lighter in tone value than the road.

The exception to this rule is red vehicles which may be equal to or darker in tone than the road.

Half tone and dark tone blue and green cars harmonise with the road and are virtually camouflaged. Because of this more blue and green cars are involved in accidents than cars of any other colour. (See "Safety Notes" August, 1968.)

The worst type of vehicle is the low, fast, half-tone grey model which is almost impossible to see. Fortunately there are few of these around.

Colours lighter in tone value than the road will give drivers an indication of size and shape before it is too late.

Another aspect of the problem concerns city driving.

Many commercial vehicles are dangerous in cities because their form is broken up by advertisements which make them blend in with the surroundings.

This was recently illustrated in London when low vehicles plastered with ads. were introduced for hire. The ads. have since been removed because it proved difficult to see the vehicles quickly enough.

Much as some people like to decorate their cars and put stickers in back windows, the verdict would seem to be "Keep it plain, prevent a claim".

Many drivers have, in their off moments, had the experience of opening their offside doors only to have them ripped off by passing motorists.

The inside locking edge of doors is invariably identical in tone with the road and no one in motion could reasonably be expected to see the door opening in time.

If the locking edge were painted white to give maximum contrast with the road the oncoming driver would see a vertical white line crossing his line of sight and might have a chance to avoid it.

The phrase "Red for Danger" is probably true in more ways that one. A trailing red flag is not as easy to see as you would think, and for this reason it is sometimes seen passing through the roof of the following vehicle.

To be identified in time the warning flag needs to be both big and white.

Finally, a comment on Divisional Vehicles. These are generally blue in colour but are considerably lighter in tone than the road. The indications are that these vehicles would present no problems in "instant identification".

L. C. R. Thompson, Safety Officer.

Measuring the Size of Science

(Continued from page 2)

It is a little surprising that Pakistan and Mexico are amongst this group, too, and it is equally surprising that there seems to exist some general minimum of science that is difficult to transgress so that there is a rather well-defined lower limit for scientific size versus economic size of the group of all nations.

At the other end of the scale, above the line marking the relation between scientific and economic size for the most sophisticated nations, there is only one single case: that of Israel.

This country has a scientific population, according to this indicator, which is more than a factor of three higher than that which one would expect by the standards even of such highly developed scientific nations as Britain, Switzerland, Hungary and Czechoslovakia.

From the fragmentary comparable data which exists for manpower, one can be reasonably sure that the indicator we have used is not grossly in error for the state of science in Israel.

By any approximate standards of comparison, Israel has about two-thirds of the scientific manpower of Czechoslovakia in agreement with Fig. 1.

I do not believe that the statistics are to be trusted with any higher confidence than half an order of magnitude, but the indication here is unmistakeable; Israel has a scientific research population much larger relative to its size than any other nation in the world.

It is not so difficult to see good reasons why and how Israel should be in this position. What to do with this position, when it has been attained, is quite another matter.

It seems obvious that Israel must pay special attention to the development of science-based industries that can bring this abnormally large population to the special productivity it might entail.

The most obvious thing is that one must treat scientific research as a considerable export industry, doing jobs for other nations. Unless good progress is made here, it will, at the least, be an oddity that any nation can afford to be so wise.

The other country that has gone overboard in producing more science than it can afford is the United Kingdom, and you can say either that Britain has twice as much science as it can possibly afford or a country of that degree of science has only half as much wealth as it ought to have.

Australia also is in this rather humorous position, although perhaps not as bad as Britain. I would say that Australia has somewhere between exactly the amount it should have and 20% more than the amount it should have, it certainly hasn't got less.

It has previously been remarked by many commentators on the Australian scene that if you examine the symptoms of scientific life in Australia, you find rather poor salaries and rather poor status, a niggardliness in research funds, and a fairly large brain drain. These are all the symptoms of overproduction.

I should, perhaps, qualify my remarks by saying that the measures of science I have been referring to measure mainly the pure science component of research.

When it comes to applied science, we don't have the nice absolute quantitative data we would like because technology is that which is not published. of it contributed by those industries that educated people didn't have to work at such as agriculture.

Once a society opts for high civilization, once you opt as you have in Australia for urban living and higher education, then you are in the position of requiring a base for your economy that can employ the people that are starting to be turned out in quantity by your universities.

In science and technology, you cannot and must not employ these people only at the research front. You must employ them behind the research front.

Australia is in the position of those nations which are changing over from a position of wealth based on natural resources to the unnatural wealth that is produced by education.

Scientific discovery is of comparatively little value for Australia as for most peripheral nations. You need only as many scientists engaged in research as can monitor all the bandwagons and all the new discoveries that come up.

In a way, you are oversupplied with scientists. My guess is that you can get by with not more than 75% of those that you've got. This is why people are leaving because they cannot be so utilized.

The proper utilization of the people that you have is not at the research front where they are necessarily inferior because they have been kept there much more than most countries keep them there.

You need to employ them behind the research front in things like sophisticated science based industries which make scientific instruments, chemicals, machine tools and electronics, not so much because these are profitable, but because you need these avenues of useful employment, because this is going to be the mainspring and source of Australian wealth in the next generation.

You are now shifting the basis of your G.N.P. The G.N.P. of Australia was very odd among the nations because you had a large amount

Now you're stuck with a highly educated population that is not producing the greater part of the wealth of Australia, and so you have to invent that industry for them.

Nuffield Grant

Mr. G. D. Bowen of the soil microbiology section of the Division of Soils has been awarded a Special Study Grant by the Nuffield Foundation to carry out research at the Botany School, University of Cambridge, on nutrient uptake and transfer mechanisms in micro-organisms and plant roots.

This research is related to studies by Mr. Bowen on stimulation of plant growth in low fertility soils by associated micro-organisms, many of which increase nutrient uptake by the plant.

Some balls are very dull affairs. Others are fraught with disaster. But without any doubt, the CSIRO Ball in Melbourne, on Thursday, September 11th, must rank as the social event of the year. Two bands, a sumptuous spread of the finest food, and free champagne combine to make this evening an unforgettable event. Avoid dismay and contact your social club representative now. This is one ball you can't afford to miss.

APPOINTMENTS TO STAFF

Mr. L. W. Best has been appointed to the Division of Wildlife Research to carry out research on the ecology of the dingo. Mr. Best graduated M.Sc. from the University of Canterbury, New Zealand, in 1967 and has spent the last year at the Forest and Range Experimental Station of the New Zealand Forest Service.

Mr. K. M. Dash has joined the Division of Animal Health to work on the population dynamics of nematode infection in sheep. After graduating B.V.Sc. from the University of Sydney, Mr. Dash spent from 1962 to 1963 as a field veterinary officer with the New South Wales Department of Agriculture, and from 1963 to 1966 as a lecturer at the University of New England. Since then he has been studying for his Ph.D. at the University of Queensland.

Dr. E. G. Matthews has joined the Division of Entomology to carry out research on the biological control of dung and buffalo flies by dung beetles. Dr. Matthews graduated B.A. from Columbia University in 1953 and Ph.D. from Cornell University in 1960. Since 1961 he has been Associate Professor in the Department of Biology at the University of Puerto Rico.

Dr. J. D. Kalma has joined the Division of Land Research to carry out research on climatology. Since graduating M.Sc.Ag. from the State University of Wageningen, Holland, in 1966, Dr. Kalma has been working at the Volcani

Dr. J. D. KALMA

Institute of Agricultural Research, Israel. He recently obtained his Ph.D. at the Hebrew University, Jerusalem.

Mr. J. W. Steel has joined the Division of Animal Health to study host-parasite relationships with particular regard to helminth infections of sheep. Mr. Steel graduated B.Sc. with honours from the University of Nottingham in 1964 and since 1965 has been studying for his Ph.D. at the University of New South Wales.

Dr. B. K. G. Theng has been appointed to the Division of Applied Mineralogy to study the adsorption of organic polymers and monomers on minerals, and the influence of minerals on organic reactions. After graduating B.Ag.Sc. with honours from the University of Adelaide in 1961 and Ph.D. from the same University in 1964, Dr. Theng spent two years at the University of Western Australia. Since 1966, he has been studying ion exchange at the University of Louvain, Belgium.

Table 2

GREAT SCIENTIFIC CITIES OF THE WORLD AND OF THE UNITED STATES

(Number of scientific first authors in 1967)

World		United States	
Moscow	4,982	New York	2783
London	2915	Washington	1506
Paris	1804	Boston	1453
Tokyo	1681	Philadelphia	1407
Leningrad	1309 ↑ 10%	Chicago	1404
		Los Angeles	1205
Prague	882	Cambridge	1010
Kiev	728	Bethesda	911
Cambridge	720	Berkeley	869 ↑ 10%
Osaka	719		
Berlin	692		
Budapest	667	Pittsburgh	720
Oxford	635	Madison	702
Munich	627	Ann Arbor	679
Ottawa	571	Seattle	648
Stockholm	546	Cleveland	632
Toronto	526	San Francisco	613
Montreal	522	Houston	576
Milan	480	Minneapolis	575
Warsaw	460	New Haven	543
Copenhagen	454	St. Louis	537
Zurich	444	Princeton	480
Birmingham	427	Buffalo	473
Kyoto	418	Columbus	459
Glasgow	386	Urbana	458
Rome	386	Palo Alto	451
Manchester	386	Rochester	448
Jerusalem	374	Pasadena	444
Bucharest	370	Stanford	406
Vienna	364 ↑ 20%	Ithaca	405
		Durham, N.C.	394
Edinburgh	357	New Orleans	369

World		United States	
Orsay	350	Murray Hill, N.J.	366
Sydney	341	Denver	350
Hamburg	331	Oak Ridge	327
Basel	323	Detroit	325
Sofia	321	Dallas	323 ↑ 20%
Frankfurt	307		
Geneva	306	Boulder	317
Vancouver	296	Gainsville	311
Nagoya	293	Rochester, Minn.	307
Melbourne	292	Bronx	298
Brussels	290	Atlanta	296
Uppsala	289	Davis, Calif.	294
Amsterdam	285	Cincinatti	290
Delhi	283	Argonne	286
Freiburg	280	Iowa City	282
Calcutta	276	Lafayette	281
Sheffield	276	Ames	256
Liverpool	275	Austin	253
Gothenburg	274	Syracuse	252 ↑ 28,974
Kharkov	270		
Bristol	264	University Park, Pa.	249
Helsinki	263	East Lansing	247
Strasbourg	259	San Diego	246
Rehovoth	252	Upton, N.Y.	246
Sendai	251	La Jolla	231
Oslo	250 ↑ 33,020	Indianapolis	227
		Dayton	208
Leeds	249	Salt Lake City	203
Gif-Yvette	248	New Brunswick, N.J.	197
Edmonton	243	Nashville, Ten.	194
Minsk	231	Lexington, Ky.	194
		Portland, Or.	190

50% World Pop. of Sci.

DEADLINE

Contributions to the September issue of Coresearch should reach the Editor at 314 Albert Street, East Melbourne, by Thursday, 14th August.

Printed by CSIRO, Melbourne

CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 126, MELBOURNE, SEPTEMBER 1969

CSIRO's Budget Passes $50,000,000

CSIRO will have a total Budget for 1969-70 of $53,595,000 for capital and non-capital expenditure, of which $43,217,500 will be provided directly by the Government, $8,828,000 by the Agricultural Industry Committees, and $1,549,500 by various other contributors.

Treasury Funds

Of the amount of $43,217,500 provided by Treasury appropriation, $37,910,000 is for salaries and general running expenses, $4,857,500 for capital expenditure, and $450,000 for repairs to buildings.

The allocation for salaries and running expenses represents an increase of $2,987,410 over the actual expenditure for 1968-69. This will cater for the following requirements:

- Increments, reclassifications, and arbitration adjustments to salaries will absorb $1,110,000.
- Two new projects previously endorsed by Cabinet will require $276,200, including 30 new positions. They are prawn research $172,000 and the Commonwealth Meteorology Research Centre $104,200.
- An amount of $74,300 has to be set aside for increased grants to the Standards Association of Australia and to the National Association of Testing Authorities.
- The expansion of relatively new and promising investigations will cost $320,600, including 43 new positions. The most important of these projects are: reproductive physiology ($38,100); wildlife investigations ($33,300); biological control of insects ($19,600); rangelands research ($46,700); soil mechanics field activities ($51,900); sulphide investigations ($15,800); and development of cotton harvester ($21,000).
- For general expansion in many Divisions and Sections the Executive has provided 124 new position, $604,900 to cover additional maintenance, $128,500 for extra travelling, and $196,500 to increase equipment allocations.

The capital allocation from Treasury sources is divided into two categories — those items under the control of CSIRO and those handled by the Department of Works and the Department of the Interior.

The first group of items will total $1,665,000. This will be spent on developmental work at field stations ($490,000), the purchase of major items of laboratory equipment ($673,000), the acquisition of additional scientific computing equipment ($374,000), the development of the new area of the Ginninderra Field Station ($60,000), and the continued development of the new cattle station established near Mundubbera, Queensland, in 1966, for the Division of Tropical Pastures ($68,000).

Of the $3,000,000 provided for building projects under the control of the Department of Works, $1,818,000 will be needed for buildings under construction at the end of 1968-69, while the remainder will cover works to be commenced in the current financial year.

The major items in the current year's new works programme are: laboratory extensions at North Ryde for Division of Food Preservation ($300,000); laboratory extensions at Parkville for the Division of Animal Health ($470,000); laboratory at Townsville for Division of Tropical Pastures ($660,000); and laboratory at Black Mountain for Division of Soils ($455,000).

Other Funds

The joint Commonwealth Industry research funds provide most of the finance available to CSIRO from non-Treasury sources.

The Australian Wool Board has allocated $6,891,500, comprising $3,604,100 for wool production research and $3,287,400 for wool textile research.

The wool production research figure includes $2,438,400 for salaries and $1,165,700 for other purposes, while the corresponding amounts for wool textile research are $1,943,900 and $1,343,500.

A new laboratory was approved two years ago for the Agronomy Section of the Division of Plant Industry and $150,000 is included in the non-salary vote for this purpose.

New buildings are also envisaged for two of the Wool Textile Research Laboratories.

The Division of Protein Chemistry is planning extensions to the main laboratory building at Parkville, for which $100,000 has been included in the current budget.

However, the approval of the Wool Board is required for this major project before construction work commences.

The sum of $80,000 has been provided for extensions to the Textile Processing Laboratory at Ryde, N.S.W., for the Division of Textile Physics.

Provision has also been made for the acquisition of textile processing plant for the Division of Textile Industry, Geelong, ($103,200), and also for the Division of Textile Physics, Ryde, ($72,500).

The Australian Meat Research Committee has agreed to provide a total sum of $1,123,974, comprising $639,000 for salaries and $484,974 for other purposes.

Because of a substantial reduction in income, due to drought conditions, the Committee was obliged to reduce CSIRO's 1969-70 allocation for cattle and beef research to approximately 90% of the previous year's allocation.

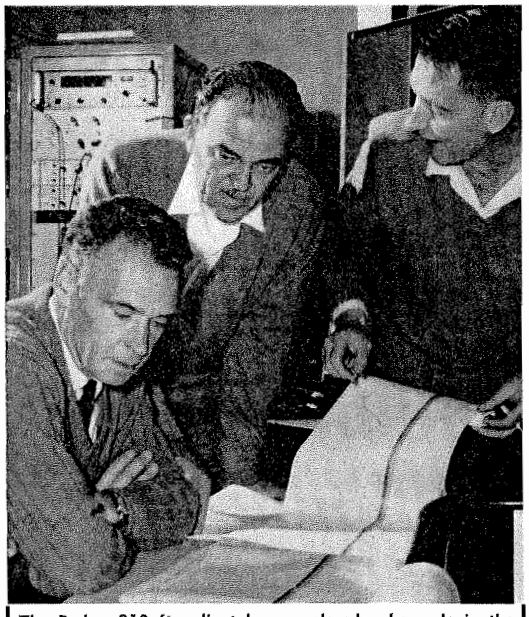
The Wheat, Dairy, and Tobacco Research Committees have provided $286,600, $294,450, and $231,500, respectively, for research for their particular industries.

In each instance the allocations represent small increases on the approved figures for 1968-69.

Provision has been included in the 1969-70 estimates for the expenditure of $1,549,476 from miscellaneous grants and donations. The actual expenditure under the same heading for last financial year was $1,705,800.

Summary of Estimates of Expenditure for 1969-70

	Estimates 1969-70 $	Expenditure 1968-69 $	Increase or Decrease $
Under CSIRO control			
Salaries and general running expenses	37,910,000	34,922,590	2,987,410
Buildings, works, plant and developmental items	1,665,000	1,228,558	436,442
Total under direct control of CSIRO	39,575,000	36,151,148	3,423,852
Under Department of Interior control			
Acquisition of sites and buildings	27,500	122,902	—95,402
Under Department of Works control			
Fittings and furniture	165,000	155,192	9,808
Repairs and maintenance of buildings	450,000	340,106	109,894
Buildings, works	3,000,000	2,253,699	746,301
Total CSIRO — Treasury Funds	43,217,500	39,023,047	4,194,453
Contributory Funds			
Salaries and general running expenses	9,639,400	9,215,691	423,709
Buildings, works, plant and developmental items	738,100	1,225,435	—487,335
Total funds CSIRO — all sources	53,595,000	49,464,173	4,130,827



The Parkes 210 ft radio telescope played a key role in the historic Apollo 11 telecast to the world last July. From six minutes after the time Neil Armstrong took his first step on the moon until the end of transmission some 4 hours and 55 minutes later, the world saw the Apollo 11 telecast via Parkes. Our picture shows, from left to right, Dr. E. G. Bowen, Chief of the Division of Radiophysics, Mr. Robert C. Taylor, Head of the Radio Frequency and Metric Systems Section of the Goddard Space Flight Centre, and Mr. J. G. Bolton, Director of the Australian National Radio Astronomy Observatory, examining a chart record of transmissions from the Apollo 11 command module during its approach to the moon.

Dr. Barnard Retires

Dr. C. Barnard, of the Division of Plant Industry retired last month after having spent almost the whole of his working life with CSIRO.

Dr. Barnard graduated M.Sc. from the University of Sydney in 1928 and obtained his D.Sc. from the same university in 1936 for his studies on growth and production in the grape vine.

In 1927 he joined what was then the Division of Economic Botany and was seconded to the Commonwealth Research Station at Merbein.

Three years later he transferred to Canberra where he worked until his retirement.

His analysis of yield in the sultana, which was started at Merbein and continued from Canberra, was responsible for the system of forecasting yield in vines that has been of great value to the dried fruits industry.

This work together with his studies on fruit bud formation and differentiation in other fruits and on decline and dieback in apples gained Dr. Barnard a world-wide reputation in the horticultural field.

During the second world war, Dr. Barnard's work was directed to research into the production of medical drugs from plants. This work led to the utilization of *Duboisia* as a source of hyoscine and atropine and of *Eucalyptus macrorrhynca* as a source of rutin.

A number of problems associated with the economic production of other drug plants particularly opium poppies were also solved successfully.

Dr. Barnard conceived the idea of the phytochemical survey of Australia's native flora towards the end of the war, and in the early postwar period did the initial work and organization of this project.

In 1951 he turned his attention to floral histogenesis in wheat and later to a systematic study of all the monocotyledons.

More recently, he established the Australian Herbage Plant Registration Authority. On behalf of the Division, he acted as Registrar with the responsibility of preparing and maintaining a register of Australian herbage plant cultivars.

Dr. C. BARNARD

Dr. Barnard prepared authoritative descriptions, origins and identification of all herbage plant cultivars registered in Australia. A companion volume on other herbage plant species introduced to Australia is now in press.

Dr. Barnard also edited the book "Grasses and Grasslands", which brought together under one cover the accumulated knowledge of Divisional research staff on the biology of grasses and on the problems of pasture establishment, maintenance and improvement.

The Interface between Science and Society

When C. P. Snow delivered the Rede Lecture just ten years ago, he introduced a phrase, "the two cultures" — one of the scientist and the other of the man of letters. Lord Snow brought us to realise a cleavage in society which many of us may have recognised but only vaguely. Some of us may have amused ourselves by looking for examples of this division; a few saw it as a tragedy and on occasion some tried objectively to bridge the gap. Some admitted that his grouping of people into scientists and literary intellectuals was a gross simplification, but he certainly made his point.

This article is based on a public lecture given to a meeting of the New South Wales Branch of the Australian and New Zealand Association for the Advancement of Science last July by Mr. A. F. Gurnett-Smith, Secretary (Agricultural and Biological Sciences). Mr. Gurnett-Smith gave the lecture in his capacity as the honorary local secretary for the A.C.T. Branch of ANZAAS.

Here I will attempt a similar task — to identify two cultures. Like Lord Snow I must over-simplify as, like him, I wish to divide society into two — the scientists and technologists in one group, and in the other people who would not regard themselves as scientists or intellectuals in the professional sense.

A person in this category could be described by the idiom the "man in the street". My thesis is that these two groups are drifting apart and unless the trend is reversed and the gap bridged, then science faces a difficult and unhappy future.

I believe that in Australia this problem has not advanced as far as it has in some other countries, but unless we realise that the early warning signals are flying and take heed, then what may be an indistinct interface between science and society will harden into a confrontation.

I suspect that many scientists, especially the young, are not aware of the existence of this gap.

Some recognise it and yet reject any attempt, even by their colleagues, to remedy it.

For many the so-called specialist scientific societies divert their interest away from a sense of social responsibility.

The same people make little effort to assist an organisation such as ANZAAS in its attempts to bridge the gap.

Unless we devise ways to promote understanding and active collaboration between science and society in general, science will lose the trust and respect it has so rightly enjoyed in the past.

I fear this reputation is declining now.

Until very recently the general public has been thankful for its scientists. With good reason, too!

If we turn the clock back 150 years for a moment we can see why. At that time science was limited almost entirely to western Europe.

There were probably less than 1,000 persons who regarded themselves as scientists.

There were no scientific journals. Physics had no theory of electromagnetism; radio activity was unknown and the spectroscope had not been invented.

Some 40 elements were known but not grouped into families. Geologists were explaining fossils on the basis of flood or fire. Uranus had been discovered, but Neptune had not.

The word "biology" was only ten years old. There was no cell theory, Mendelian genetics did not exist, nor did the germ theory of disease. The fusion of ovum and sperm had been guessed at, but not established.

The windmill, water wheel and human and animal muscle supplied basic power. Olive and whale oil supplied light. Road construction had changed little since Roman times.

Malaria had not been associated with mosquitoes, nor plague with rats and fleas. Life expectancy in England was 40 years and less in practically every other country. Anaesthetics were not used, neither were antiseptics.

And then things began to move. Science developed exponentially and its benefits accumulated accordingly.

The success of science bred confidence in those who practised it; the general public grabbed at the material benefits that science provided and was thankful.

The scientific culture promised a brave new world and the public believed that it was at hand. Ample evidence for this view was provided as more and more of the discomforts of life were eliminated.

These attitudes were expressed most forcibly when in Communism a whole political structure was established on the principle of national unity for material welfare, through science and technology.

In recent times, however, this exponential growth of science has shown symptoms of overgrowth and this era, when science was accepted without question as the hope of mankind, is rapidly passing.

This change is taking place most especially in those so-called advanced countries where economic standards are such that highly expensive and complicated scientific programmes are supported.

Where such efforts cannot be supported, science still tends to be more closely related to human needs — although many examples can be given where politicians and national scientific leaders in underdeveloped countries prefer to put sorely needed resources into "big science".

It seems to me that in Australia we are in the middle of this range.

I doubt if much can be gained by pointing the finger of blame in any one direction; the problem is too complicated. In the main it has resulted from overenthusiasm by sincere men.

Perhaps their main error has been in too narrow an outlook and an unquestioning belief that science per se is good.

It would, of course, be incorrect to infer that scientists alone are responsible for the situation.

Politicians, industrialists and advertisers have been intoxicated by the prestige of science, especially "big science".

In this "heady" situation the man in the street was expected to play his part by providing the finance.

As a newspaper columnist asked a few weeks ago: "Why is it we don't have to have a door-knock appeal to send man to the moon, but we do to feed the hungry?"

The forces leading to the separation of science from society are real and powerful.

To succeed at research today a scientist usually has to restrict his interests to a narrow path. There seems little escape as knowledge in every specialty continues to grow.

Professor de Solla Price has pointed out that the number of scientific journals increased by a factor of 10 every 50 years, i.e., doubling about every 15 years.

In the past 50 years the number of journals has risen from 30,000 to 300,000.

Abstracting journals are increasing at a similar rate. There are now 300. There is even talk of abstracts of abstracts.

Electronic cataloguing and sorting techniques have been devised, but they are of little assistance.

Many scientists seem to have surrendered and reverted to the middle ages and are now relying largely on word of mouth for the communication of new ideas.

The popularity of seminars, colloquia, conferences or gatherings of any other fashionable title is indicative of this.

When I quizzed a group of leading scientists in the U.S. recently on this point, they agreed that new leads of significance to research came largely from conversation.

To be sure, literature is often of value later, but for many research workers there are simply not enough hours in the day for them to keep in the vanguard of their specialties, and be sensitive to the needs and pressures of the "man in the street".

In other words, it is becoming too difficult to belong in more than one culture.

Another reason for the division, and one associated with the first, is the increase in the cost of science in relation to its benefits.

Early settlers in a new land find nuggets of gold more frequently and more easily.

In science nuggets are getting scarce and the search requires expensive equipment and much training.

Professor Price likens attainments of science and the number of journals, papers or scientists to a pyramid — a doubling in height requires an eight-fold increase in volume.

I suspect that the majority of citizens in the more developed countries are at a point when they doubt if the return from science over the past ten years warrants the enormous increase in its costs.

Refrigerators, television sets, washing machines, air-conditioning, and so on, have now been available for a number of years.

If suburban dwellers do not have them the reasons are usually economic, certainly not scientific. Indeed, there don't seem to be any new developments of consequence on the horizon.

What was the last big innovation? Transistors, I suppose.

The director of research at the Batelle Institute in Geneva told me recently that the main reasons for almost every major electronic company rushing into computing and laser technology was that there seemed almost no other promising avenue for their developmental departments to pursue.

Scientists speak of the "spin-off" from research (new saucepans from research on nose cones of rockets, and so on) but the "spin-off" seems minute compared with the gigantic financial commitment for the main line of work.

The "man in the street" suspects the validity of the economics in this comparison.

Society suggests that if there is to be a "spin-off" it should be from the household to rocketry, not the reverse.

The Apollo programme has cost $23 billion. Its size and cost create two problems.

First, very few individuals, even those employed on the programme, can look at it in perspective.

Secondly, the "man in the street" is paying for it and, of course, is less infatuated. He is asking: "Is the journey really necessary?" — perhaps timidly, but with increasing confidence.

In the United States scientific leaders have advocated a 15 per cent. annual increase in research expenditures.

Some have the faith to believe that science will enable the G.N.P. to expand at more than 15 per cent. and all will be well.

But the ranks of those who do not share this faith are growing.

In Australia science and technology have been influenced greatly by the strength of our desire for the development of our natural resources.

This could well be a reason why CSIRO has not had to combat much public criticism.

But in the future we will move beyond this more pioneering stage of our development and we will be tempted to establish new scientific priorities.

We must ensure that these priorities are oriented towards human welfare as seen by our society.

Last April I was honoured to represent ANZAAS at a small informal meeting of scientists in Boulder, Colorado.

For a week ten Americans, ten British and ten from other countries met to discuss the problem I have outlined.

The impressions I gained from that week were deep — you could say I was shocked, not just because I realised that what I heard was a prophecy of something that could happen here.

So far I believe we have not experienced the division in society that has occurred overseas.

We have only flirted with atomic explosions, rocketry, biological warfare. We haven't fallen blindly in love with them.

On the other hand, it would be folly to think that the imbalance I found overseas could not happen here.

I believe that we have time to ensure that it doesn't. This then is the crux of my thesis.

Science and militarism are linked in the minds of many in this world.

Instead of a course being set firmly towards human welfare and peace, science is now — particularly in the U.S. and Europe — joined with militarism in what many regard as an unholy wedlock; it is particularly frustrating to the critics to find that many scientists view the marriage as a happy one.

But society does not like the consequences of this kind of marriage for strong reasons.

I was told that the U.S. defence expenditure amounts to 41 per cent. of the national budget.

One of every nine in the work-force is connected with defence by being either enlisted or working for industries with defence contracts.

There seems to be real truth in the remark by General David M. Shoup, retired Commander of Marine Corps, who was reported recently as saying that the military sector of society, and I quote, "has become involved with the need for justifying the existence of the military establishment, i.e., militarism for its own sake".

I would not dwell on this point but for the inevitable damage to the image of science and technology.

Any reaction against militarism is a reaction against science.

American scientific institutions have grown dependent on defence grants.

The space programme, supersonic aircraft, biological and chemical warfare are equated, in general, with science and the people who promote it.

Some will say that it's not the scientists' fault if politicians, defence planners and pressure groups with selfish goals take the results of research and put them to unpleasant uses.

This is no doubt true but society has no other group than its scientists to warn it of dangers.

Scientists are suspected of failing to take this responsibility and of becoming blindly committed to research and technological projects with little thought of their relevance to society.

The world wants slum clearance, better transport, better planned cities.

About 150 years ago it took three days for a letter posted in Newcastle to be delivered in Sydney and today it takes about the same time.

We may smile, but to a businessman this isn't funny. Our smile reveals our lack of ideas and our lack of concern.

Dr. D. F. Martyn, President of the Australian Academy of Science, pointed out recently that if we continue to consume fossil fuels at our present rate, in 150 years the coastal cities of the world may be flooded with melted polar ice.

In other words, there may be nobody in Newcastle to post the letter to Sydney!

Shouldn't this be as challenging for "big science" as finding the composition of the atmosphere of Venus.

One reason expressed to me for student riots in the U.S.A. was that university research departments have become so dependent on defence grants that the traditional scientific freedom of universities is in jeopardy.

(Continued on page 4)

News In Brief

Rivett Lecture

Dr. F. H. Westheimer of the Department of Chemistry, Harvard University, will deliver the Fourth David Rivett Memorial Lecture at the Australian Academy of Science, Canberra, on Tuesday, 2nd September, at 8.15 p.m.

Dr. Westheimer will speak on chemical methods for determining the mechanisms of enzyme action.

Vice-President

At the Eighth Conference of the International Commission for Optics, England, last July, **Dr. W. H. Steel** of the Division of

Dr. W. H. STEEL

Physics was elected to the Bureau of the Commission for three years as one of the Vice-Presidents.

Transfer

Dr. J. Leigh, Officer-in-Charge of the Riverina Laboratory of the Division of Plant Industry, is moving to the Division's Ecology Section in Canberra this month.

Dr. Leigh was first appointed to the Riverina Laboratory as a dryland ecologist in 1961 and over the past eight years has conducted many investigations into the grazing utilization of the semi-arid and arid pastures of the Riverine Plain, particularly in relation to the diet selectivity of Merinos.

In Canberra, Dr. Leigh will continue much of the work that has already been initiated at Deniliquin, particularly on the persistence of some of the important chenopod shrubs such as bladder saltbush and cotton bush. He will also work on the utilization of other semi-arid and arid pastures outside the Riverine Plain.

David Rivett Medal

Applications are invited from CSIRO officers under the age of 40 years on 1st January 1970, for the 1970 award of the David Rivett Medal, which on this occasion will be for research in the physical sciences.

The award is made by the CSIRO Officers' Association for research carried out in the past ten years, mainly while working in CSIRO.

Each candidate should submit:

- a statement of not more than 100 words setting out in general terms the nature of the work,
- a list of papers published or to be published in the ten years before the award, and
- copies of these

The closing date for entries is 31st December 1969. Entries should be sent to Miss C. M. Wright, General Secretary, CSIROOA, 3/27 Glen Street, Hawthorn, Vic. 3122.

Marconi Premium

Dr. G. W. Paltridge of the Division of Meteorological Physics and **Mr. J. A. Lane** of the Radio and Space Research Station, Slough, have been awarded the Marconi Premium of the Institution of Engineers, Britain, for their work on small-scale variations of radio refractive index in the troposphere.

Advisory Council Appointment

Senator S. H. Cohen, Deputy-Leader of the Opposition in the Senate, has been appointed a member of the Advisory Council.

ANZAAS Symposia

The New South Wales Division of ANZAAS will hold a symposium on "Science and the Community—a Stocktaking" in Sydney on 11th and 12th September.

The following month on 9th and 10th October it will hold a symposium in Sydney on "The Aged in Australian Society".

Further details may be obtained from the Executive Secretary, Science House, 157 Gloucester Street, Sydney (telephone 27-2620).

Washington Job

Any young stenographer planning a working holiday in the United States may be interested in a vacancy in the Office of the Australian Scientific Attache in Washington.

Applicants should be able to write shorthand at 100 words a minute and type at 60 words a minute. The salary is $US5,316.

Fares to and from Washington will be the responsibility of the individual and not the Commonwealth.

Mr. D. Young at Head Office would be pleased to hear from any CSIRO staff or friends of staff who may be interested in this position.

Paperweight

Mr. W. H. Taylor of the Division of Building Research, who has just published a third edition of his monumental tome "Concrete Technology and Practice", has calculated that if all the copies published in the three editions were placed one upon the other, they would form a pile about six times as high as the I.C.I.A.N.Z. building in Melbourne, three times as high as the Australia Square in Sydney, and one-and-a-half times as high as the Empire State Building in New York.

Further calculations reveal that if all the pages of all the copies were placed end to end they would reach from Melbourne to Brisbane and if placed side by side they would cover 55 acres.

The paper in 10,000 copies weighs 12¼ tons.

Brisbane Bug

During investigation of contamination of hides of cattle at slaughter, **Dr. F. H. Grau** and **Mr. M. G. Smith** of the Meat Research Laboratory at Cannon Hill, Brisbane, isolated a new serotype of Salmonella. This has just been confirmed by the International Centre in Paris and has been named *Salmonella Cannonhill.*

CSIRO

DIVISION OF ANIMAL HEALTH

TECHNICAL ASSISTANT, (MALE) (BOLD TYPE)

DUTIES: To assist in microbiological, pathological and immunological procedures in connection with research on bovine tuberculosis.

QUALIFICATIONS: At least School Leaving Standard (including science subjects), but Matriculation preferred. Appointment at higher level

Laboratory notice boards can be dull, prosaic objects displaying little to excite the imagination of even the most sensitive of souls. But a recent advertisement pinned to the board at the Animal Health Laboratory, Parkville, proved the focus of much feminine interest. Why should an advertisement cause Jill Vaughan, Susan Gourlay, Kathy Burman, and Kay Moss to pause and ponder? To help you answer this question we have reproduced the opening lines of the advertisement at the foot of this page.

Wine Tasting

The C.S.I.R. Ski Club is holding a tasting of widely available flagon wines on Friday, 19th September at 8 p.m. at the Sciences Club, 191 Royal Parade, Parkville.

A feature of the evening will be a talk entitled "Beat Rising Wine Prices—Make Your Own" by **Mr. Cliff Restarick** of the Division of Chemical Engineering.

Refreshments will be served throughout the evening. Tickets are available at $2.25 a head from **Mrs. M. Wailes** (92-8937).

"Why Didn't You Say So?"

The following incident involving a Chief of a Division took place during dinner at a recent conference in Queensland.

Chief (to waiter): "What kind of vino have you tonight?"

Waiter: "I am sorry, Sir, there is no vino left. It is all been drunk."

Chief: "Then I suppose we shall have to have a jug of beer."

Fellow diner (to waiter): "Perhaps you still have some claret?"

Waiter: "Oh, yes, Sir. We have plenty of that."

Willing Worker

When the Hawke's Bay Electric Power Board in New Zealand advertised for a female cleaner recently, it got this reply from a man:

"I don't have too much experience in this field, but I consider a bath with plenty of soap and water the best method. I am sure a trial period would show I could get a female sparkling clean and I would take a keen pleasure in the work. Wages would be of minor importance."

Deadline

Contributions to the October issue of Coresearch should reach the Editor at 314 Albert Street, East Melbourne, by Friday, 12th September.

SAFETY NOTES

Impact

Have you noticed how many safety helmets there are these days on the back window ledge of motor cars? In the event of an emergency stop, one of the car occupants could find himself wearing one unintentionally.

Like anything else of hard construction kept there, a helmet can become a dangerous missile.

By the way — after safely adjusting your seat belt in a car with collapsible steering column, break-away rear vision mirror, recessed control knobs, and all the rest of the safety features to stop you injuring yourself in a prang — where do you put your brief case, umbrella or the half dozen cold cans?

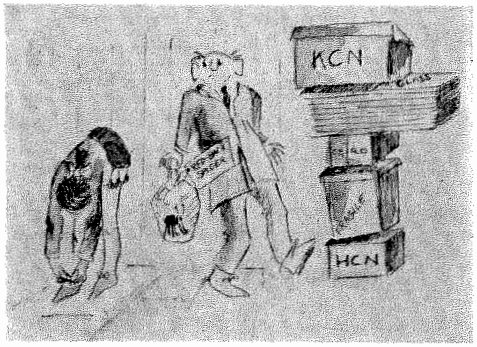
I bet there's a fair chance that they're not in the boot or on the floor at the back.

There is little point in protecting yourself against projections in a vehicle if you load it with potential missiles.

High hemlines save slipped discs

Recent statistics show that the incidence of back strain is much lower among women in mini skirts.

This is because a mini skirt encourages its wearer to lift objects correctly, that is by bending the knees and not the back.



In the interests of safety, therefore, I must strongly support the wearing of mini-skirts. Naturally, my own personal preferences have no bearing on the subject.

Correcting lifting will, of course, also prevent distraction among male members of the staff and so remove another cause of accidents.

Blow-up

Keep pressure cans off that back window ledge in your car. In the summer it can be a real oven with the sun shining through, and pressure spray cans of suntan lotion and insect repellant can explode violently.

True Confessions

Please spare a kind thought for the Safety Officers, who, before being aware of the facts on car colours and road safety which we published last month, were proud of their dark blue-green station wagon and two-tone grey sedan.

J. W. Hallam, Safety Officer.

APPOINTMENTS TO STAFF

Dr. J. R. Blake has been appointed to the Commonwealth Meteorology Research Centre to study the quantitative interpretation and use of satellite cloud pictures and other data. After graduating B.Sc. from the University of Melbourne in 1956, Dr. Blake spent two years with the Antarctic Division of the Department of External Affairs and three years with the Commonwealth X-ray and Radium Laboratory. Since 1962 he has been with the Geophysical Institute at the University of Alaska where he obtained his Ph.D. last year.

Dr. J. R. BLAKE

Mr. R. J. Carruthers has joined the Division of Animal Physiology. He will be responsible for the health of all experimental animals at the Division's laboratories at Prospect. Since graduating B.V.Sc. from the University of Sydney in 1949, Mr. Carruthers has been in private veterinary practice in New South Wales and Victoria.

Dr. L. J. Cook has been appointed to the Division of Animal Physiology to study lipid metabolism in ruminants with special reference to the metabolism of fatty acids. Dr. Cook graduated B.Agr.Sc. from the University of Melbourne in 1962, M.Sc.Agr. from the University of Sydney in 1964, and Ph.D. from Texas A and M University this year.

Mr. N. B. Lee has been appointed to the Agricultural and Biological Sciences Branch at Head Office where he will assist in the administrative activities of the Branch. Mr. Lee graduated B.A. with honours in zoology from the University of Oxford in 1965, and between 1966 and 1968, worked with the Ministry of Agriculture, Tanzania, on tsetse control.

Dr. D. A. J. Rand has been appointed to the Division of Mineral Chemistry to study the electrochemical behaviour of oxide systems with the aim of relating structural changes to catalytic activity. Dr. Rand graduated B.A. with honours in chemistry from the University of Cambridge in 1964, and recently obtained his Ph.D. from the same university.

Dr. P. J. M. Sale has joined the Division of Irrigation Research to study water stress and photosynthetic efficiency in crops. After graduating B.Sc. with honours from the University of Reading in 1956, and Ph.D. from the same university in 1959, Dr. Sale spent six years with the Irrigation Section of the National Vegetable Research Station, Britain. Since 1965 he has been working with the Cocoa Research Department of the University of the West Indies.

Dr. T. H. Stobbs has been appointed to the Division of Tropical Pastures to carry out research on the productivity of selected pasture species and mixtures when grazed by dairy cattle. After graduating B.Sc. (Agric.) from the University of Durham in 1955, Dr. Stobbs gained agricultural diplomas from the University of Reading in 1956 and from the Imperial College of Tropical Agriculture, Trinidad, in 1957. Since then he has worked as an agronomist in Uganda. He obtained his Ph.D. from the University of East Africa in 1967.

Dr. J. A. Webster has joined the Division of Computing Research to carry out research in numerical weather forecasting and to assist with research on fluid flow problems. Dr. Webster graduated M.Sc. from the University of Aberdeen in 1965 and Ph.D. from the same university this year.

Mr. M. R. E. Durand has joined the Agricultural and Biological Sciences Branch at Head Office to prepare material for "Rural Research in CSIRO". After graduating B.V.Sc. from the University of Glasgow in

Mr. M. R. E. DURAND

1954, Mr. Durand joined the Kenya Department of Veterinary Services as a district officer. Since 1964 he has been Assistant Director of the Department.

"Quo vadis?" — Turn off to the Division of Animal Genetics' National Cattle Breeding Station "Belmont" near Rockhampton.

The Interface Between Science and Society

(Continued from page 2)

The methods of the protesters may be deplorable but I had to agree with their view that if the government wishes to sponsor classified research, then it shouldn't be done in universities.

If the research is not classified then it should not be financed from defence grants.

I was even more surprised and indeed distressed to find at Boulder a suggestion that a loss of confidence in logic is emerging in Europe and more particularly in the U.S.A.

Today in the U.S.A. there are 10,000 full-time astrologers (and incidentally 2,000 astronomers).

The U.S. Government was forced by public pressure to spend $500,000 on an official inquiry into U.F.O.'s.

Drug taking is for many, a release from logic.

Some of these trends may decline but they are symptomatic of a deep-seated decline in confidence in the logic upon which scientific research processes are based.

In his "Advancement of Learning", Francis Bacon divided scientists into pioneers who dug and smiths who refined and hammered.

Some may say we have too many pioneers and too few smiths. Perhaps the pioneers are digging in the wrong places.

The swing among university students in the western world from science towards the classics is a reflection of the growing community disquiet.

From what I could find in the U.S.A., it was not only a decline in the proportion, but more importantly, a decline in quality of students taking science.

In bringing these impressions to you I hope I have not been too sensational.

However, I believe that the sensible management of science and technology is perhaps the most important challenge for scientists in the next decade.

If science based on human needs takes a lower priority to that based on political prestige, narrowmindedness and selfishness, then the colossus will crumble; a colossus that has done and can still do so much good.

What can be done? I can see no other course than for scientists to seek the aid of economists, historians, unbigoted theologians, industrialists, sociologists, trade union leaders and many others.

Scientific organisations must join with these people to formulate new priorities and to inform society of the likely benefits and dangers of new discoveries; also to explain what science is about, what those who take science as a career are like and how society can help scientists.

At the last ANZAAS Congress, Thornton put it this way: "Science is too dangerous to be tolerable by human beings unless it is controlled from the source of true authority in scientific research, viz., insight. And this is a human, ethical, not merely a scientific, qualification".

I realise that there have been moves in this and other countries for governments to have advisory committees to advise them on priorities for science.

Some overseas countries have established such groups, but as far as I can see, without much success.

I am more attracted to the task being given to non-government bodies that can work with greater flexibility and informality.

The main task is to create healthy social attitudes to science. I regard organisations such as ANZAAS, the Royal Societies, and perhaps the Australian Academy of Science as key bodies to accept a responsibility of this nature.

The specialist scientific societies can help, but there will always be an important role for them as they are.

I look forward to ANZAAS and the Academy of Science cooperating in a number of activities.

I note the enthusiasm with which the U.K. delegation at Boulder spoke of the B.A.Y.S. (a series of clubs in high schools sponsored by the British Association and science teachers).

This is just one suggestion we might examine for Australia.

I note that the theme of the next ANZAAS Congress is "Science in the Service of the Community" and that in Western Australia and N.S.W., divisions of ANZAAS have arranged meetings on subjects which highlight the contribution scientists can make on public issues such as road safety.

Perhaps a lecture on the relationships between science and society might be a regular event at ANZAAS Congresses.

Perhaps the Australian Journal of Science might give more space to these issues.

No doubt apathy and, in some quarters, hostility will appear, but if science is to be a means of giving human beings the maximum possibility for constructive self-realisation, then we must be active to short-circuit these prejudices.

I will conclude with a quotation by Dr. Robert S. Morrison, a neurophysiologist and director of the Department of Biology at Cornell:

"I am not really sure that we stand on the kind of watershed that Luther stood on when he nailed the 95 theses to the door of the cathedral or the somewhat less clearly defined moment in the 17th century when a new type of reason began to take course of affairs over from those who depended only on faith and revelation; but I have the uncomfortable feeling that we will be making a serious mistake if we don't at least entertain the possibility.

"If we don't explicitly attend to the need of the average man, to believe that he and the people immediately around him have some reasonable command over their own lives, he is simply going to give up supporting those systematic elements in society which he sees as depriving him of this ability.

"At the present time science seems increasingly to be one of those systematic elements."

The title of my address was "The Interface between Science and Society". I believe there ought to be no such thing.

"Now that we've learned to talk, let's not speak in vague generalities."

Courtesy "Saturday Review".

Printed by CSIRO, Melbourne

CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 127, MELBOURNE, OCTOBER 1969

QUEENSLAND BENEVOLENT FUND

A CSIRO Staff Benevolent Fund to cover all Divisions and Sections located in Queensland was established in Brisbane last month.

Mr. C. S. Christian of the Executive chaired the inaugural meeting which was attended by the following representatives: Mr. J. Anderson (Cooper Laboratory, Lawes), Mr. R. Brooks (Regional Administrative Office), Mr. J. Kennedy (National Cattle Breeding Station, Belmont), Mr. W. Lovett (Tobacco Research Institute, Mareeba), Dr. D. Morton (Meat Research Laboratory, Cannon Hill), Dr. P. Robinson (Townsville Pastoral Research Laboratory), Mr. E. Smart (Cattle Research Laboratory, Rockhampton), Mr. H. Warwick (Pasture Research Station, Samford), Mr. J. T. Wilson (Long Pocket Laboratories).

Mr. R. Viney, Finance Manager, Head Office, and Mr. J. Bourne, Acting Regional Administrative Officer, Brisbane, also attended the meeting.

Grants from the Fund will be made to less fortunate members of CSIRO's staff who, through no fault of their own, are placed in extremely difficult financial circumstances.

Statistics concerning the Benevolent Funds operating in Melbourne and Canberra were made available to the Meeting and some of the administrative problems encountered in setting up those Funds were discussed.

The Queensland Fund will be built up from contributions of ten cents a fortnight made on a voluntary basis by members of the staff. This is the rate which applies to the Melbourne and Canberra Benevolent Funds.

Already more than two-thirds of the staff on the Brisbane salary register have authorized deductions to be made from their salary payments for credit to the Fund — an excellent beginning. The initial deductions will take place on 9th October, 1969.

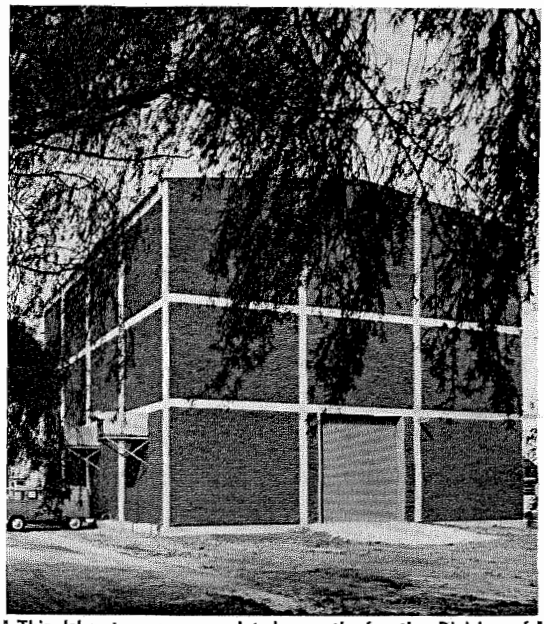
The annual income of the Brisbane Fund is expected to be about $1,000.

At the conclusion of the inaugural meeting the Divisional representatives elected Dr. D. Morton, Chairman, and Mr. John Wilson, Secretary-Treasurer, of the Queensland Fund.

These two officers plus Mr. H. Warwick, Mr. R. Brooks, and Mr. A. Eyles comprise the Executive of the Management Committee.

Each Divisional representative will be responsible for submitting to the Executive of the Management Committee any case which he considers worthy of financial support.

The creation of the Queensland Fund means that a large proportion of CSIRO's staff is now covered by some form of Benevolent Fund.



This laboratory was completed recently for the Division of Building Research and will be used for testing building structures and components under heavy loads. The floor has been designed to allow loads of up to 100,000 lbs. to be applied either up or down at pick-up points built into the floor at three-foot centres. In addition, horizontal loads of up to 100,000 lbs. can be applied to the south wall. The building, which cost about $182,000, was designed by the Melbourne office of the Department of Works.

Chairman for Canberra Fund

Dr. P. Muecke of Head Office has been elected Chairman of the Canberra Benevolent Fund which covers CSIRO staff in the A.C.T. and Northern Territory and at the Kimberley Research Station, Western Australia.

Dr. Muecke succeeds Dr. D. Goodchild of the Division of Plant Industry who, as the Fund's first Chairman, made a substantial contribution to its successful establishment earlier this year.

Dr. Goodchild has had to resign from the Management Committee of the Fund because of an extended overseas visit.

At present some 65% of the staff serviced by the Canberra Regional Administrative Office are contributing to the Fund and over $300 has already been paid into it.

Below: Dr. D. Morton (right) of the Division of Food Preservation's Meat Research Laboratory at Cannon Hill, and Mr. J. T. Wilson of the Division of Entomology, Long Pocket Laboratories, Indooroopilly. Dr. D. Morton is Chairman of the newly-formed Queensland Benevolent Fund and Mr. Wilson, Secretary-Treasurer.

Top Prices for Exotic Bulls

Three Red Sindhi and five Sahiwal bulls were sold for a total of $110,000 last month at the Division of Animal Genetics McMaster Field Station at Badgery's Creek, south of Sydney.

The top price of $22,000 was paid by Dr. F. W. Stone for a 4-year-old Sahiwal bull; the lowest price was $6,500 for a 14-month-old Red Sindhi.

Dr. Stone of Stanley Park, 250 miles north-west of Brisbane, runs a Brahman stud farm. He figured prominently in the recent sale of exotic cattle by the Division at its National Cattle Breeding Station at Belmont, near Rockhampton.

Last month's sale represented the first public release of full blood Red Sindhi and Sahiwal bulls in Australia.

In western Queensland in the last few years the performance of beef cattle crosses between Sahiwals and beef Shorthorns has attracted growing interest and an Australian Red Sindhi and Sahiwal Association is being formed.

Sahiwal and Red Sindhi cattle have been the basis of a cross-breeding and research programme by the Division of Animal Genetics which is aimed at producing a new tropical dairy breed.

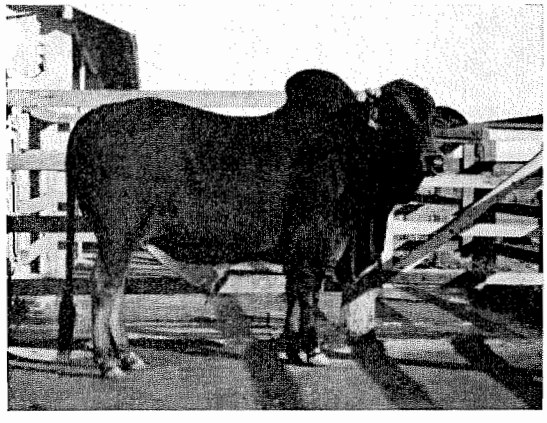
In recent years it has been recognised that they could have an important contribution to make in cross-breeding programmes aimed at developing beef animals, better adapted to the northern Australian environment.

As with other Zebu breeds, the Sahiwals and Sindhis show great tolerance to heat, high resistance to cattle tick and an ability to utilise poor feed.

Their disadvantages, which the Division is trying to overcome by cross breeding with European breeds, include lower milk production than European breeds and a strong maternal instinct which results in a tendency for the female to become dry when her calf is removed.

The cattle sold are the descendants of ten Red Sindhis and eight Sahiwals which were presented to Australia in 1952 by the Pakistan Government.

Below: This four-year-old Sahiwal bull fetched top price of $22,000 at last month's reduction sale at Badgery's Creek.



Holiday Club

The Anglesea Holiday Club is organising work parties at Anglesea on the first three week-ends in October. Anyone who can help should ring **Mr. A. White** at the Division of Tribophysics (34 1614).

The Club also has a share for sale at the present time. If you would like to become a member of the Club and so become eligible for a holiday at Anglesea at very moderate rates, contact **Mrs. Fricker** (83 7862) for further details. Current cost of the share is $220.

Non-members can also have holidays at Anglesea at moderate rates. Bookings are available in February and March (the pick of the season). For details, ring **Miss McDonald** at Head Office (Ext. 234).

Advisory Council

The Advisory Council will meet in Melbourne on Tuesday, 11th, and Wednesday, 12th November.

POSITIONS VACANT

The following vacancies for professional appointments are current:

SCIENTIFIC SERVICES OFFICER—HYBRID COMPUTER (SSO 2/3)—Division of Chemical Engineering—608/102 (3/10/69).

EXPERIMENTAL OFFICER—MUSCLE BIOCHEMISTRY (EO 2/3)—Division of Food Preservation—305/144 (10/10/69).

EXPERIMENTAL OFFICER (EO 1/2)—Division of Horticultural Research—490/197 (10/10/69).

EXPERIMENTAL OFFICER (EO 1/2)—Division of Irrigation Research—500/242 (10/10/69).

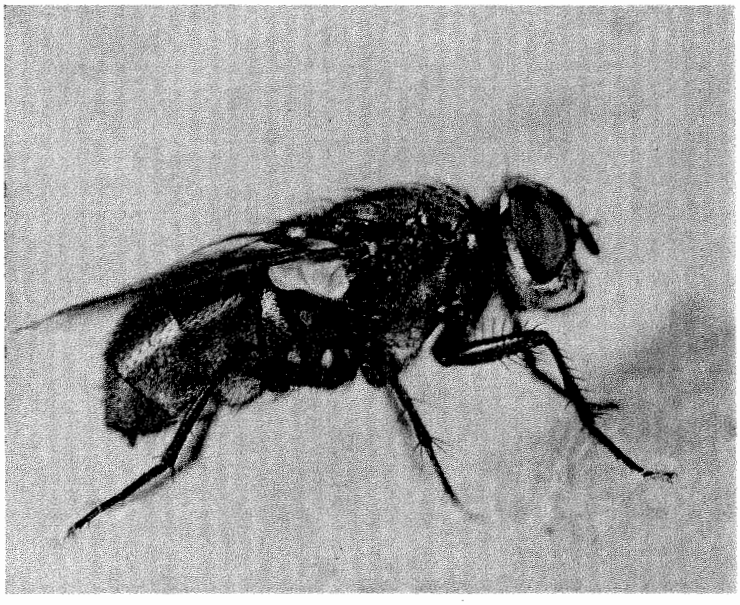
CORROSION SCIENTIST (RS)—Division of Mineral Chemistry—601/97 (10/10/69).

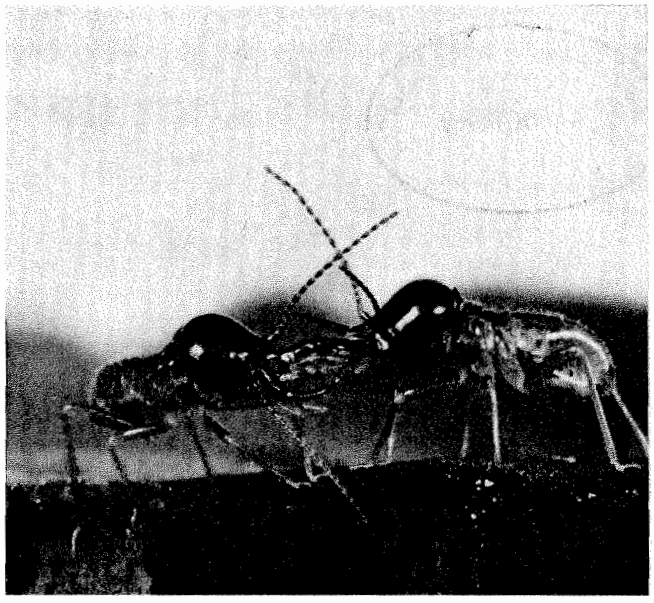
RESEARCH SCIENTIST—MOLECULAR BIOLOGY (RS/SRS)—Division of Plant Industry—130/1029 (10/10/69).

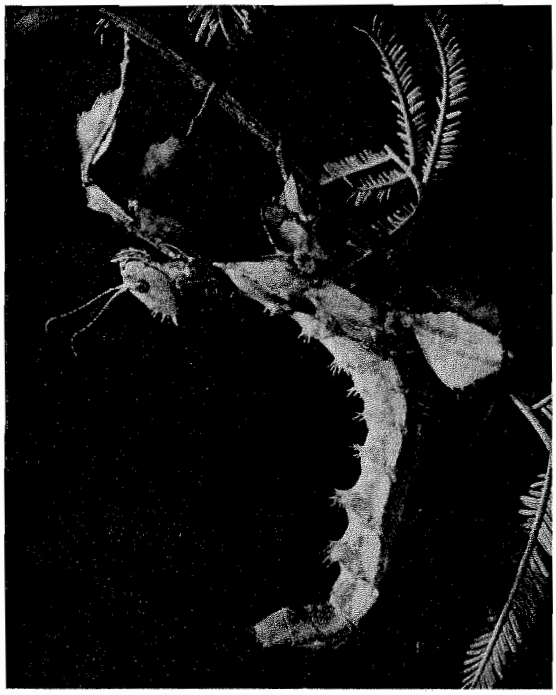
RESEARCH SCIENTIST—LEGUME MICROBIOLOGY (RS/SRS/PRS)—Division of Plant Industry—135/79 (10/10/69).

ENDOCRINOLOGIST (RS/SRS)—Division of Animal Genetics—675/254 (17/10/69).

PHYSIOLOGIST—DINGO STUDIES (RS/SRS)—Division of Wildlife Research—560/262 (31/10/69).







The World of Insects

"as a representative/of the insect world/i have often wondered/ on what man bases his claims/to superiority/everything he knows he has had/to learn whereas we insects are born/ knowing everything we need to know . . . men after thousands of years' practice/are not as well organized socially/as the average ant hill or beehive/they cannot build dwellings/as beautiful as a spider's web/and i never saw a city/full of men manage to be as happy/as a congregation of mosquitoes/who have discovered a fat man/on a camping trip."

From "archy's life of mehitabel" by Don Marquis.

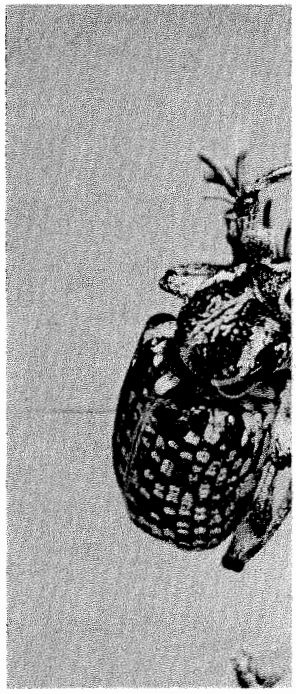
The fascinating world of insects is revealed in these pictures taken by two of Australia's leading photographers of insects, Mr. John Green and Mr. Chris Lourandos, of the Division of Entomology. Mr. Lourandos joined CSIRO in 1949 and has been in charge of the Division's Photography Section since 1960. Mr. Green came to the Division in 1961 from the Australian National University, where he was a photographer with the Department of Astronomy.

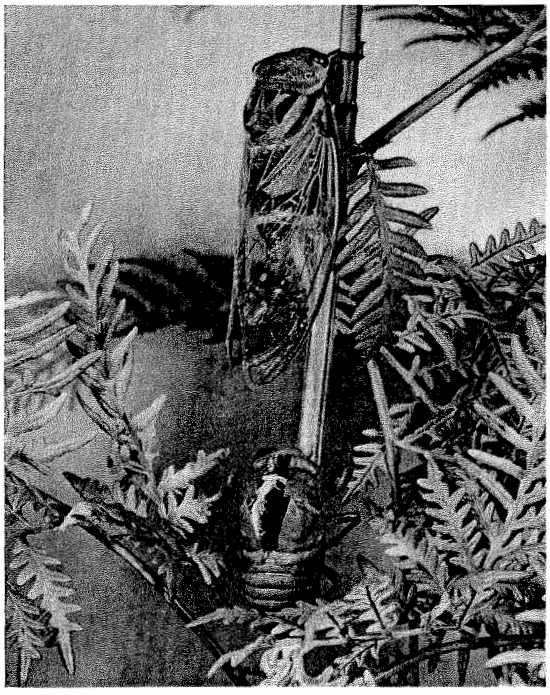
The top row of photographs shows a sheep blowfly *(Lucilia cuprina)*, soldiers of the Australian harvester termite *(Drepanotermes rubriceps froggatt)* in aggressive display, and a female of the parasitic wasp *(Myrmecomimesis semiglabra)* laying an egg in a phasmid egg.

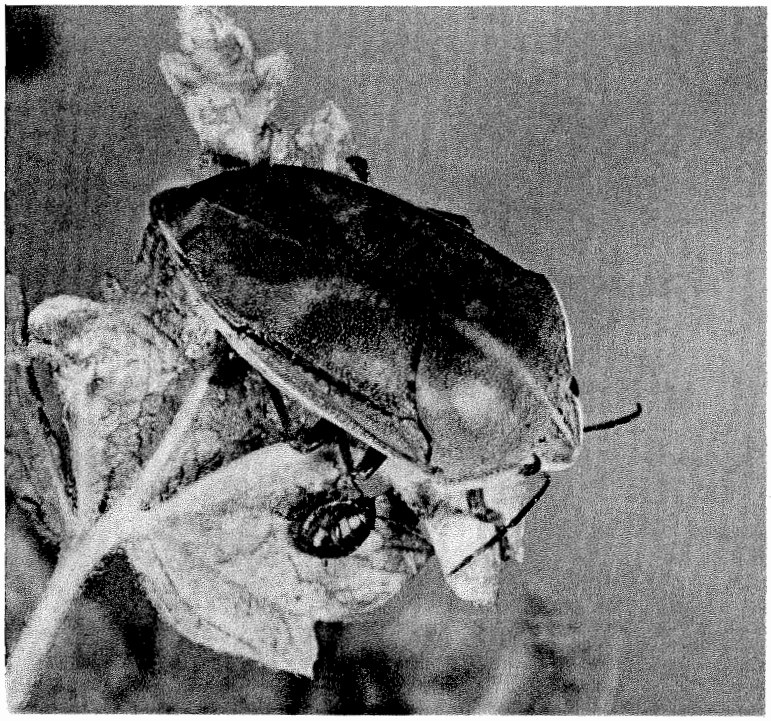
The middle row shows an adult female phasmid *(Euryenema goliath)*, a species from the northern tropics of Australia, a Botany Bay diamond weevil *(Chrysolophus spectabilis)*, and a male and female leaf beetle *(Paropsis atomaria)*.

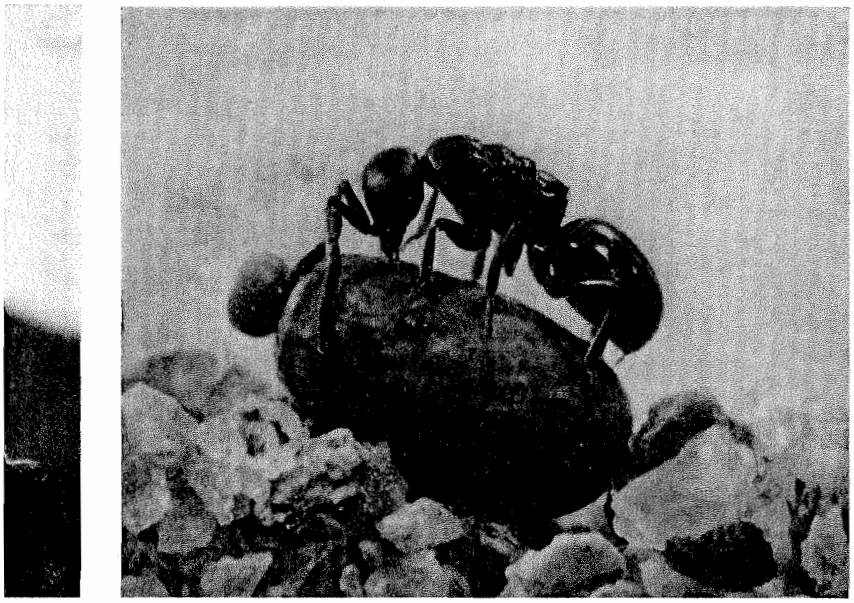
The bottom row shows a newly-emerged double drummer cicada *(Thopha saccata)* with nymphal case, an adult and an immature stage of a shield bug *(Coleotichus costatus)* on a gooseberry leaf, and a giant burrowing cockroach *(Macropanesthia rhinoceros)* from the dry country of northern Queensland.

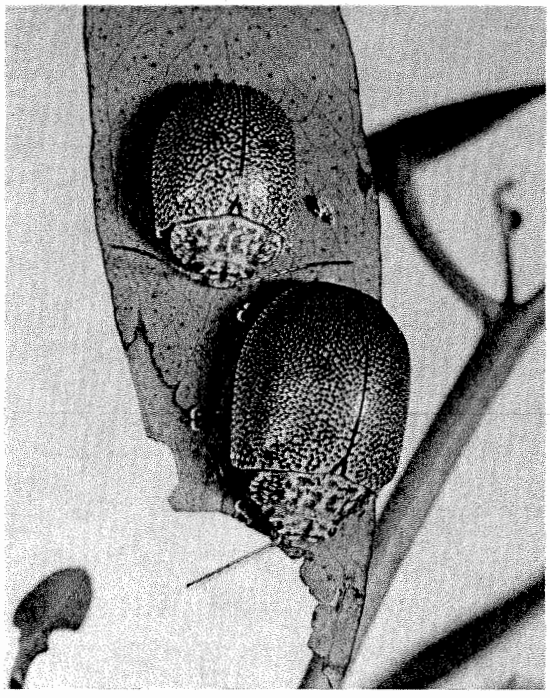
The photographs of the blowfly, termites, parasitic wasp, phasmid, and giant cockroach were taken by Chris Lourandos and the remainder by John Green.

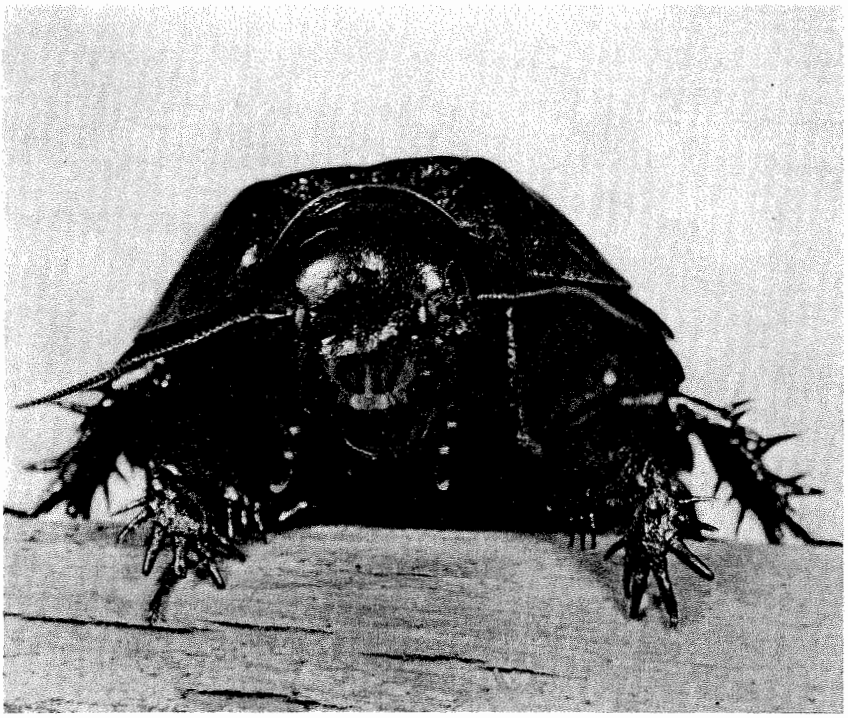












News In Brief

Doctorate

The Chairman, **Sir Frederick White,** was awarded the honorary degree of Doctor of Science at the Australian National University last month.

ANZAAS Chairman

The Chairman, **Sir Frederick White,** has been elected the first Chairman of ANZAAS. The appointment is for a three year period.

At a meeting in Adelaide last August, the Council of ANZAAS agreed to reconstitute the Association to allow for a reduction in the size of the Council from 300 to 20 and to give encouragement to the States to form groups for organizing individual meetings on specific subjects of community interest.

Sir Frederick said that the new constitution would allow ANZAAS to align itself towards being an interface between science and the public.

Professor

Mr. R. G. Pearson of the Division of Forest Products has been appointed Associate Professor of Wood Mechanics at the North Carolina State University, Raleigh, United States.

Visiting Professor

Dr. R. C. Gifkins of the Physical Metallurgy Section has been granted six months leave of absence to take up an appointment as Visiting Professor in the Metallurgy Department of the University of British Columbia, Vancouver.

Agricultural Fellows

Two members of CSIRO have been made Fellows of the Australian Institute of Agricultural Science.

They are the Officer-in-Charge of the Kimberley Research Station, **Dr. A. J. Millington** of the Division of Land Research, and **Mr. D. V. Walters,** who is on secondment to the Queensland Department of Primary Industries from the Head Office Agricultural and Biological Sciences Branch.

Food Fellow

Dr. J. N. Olley of the Division of Food Preservation has been elected a Fellow of the Institute of Food Science Technology, Britain.

Gift to Library

During 1967-68, **Dr. Katie Helms** of the Division of Plant Industry spent twelve months at the University of Freiberg, Germany, on a fellowship from the Alexander - von - Humboldt Foundation. Following this, the Foundation has made a gift of German scientific books, chosen by Dr. Helms, to the Canberra Laboratories Library.

Transfer

Miss Sheila O'Connor, who has been secretary to successive Chief Scientific Liaison Officers in the Australian Scientific Liaison Office, London, during the past eight years, has transferred to the staff of the Official Secretary in the Australian High Commission at Australia House.

New Book for Sheep-Breeders

"Quantitative Genetics in Sheep-Breeding" by **Helen Newton Turner** and **S. S. Y. Young** has been published recently by the Macmillan Co. of Australia Pty. Ltd.

It is the first book to set out in detail those parts of the theory of population genetics that are relevant to animal breeding and to carry the discussion through to applying that theory in practice.

The sheep is used as an illustrative animal, and much useful information is summarized in tabular form.

The authors draw on the whole field of animal breeding research, but include also a crystallization of their own original contributions.

Miss Turner has led the sheep breeding research team in the Division of Animal Genetics since 1956. Dr. Young was a member of the team for ten years. He left in 1967 to accept a chair in genetics at the Ohio State University.

SAFETY NOTES

Avoiding Burns

All too many children are burnt and scalded each year because of their parents' lack of awareness of the everyday dangers that surround children.

Many parents underestimate the inquisitiveness of a child. They are too ready to believe that their children aren't able to reach and light matches, stumble into an open fire, or pour boiling water over themselves.

To prevent scalding, keep teapots out of reach and always turn the handles of cooking utensils towards the centre of the stove.

Run cold water into the bath before the hot. But remember, after the hot water has been running the tap will be hot, so run the cold tap again for a short while.

Avoid overhanging tablecloths, particularly when teapots, hot water jugs, and other containers of hot liquids are on the table.

If someone is unlucky enough to get scalded, the most effective first aid measure is to run cold water over the affected area for as long as is necessary to take the sting out.

The Perils of Pills

In this pill-taking society of ours, the most effective way of keeping pills out of the hands of children is to keep the pills in a medicine cabinet, preferably locked, high up on the wall.

As a second line of defence, one can store pills in special vials which have been designed to prevent children from removing the lids. Some chemists are now using these vials. Is yours?

Death Trap

To a child, that old refrigerator seems a good place to hide. All too often, however, old refrigerators have proved to be death traps.

They have no provision for opening doors from the inside, they are insulated, and they are airtight.

If you know of any old refrigerator that is no longer used, have the door taken off. Children will play just as happily with it and there won't be any tragic consequences.

L. C. R. Thompson, Safety Officer.

New Appointees

Mr. N. D. Bowey has been appointed to the Division of Animal Genetics to carry out research on nucleic acids of animal cells and their significance in differentiation. Mr. Bowey graduated B.Sc. from the University of Adelaide last year and since then has been working as a bacteriologist at the Repatriation General Hospital, Adelaide.

Mr. W. M. J. Ellul has joined the Division of Mechanical Engineering to carry out research on heat and moisture transfer. Mr. Ellul graduated B.E. with honours from Monash University last year and since then has been working as an engineer with the Department of Supply.

Mr. L. R. Fisher has been appointed to the Division of Food Preservation to study the properties of thin films of water. Since graduating M.Sc.

Mr. L. R. FISHER

from the University of Sydney in 1965, Mr. Fisher has been carrying out research in the University's Pharmacy Department.

Dr. J. S. Godfrey has joined the Division of Fisheries and Oceanography to study the physical structure of the East Australian Current. Dr. Godfrey graduated B.Sc. with honours from the University of Tasmania in 1961, and Ph.D. from Yale University in 1968. He has spent the last twelve months at Harvard on a Divisional Postdoctoral Studentship.

Mr. A. R. Kerr has joined the Division of Radiophysics to carry out research in radio astronomy, particularly in the field of amplifying and receiving equipment. Since graduating M.Eng.Sc. from the University of Melbourne in 1966, Mr. Kerr has been studying for his Ph.D. at the same university.

Mr. P. J. Ketterer has been appointed to the Division of Animal Health to carry out research on bovine babesiosis. After graduating B.V.Sc. with honours from the University of Queensland in 1962, Mr. Ketterer spent four years with the Western Australian Department of Agriculture. Since 1967 he has been in private practice in Western Australia.

Mr. R. W. Murnain has been appointed to the Staff Section at Head Office where he will be associated with the administration of the Organization's

Mr. R. W. MURNAIN

postgraduate studentship scheme. Mr. Murnain graduated B.Sc. with honours recently from the University of Newcastle.

Dr. P. M. Outteridge has joined the Division of Animal Health to carry out immunological research, particularly in fields relevant to myco-

Dr. P. M. OUTTERIDGE

bacterial infections. Dr. Outteridge graduated B.V.Sc. from the University of Sydney in 1963 and Ph.D. from the same university in 1967. Since 1967 he has been a research immunologist at the School of Veterinary Medicine, University of California.

Dr. H. Mamers has been appointed to the Division of Chemical Engineering to study heat and mass transfer. After graduating B.Sc. with honours from the University of Birmingham in 1962 and Ph.D. from the same university in 1965, Dr. Mamers spent twelve months with the SASOL Corporation in South Africa. He has spent the last three years as a research engineer with Australian Paper Manufacturers Limited.

Mr. H. Rosser has been appointed to the Division of Soils to study the micro-distribution of elements in soils and associated materials. Mr. Rosser obtained his Diploma of Applied Physics from the Glamorgan College of Technology, Wales, in 1961. Since 1960 he has been with Cambridge Scientific Instruments Limited, England.

Dr. M. L. Sharma has joined the Division of Plant Industry to study soil-water relations on their effect on production processes in a semi-arid environment. Dr. Sharma graduated B.Sc.Ag. from the B.R. College, Agra, India, in 1961, M.Sc. from the Indian Agricultural Research Institute, New Delhi, in 1963, and Ph.D. from the University of Hawaii in 1966. From 1967 to 1968 Dr. Sharma was Assistant Soil Physicist at the University of Hawaii and for the last year he has been a research associate at Purdue University, Indiana.

Dividing the sheep from the goats may seem a simple task, but it can be a fair cow when you have to deal with geeps (or are they shoats?). The mother of this strange animal, who by all accounts was a bit of a dark horse, was apparently led astray by a passing buck (a sheep in wolf's clothing?). No wonder the offspring of this capricious union looks a crazy mixed-up kid. Having taken blood samples from the klamb(?) to resolve the poor fellow's ancestry, Beverley Watt and Ron Camp of the Parkville Laboratory of the Division of Animal Health do their best to put his confused mind at rest.

Mr. A. J. Vezis has been appointed to the Division of Animal Genetics to design and develop equipment associated with automatic data-logging, telemetry, and computer facilities. Since graduating in electrical engineering from the University of Melbourne in 1967, Mr. Vezis has been an engineer with the Postmaster-General's Department.

FINANCE FOR HOUSING

Since the A.M.P. Society's housing scheme for CSIRO officers commenced thirteen years ago, 123 members of the Organization's staff have received housing finance totalling $1,049,260.

During 1968-69 two officers obtained advances from the A.M.P. Society — one for $11,000 and the other for $18,000.

The general situation regarding housing finance during 1968-69 was much the same as for the previous financial year. Long-term finance was available from the Savings Banks, Trading Banks, and other lending institutions, although waiting periods of several months applied in many instances.

Last year the interest rate charged by the A.M.P. Society on housing loans ranged from 6¼% to 7% a year, according to the amount of the loan.

This rate was between 1% and 1¼% higher than that charged by the Savings Banks. Also, it was necessary for any officer joining the A.M.P. Scheme to take out life insurance cover with the Society for the amount of the loan.

However, the A.M.P. Housing Scheme is still attractive to a limited number of CSIRO personnel because the Society is prepared to advance up to 80% of their valuation of a property.

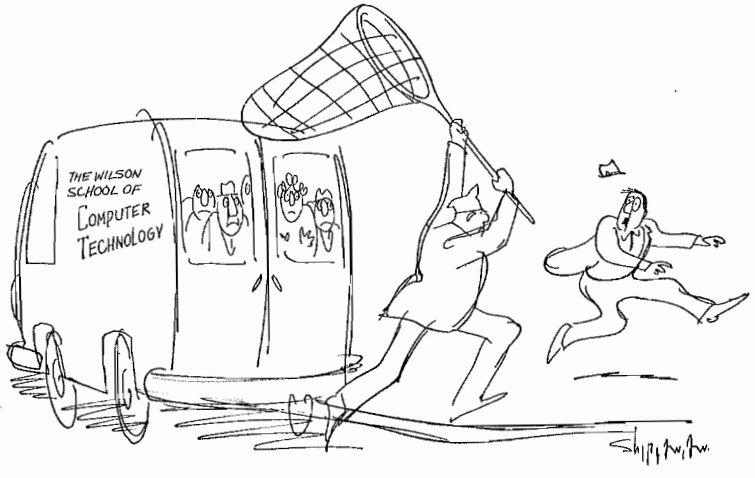
Although the Society has a formal limit of $15,000 on the amount of a loan this can be extended in special circumstances. Most Savings Banks will not advance more than $8,000.

Enquiries about the scheme should be directed to **Mr. R. W. Viney**, Finance Manager, Head Office.

Deadline

Contributions to the November issue of Coresearch should reach the Editor at 314 Albert Street, East Melbourne, by Wednesday, 15th October, 1969.

Printed by CSIRO, Melbourne



"But I don't want to be a computer programmer!"

Courtesy "New Yorker".

FUZZPHRASE COMPUTER

The Fuzzphrase Computer is a semi-automatic device for generating striking or memorable phrases in memoranda, telephone conversations, proposals, spec negotiations, or other occasions requiring obfuscatory capability.

Take any random three-digit number and choose from columns A, B and C, respectively, the words corresponding to each digit. (For instance the number 792 is optimal third-generation flexibility — and just think how many times you could use THAT).

A	B	C
1. Integrated	1. Management	1. Options
2. Total	2. Organisational	2. Flexibility
3. Systematised	3. Monitored	3. Capability
4. Parallel	4. Reciprocal	4. Mobility
5. Functional	5. Digital	5. Programming
6. Responsive	6. Logistical	6. Concept
7. Optimal	7. Transitional	7. Time-phase
8. Synchronised	8. Incremental	8. Projection
9. Compatible	9. Third-generation	9. Hardware
0. Balanced	0. Linear	0. Contingency

CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 128, MELBOURNE, NOVEMBER 1969

Death of Noted Radar Pioneer

Sir John Madsen, who helped pioneer Australian radio and radar research, and who played a major role in the development of national engineering standards, died last month at the age of 90.

Sir John was Australia's first Professor of Electrical Engineering and held this post at the University of Sydney from 1920 until his retirement in 1948.

He began a close association with CSIR when it was established in 1926 and made many important contributions to its development.

He was actively associated with the foundation and development of the Standards Association of Australia, and in 1926 CSIR invited him to set up a committee to advise it on Australia's engineering standards requirements.

In 1938 he was appointed chairman of the committee of CSIR's new National Standards Laboratory. The development of national standards of measurement proved vital to the growth of mass production industries in Australia.

In 1927 Sir John persuaded CSIR to establish a Radio Research Board to undertake basic studies in the infant science of wireless.

The Board, made up of representatives of CSIR, the P.M.G.'s Department, universities and the services, appointed a number of physicists to conduct research on radio propagation.

These studies led the Board's scientists to adopt and develop electronic techniques for studying the ionosphere using pulse methods which were later applied in the science of radar.

When it became necessary at the start of World War II to organize work on radar in Australia the Radio Research Board provided the initial nucleus of scientists for the project.

Sir John was appointed Chairman of the CSIR Radiophysics Advisory Board set up as a result of secret consultations between the British and Australian governments to organize work on radar for the Australian forces and to undertake the local manufacture of equipment.

With the help of the P.M.G.'s Department and the Department of Munitions Directorate of Radio and Signal Supplies, the Board's Australian radar enterprise grew rapidly. The programme eventually embraced more than 2,000 items of service equipment.

In 1941 Sir John was appointed Director, Research Liaison (Physics and Engineering) to head a CSIR overseas scientific research liaison group covering Britain, Canada and the United States. He was knighted the same year.

After the war Sir John enlisted the co-operation of member organizations of the Electricity Supply Association of Australia in establishing an Electrical Research Board to give financial support to research on electrical engineering in Australian universities.

He was Chairman of the Board from 1945 to 1966.

Sir John also served on a number of CSIRO advisory committees dealing with research on radio waves, meteorology, and atmospheric physics.

From 1944 to 1948 he was Dean of the Faculty of Engineering at the University of Sydney and a Fellow of the University Senate.

Sir John, who lived in Sydney, is survived by two sons and a daughter.

RARE BOOK FIND AT CAMDEN

The Canberra Laboratories Library has acquired a collection of 18th and 19th century botanical books and journals from Camden Park, home of the Australian wool industry pioneer John Macarthur.

These volumes are very valuable to modern taxonomists as they contain the first botanical descriptions of many Australian plants.

There are about 250 volumes in the collection, and some of them were not previously held in Australian libraries. Many are illustrated with hand coloured plates.

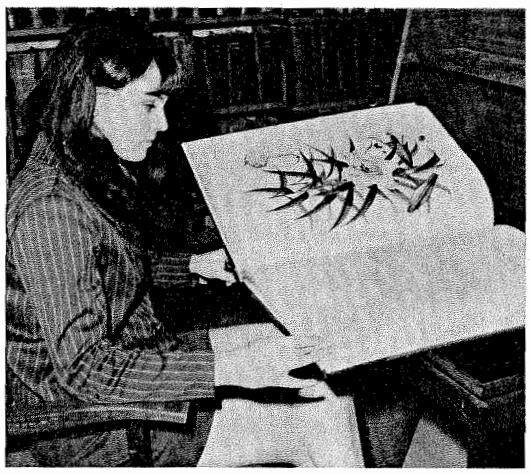
CSIRO learnt of the collection at Camden Park when Dr. P. W. Michael of the Division of Plant Industry was tracing the origin of the Scotch thistle, an important weed, in the Camden area.

He found that the thistle had apparently spread from the family graveyard at Camden Park. It had probably been planted there as an ornamental flower.

Dr. Michael saw the collection of botanical volumes when he visited the homestead.

John Macarthur's sons, James and William, were amateur botanists and collected much of the material.

The collection includes about 50 volumes of Curtis' Botanical Magazine from about 1780 to 1830, the Journal of Botany from its inception in 1834 up to 1857, the journal Flores de Serres from 1845 to 1880, and Loddiges Botanical Cabinet, 1817 to 1826.



Diana Henderson of the Canberra Laboratories Library consults a volume from the collection — a rare monograph on the genus Lilium by H. J. Elwes, published between 1870 and 1880.

Another Good Year for Credit Society

The CSIRO Co-operative Credit Society continues to grow, and at the Society's twelfth annual meeting at Head Office on 29th October, the Directors reported that membership had increased by 232 to a total of 2,371 during the last financial year.

The net increase in capital for the year was about $275,000, with total capital rising to more than $1.6 million.

Loans totalling more than $600,000 were made to 408 members during the year and the total amount of loans outstanding at the end of the financial year was $1,508,600.

The Directors said the Society's financial position was sound.

They said the investment rates offered to depositors remained attractive and it had been decided not to alter them at present.

Borrower interest rates would also remain unchanged.

The Directors reported that the Manager of the Society, Mr. J. Belkin, had visited several Divisions and Sections in Melbourne, Sydney, and Canberra during the last financial year to spread information about the Society.

Mr. Belkin had discussed individual problems with members and answered questions on the Society's policy and procedures.

"These visits do much to develop good relations between the Society and the staff of the Organization and make the staff more aware of the assistance the Society can give in times of financial difficulty," the Directors said.

"It is intended that the Manager extend these visits to other States during the next financial year."

The Directors have pointed out that the interest rate on loans (7¼% adjusted quarterly on the amount owing) is highly competitive with finance available from other sources — particularly when other factors such as the death indemnity and disability cover are taken into account.

Sir Frederick White was presented with a trophy last month at a reception in Sydney for Australia's ten best dressed women. The Prime Minister, Mr. Gorton, presented Sir Frederick with the Lady Fairfax Award in recognition of the outstanding contribution of CSIRO to the wool industry. The reception was held at Fairview, the Double Bay home of Sir Warwick and Lady Fairfax, to raise money for the Australian Musical Foundation. The elaborate trophy was donated by Sir Warwick and Lady Fairfax. It was made by a Melbourne silversmith about 1862. Our picture shows Sir Frederick receiving the trophy from Mr. Gorton.

POSITIONS VACANT

The following vacancies for professional appointments are current:

LIBRARIAN (Librarian 3) — Central Library — 118/196 (7/11/69).
POSTGRADUATE STUDENTSHIP IN PLANT SCIENCE — Rangelands Research Unit — 951/7 (7/11/69).
EXPERIMENTAL OFFICER (EO 1/2) — Division of Computing Research — 900/138 (10/11/69).
EXPERIMENTAL OFFICER (EO 1/2) — Division of Entomology — 180/517 (14/11/69).
EXPERIMENTAL OFFICER (EO 1/2) — Division of Irrigation Research — 500/242 (14/11/69).
EXPERIMENTAL OFFICER (EO 1/2) — Wheat Research Unit — 651/31 (14/11/69).
PLANT ECOLOGIST (EO 1/2) — Division of Land Research — 951/6 (14/11/69).
ELECTRON MICROSCOPIST (RS/SRS) — Division of Textile Industry — 464/472 (14/11/69).
ANIMAL PHYSIOLOGIST (SRS/PRS) — Division of Food Preservation — 305/147 (14/11/69).
CHEMIST (EO 2/3) — Division of Tropical Pastures — 850/335 (28/11/69).
RESEARCH SCIENTIST IN SOLID STATE CHEMISTRY (RS) — Division of Mineral Chemistry — 601/99 (28/11/69).
RESEARCH ENGINEER/SCIENTIST (AERODYNAMIC INVESTIGATIONS) (RS/SRS) — Division of Mechanical Engineering — 430/283 (28/11/69).
RESEARCH SCIENTIST (BIRD STUDIES) (RS/SRS) — Division of Wildlife Research — 850/338 (28/11/69).
BIOCHEMIST (RS/SRS/PRS) — Division of Animal Physiology — 245/468 (28/11/69).
ELECTRON MICROSCOPIST (RS/SRS/PRS) — Division of Animal Physiology — 245/468 (28/11/69).

Remote Sensing – An Aid to Land Resource Surveys

In recording images of land surface characteristics, the panchromatic film most commonly used in aerial photography uses only part of the electromagnetic spectrum, but it does provide a considerable amount of information, providing trained personnel are available for the interpretation of photographs.

There is, however, a greater scope for the recognition and differentiation of ground information if colour sensitive film is used.

A hand held colour photograph taken from a satellite flight and covering an area of Central Australia previously surveyed and mapped by the Division of Land Research, showed a high correlation between the map and the photograph, but in some respects the space photograph showed detail which had not been discerned on the black and white aerial photographs available for the survey.

If colour photographs taken at satellite height were available for the whole of Australia, the construction of a broad land type map of the whole country would be greatly facilitated.

The scope for detection by photography is further extended by the use of films sensitive in the near infra-red section of the spectrum which provides a different array of photographic responses.

Multi-band photography extends the possibilities still further. This is the use of a number of film and filter combinations to sample different parts of the visible and near visible spectrum.

By projecting the several images through different combinations of filters, it is possible to separate many features visually which are not discernible in single-band photography.

At longer wavelengths in the infra-red through to radar, photographic methods are not possible, but the reflected radiation can be sensed and recorded electronically on tape by devices which automatically scan the land surface, giving continuous spatial coverage.

The output from these can be displayed on a T.V. screen or recorded as permanent images on film and used in a similar way to photographs, but at present these methods have considerably lower resolution than direct photography.

Because different materials at the earth's surface have different reflective properties, the use of a wider array of wavelengths than in the photographic range extends the possibility of differentiating objects and of sensing different attributes.

For example, if the human eye can differentiate between ten shades ranging from white to black as presented by panchromatic photography, the use of three different wavelength bands with equivalent differentiating powers would provide 1,000 possible combinations from which to select individual signatures of particular land surface features.

Other forms of sensing may also have application to land resource studies, for example, gamma ray and other techniques being used in geological and mineral studies.

The two articles on this page have been taken from the Farrer Memorial Oration which was delivered at the University of Sydney on September 15 by Mr. C. S. Christian of the Executive. In his oration, titled "Land resources and land research", Mr. Christian discussed the development of modern approaches to land research and land assessment and examined future possibilities and problems. Before the oration, Mr. Christian was awarded the Farrer Memorial Medal for 1969 in recognition of his outstanding contributions to agriculture in the field of utilization of land resources.

The usual visual interpretation of photographs provides information directly but is dependent upon the skill of the operator. The process is slow and becomes more so with the use of multiple imagery.

Attention has, therefore, been directed to automatic techniques of image interpretation.

This has been applied both to images derived from direct photography and from electromechanical scanning devices.

Some of the achievements recorded to date are impressive.

For example, at Purdue, an airborne multi-band optical mechanical scanner has provided an automatic computer print out of areas of different agricultural crops. A 90% success in identification has been claimed.

The value of such methods is at present restricted to situations such as in agriculture where discrete areas of very uniform characteristics can be identified.

It is conceivable that similar processes could apply to the recognition of landscape patterns, but it is unlikely that a high degree of precision could be achieved without a considerable amount of ground control.

Another method of extracting data from actual photographs is the use of automatic stereo scanning equipment to record terrain height data. Such data can be analysed to give quantified land form descriptions.

The present state of the art of remote sensing is illustrated by the fact that the United States proposes to launch in 1972 an Earth Resources Technology Satellite (E.R.T.S.) and at a later date a satellite to record data for agricultural use only.

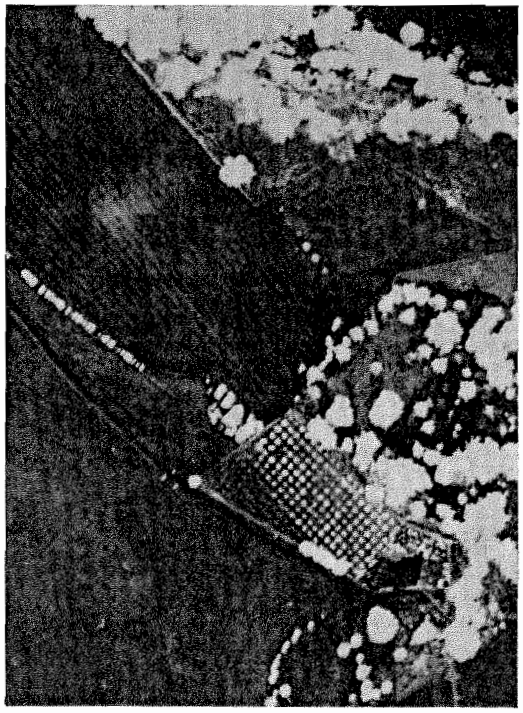
The agricultural satellite will be placed in an orbit which will make it synchronous with the sun.

Apart from carrying various multi-spectral sensing devices, this satellite will have data collecting equipment which will be able to interrogate fixed ground installations, designed to transmit information on such items as water levels of lakes and streams, atmospheric data, surface temperature, soil moisture, or snow depth.

Providing these new sensing devices can be developed to give adequate resolution, the possibilities for observing agricultural phenomena from satellites and aircraft become enormous, particularly if multiple satellite systems are eventually established, permitting more frequent observations.

Some of the possibilities being examined are:

- the collection of census data for crop areas; progress observations on crop condition and yield estimates; recognition of some soil nutrient deficiencies; monitoring soil moisture conditions and irrigation requirements.
- weather forecasting.
- progressive observation of the development of drought conditions and fire hazard conditions; observation of rainfall patterns and the monitoring of vegetation condition in pastoral areas.
- early warning of the development of crop or forest disease and insect infestation.
- soil erosion changes.
- water leakages from irrigation channels and from aquifers to the sea; assessment of surface water resources.
- collection of information that could be of value in detecting mineraliferous areas.
- collection of oceanographic information related to marine resources and phenomena.



This aerial photograph of part of the Araleun Valley in south-eastern N.S.W. was taken using an infra-red film. Living vegetation is highly reflective in the near infra-red band of the spectrum. That is why the trees at the right and top of the picture and in the orchard (lower, centre) have come out white. The images of individual trees in the orchard give an indication of their vigour. The photograph was taken from about 4,000 ft. above ground level.

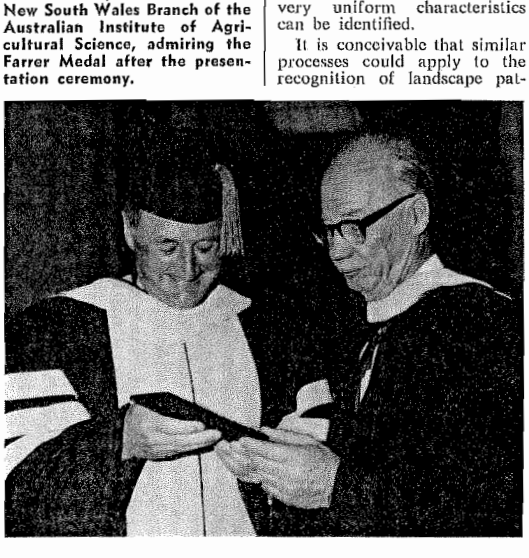
The possible significance of these techniques can be illustrated by two examples, one at the global and the other at the national level.

Any single nation having the facility to acquire prior knowledge of world crop situations by satellite records would have a distinct advantage in the marketing of its own primary produce over countries lacking this facility.

Australia would not want to be one of the latter.

The second relates to possibilities of drought monitoring.

(Continued on page 4)



Mr. G. S. Christian and Dr. O. G. Carter, President of the New South Wales Branch of the Australian Institute of Agricultural Science, admiring the Farrer Medal after the presentation ceremony.

Conservation and Land Use

Conservation means more than mere preservation. Rational utilization of resources is the keynote to modern land conservation concepts.

Intrinsic in this positive approach is the concept of the ecological management of land resources.

The ultimate objective in the rational use of land, so far as is practicable in a complex community, and taking into account the needs of the future, as well as the present, is to have different land types used for the purposes to which they are best adapted and most appropriately allocated, e.g., to forests, watersheds, arable lands, pastoral lands, mixed agriculture, irrigation, urban and industrial areas, recreation lands and tourist reserves, and special reserves selected to preserve adequate samples of the inherited natural biological capital of the nation.

A second objective, with the same reservations about practicability, is to have lands managed in a way that not only maintains or improves productivity or other virtues of value to the community, but also avoids detrimental repercussions on other areas or other resources.

There is a third objective involved in ecological management, namely that associated lands should be both allocated and used in a manner which capitalizes on the profitable interactions between them.

It is necessary to realize, however, that there is now an existing pattern of land use which has resulted from natural limitations, historical accidents, past economic influences, and previous land tenure policies. It cannot easily be disturbed without good reason.

Changes to a more desirable pattern must necessarily involve many conflicting interests.

It is here that it becomes so necessary for firm attitudes to be taken on what represents the best use of land in the community's interest and in the interests of future communities.

If such attitudes are to be generally acceptable, a background of sound information about all types of land and their significance and behaviour under different circumstances becomes essential.

Unfortunately, many land use developments involve changes which are irreversible, or at least very difficult or costly to reverse.

For example, once arid and semi-arid regions are severely degraded by over-grazing, it can take decades or even centuries for a stable vegetation and surface soil to be re-established.

Forest unnecessarily cleared may take many decades to regenerate.

Changes in surface and subsurface water regimes following land development can degrade land permanently by the accumulation of salt or by other repercussions.

The effects of establishing a large dam and an irrigation scheme are equally irreversible and engineering works, which unnecessarily scar the landscape, can destroy its aesthetic as well as its physical qualities.

This irreversibility further emphasizes the importance of knowing and taking into account the consequences of any projected change in the use of land.

News In Brief

Leighton Memorial Medal

Dr. J. R. Price of the Executive has been awarded the Leighton Memorial Medal for 1969.

The award, which was established in memory of the late A. E. Leighton, a distinguished chemist, technologist and administrator and a former President of the Royal Australian Chemical Institute, is made in recognition of eminent service to chemistry in Australia.

Doctorates

Dr. D. H. Solomon of the Division of Applied Mineralogy has been awarded the degree of Doctor of Science by the University of New South Wales for his work on the chemistry of coating compositions.

Mr. I. W. Vallis of the Division of Tropical Pastures has been awarded the degree of Doctor of Philosophy by the University of Queensland. His thesis was entitled "The measurement of gains and losses of nitrogen in grazed pastures".

McMaster Fellow

Dr. F. W. Jennings of the University of Glasgow's Department of Veterinary Biochemistry is spending a year at the Division of Animal Health's McMaster Laboratory, Sydney, as an Ian McMaster Fellow.

He has joined a team studying biochemical disturbances resulting from internal parasitic infection of sheep.

Glasgow Graduates Association

A Glasgow Graduates Association of N.S.W. has been formed in Sydney.

Graduates of Glasgow University or "similar Glasgow seats of learning" are invited to contact Dr. W. N. Shand at 229 Macquarie Street, Sydney 2000.

Fellow

Mr. H. Kobler of the Division of Physics has been elected a Fellow of the Institution of Engineers, Australia, and a Senior Member of the Institution of Radio and Electronics Engineers, Australia.

Dinner Dance

The CSIR Ski Club will hold its annual dinner dance at 9 Darling Street, South Yarra, on Saturday, 29th November, beginning at 7 p.m.

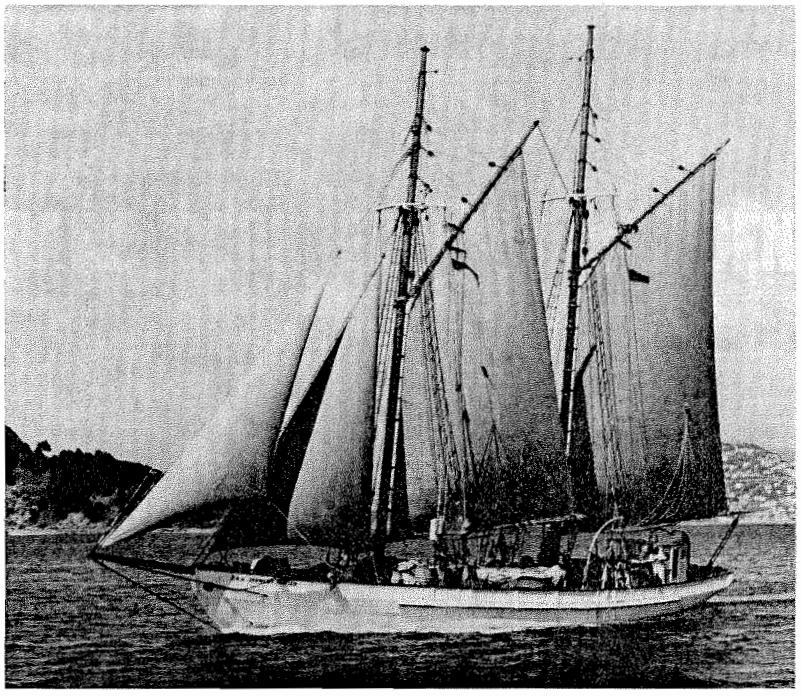
Savouries, sherry, a four course meal, coffee, and late supper will be served, and Dennis Farrington's band will supply dance music to midnight.

Tickets, at $6 a single, are available from **Mrs. M. Wailes,** 58 Hanby Street, Brighton (telephone 92 8937).

Walk on Want

Miss Diane Nicholas of the Central Library will represent Head Office in Community Aid Abroad's annual "Walk Against Want" on Friday, 12th December.

Diane (telephone 419 1333, ext. 243) will walk 18 miles from Melbourne's Myer Music Bowl to Ringwood and is looking for supporters who will back her at 10 cents a mile.



Fisheries Boat in New Role

Australia's first oceanographic vessel, the 80 ton 75 ft. schooner Derwent Hunter, has a new starring role — in a TV series.

Derwent Hunter, built in Tasmania in 1945, was owned by CSIRO from 1950 to 1962.

Now, rechristened the Pacific Lady, it is the "real star", according to TV Times, of the NLT Productions' colour series, The Rovers.

The Rovers tells of the adventures of a crusty old sea salt whose schooner is hired by a wildlife photographer. The other main characters are a pretty woman reporter who shares the photographer's exploits, the sea salt's 11-year-old grandson, a koala, a cockatoo, and a wombat.

The below decks portion of the schooner is the permanent set for the series which is being filmed on the Hawkesbury River, north of Sydney.

Derwent Hunter was built as a fishing vessel for Tasmanian waters.

CSIRO bought it in 1950 and used it until 1956 for research on fisheries between the Great Australian Bight and ports north of Sydney.

Then the Division of Fisheries became the Division of Fisheries and Oceanography, and Derwent Hunter became Australia's first oceanographic vessel.

It was used for research on the movements of water in and out of the Tasman Sea, the structure and track of the East Australian Current System, and the type, amount, and fluctuations of minute life in the area.

In 1959 the Navy made available to CSIRO facilities for oceanographic research on two frigates of 1,600 gross tons, HMAS Diamantina and HMAS Gascoyne.

CSIRO's oceanographic work was transferred from the Derwent Hunter, but the Division continued to use the schooner for tuna studies until 1962, when it was sold.

Now it is owned by a Sydney boating enthusiast and is on charter to NLT Productions for the duration of The Rovers.

NEW BOOK ON KANGAROOS

"A major contribution to the intelligent layman's understanding of the biology and basic conservation needs of a major element of the Australian fauna."

That is how Graham Pizzey in the "Herald", Melbourne, described Kangaroos, a new book by Dr. H. J. Frith and Mr. J. H. Calaby of the Division of Wildlife Research.

In a preface to the book, Dr. Frith and Mr. Calaby say they have attempted to collate biological data about kangaroos to form a basis on which kangaroo control and conservation might be more logically discussed.

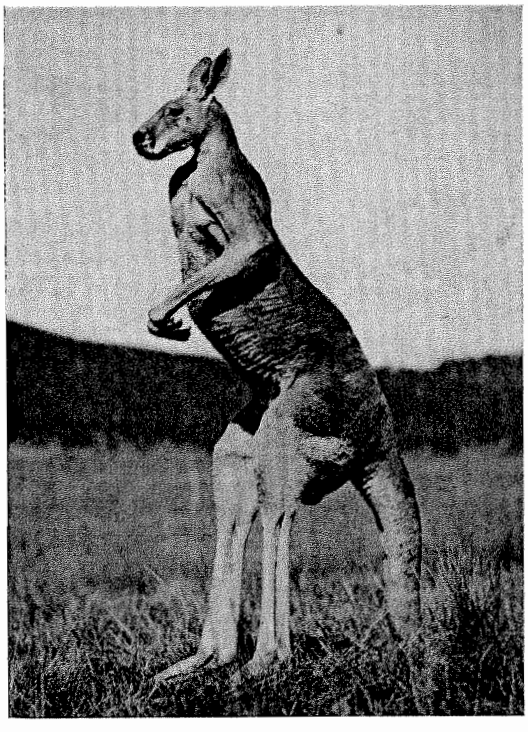
Chapter headings include evolution, distribution, abundance, behaviour, breeding, economics, populations and conservation.

The authors conclude that there seems to be no reason why all interests cannot be catered for in a well controlled management programme.

"Australia is a vast country," they write, "and with proper management there is room for the people, the industries, the stock, and the wildlife — provided we all realize the need for a positive approach to conservation before the chance passes.

"Our record in conservation so far has been poor."

Kangaroos, published by F. W. Cheshire, contains numerous line drawings and colour illustrations by Frank Knight and photographs by Ederic Slater.



VISITORS TO HOBART

Two scientists from overseas have started work recently at the Tasmanian Regional Laboratory at Hobart.

They are **Professor G. Bunemann,** Director of the Institute of Horticulture in West Berlin, and **Dr. R. C. Little,** a soil scientist with the National Agricultural Advisory Service of England and Wales.

Professor Bunemann, who is on sabbatical leave for twelve months, is working on apples with **Dr. D. Martin** of the Division of Plant Industry and other scientists from the Tasmanian Department of Agriculture and the University of Tasmania.

Dr. Little is working with **Mr. K. D. Nicolls,** Regional Soils Officer of the Division of Soils in Hobart, on Tasmania's apple-growing soils.

SAFETY NOTES

Keep it Clean

You don't have to be a fresh air fanatic to enjoy camping, but lack of clean fresh air in tents and caravans can be a killer when gas appliances are being used.

Inadequate ventilation and lack of proper precautions can allow the build up of deadly carbon monoxide.

Carbon monoxide is a colourless, odourless gas. It is a product of incomplete combustion and in tents and caravans can be produced by L.P.G. (liquid petroleum gas) operated lights, stoves, heaters and refrigerators.

Leakage of gas from cylinders can also lead to flash fires and explosions.

If you want to prevent your camping trip from becoming a headache (or worse), take the following precautions:

Before setting out on your trip

Check equipment to see that it is in good order.

Make sure the gas is turned off at the cylinder.

After arriving at the campsite

Check all gas fittings for tightness. Remember, however, that it is possible to damage the fittings by overtightening. Check fittings for leaks with soapy water.

Air your tent or caravan before operating any gas appliances.

Whenever appliances are operating make sure that adequate ventilation is provided.

Check the colour of the flame regularly. If it is yellow, combustion is incomplete and excessive carbon monoxide is being produced.

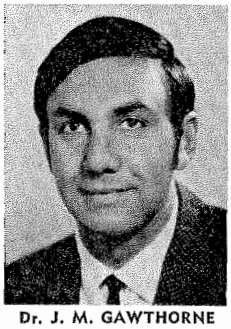
Gas burning equipment should be turned off before going to bed. A faulty lamp in a closed tent or caravan can quickly produce lethal quantities of carbon monoxide. If a gas refrigerator is used, make sure ventilation is adequate.

L. C. R. Thompson, Safety Officer.

APPOINTMENTS TO STAFF

Dr. G. B. Allison has joined the Division of Soils to study the use of naturally occurring isotopes for hydrological investigations. Dr. Allison graduated B.Sc. with honours from the University of Adelaide in 1964 and Ph.D. from the same university in 1968. He held a CSIRO Postdoctoral Studentship at the University of Oxford in 1968-69.

Dr. J. M. Gawthorne has joined the Division of Nutritional Biochemistry to study the functions of zinc in sheep nutrition, particularly in relation to cell growth and the enzyme systems associated with it. Dr. Gawthorne graduated



Dr. J. M. GAWTHORNE

B.Sc. (Agric.) with honours from the University of Western Australia in 1964 and Ph.D. from the same university in 1968. He held a CSIRO Senior Postdoctoral Studentship at the University of California (Berkeley) in 1968-69.

Dr. D. C. Andrews has been appointed to the Division of Soil Mechanics to study foundation problems in the Perth area and the stress-strain characteristics of the dominant soils. Dr. Andrews graduated B.Sc. in Civil Engineering from the University of Leeds in 1963 and Ph.D. from the same university in 1966. Since 1968 he has been a soils engineer with Cementation Company Ltd., London.

Dr. D. Dunnet has been appointed to the Division of Applied Mineralogy to study the nature and origin of Australian ore deposits, particularly in relation to phenomena having a bearing on techniques of exploration. Dr. Dunnet graduated B.Sc. with honours from the university of Sydney in 1962 and Ph.D. from the University of London in 1969. From 1961 to 1965 he worked as a geologist with the Bureau of Mineral Resources.

Dr. R. W. Lewis has joined the Division of Food Preservation where he will study the mobilisation and deposition of lipids in cattle and other animals. Dr. Lewis graduated B.A. in Chemistry and Zoology from Pomona College in 1948, M.S. from the University of Southern California in 1961, and Ph.D. from the University of California in 1965. He worked at the Institute of Arctic Biology at the Uni-

Dr. R. W. LEWIS

versity of Alaska from 1965 to 1967 before joining the Food Chemistry Division of D.S.I.R. in New Zealand.

Dr. D. G. Oakenfull has been appointed to the Division of Food Preservation to study possible effects of the state of water and its structure on the course of action of hydrolytic enzymes. Dr. Oakenfull graduated B.Sc. from the University of London in 1963 and Ph.D.

Dr. D. G. OAKENFULL

from the same University in 1966. He was a Post-graduate Fellow in the Chemistry Department at Cornell University in 1967-68, and then a Research Associate in the Graduate Department of Biochemistry at Brandeis University.

Mr. R. A. Faragher has been appointed to the Division of Fisheries and Oceanography to collect field data for research on northern prawn species. Mr. Faragher graduated B.Sc. from the University of New South Wales in 1968. He has worked as a research assistant with the New South Wales Fisheries Department and as a graduate ranger with the National Parks and Wildlife Service of New South Wales.

Mr. J. Hanna, Divisional Administrative Officer of the Division of Applied Physics, retired last month after more than 28 years service with the National Standards Laboratory. Our picture shows Mr. F. J. Lehany, Chief of the Division of Applied Physics, farewelling Mr. Hanna at a party held in his honour.

REMOTE SENSING

(Continued from page 2)

One important contribution to the management of drought situations would be to provide the primary producer with as much predictive information as possible—short term weather and water supply forecasts, estimates of the likely feed situation in his own and other areas some months ahead, likely supplies of fodder or grain reserves, price projections for feed and livestock—in fact, about all factors which he might have to manipulate should a drought develop.

The automatic monitoring of soil moisture changes and vegetation condition over the agricultural and pastoral regions of Australia could make an important contribution to such predictions.

The automatic recording by satellites of information transmitted from equipment located in remote areas, difficult of access and supervision, opens a special array of possibilities in the field of water resources and the agricultural environment.

Although existing evidence encourages the belief that all the observations I have mentioned will be possible and could become routine in the long term, there are many technological and analytical problems yet to be solved.

Further, the magnitude of the ground installations and systems necessary for receiving, storing, processing and distributing data would be considerable and expensive.

The advantages of the several methods will need to be related to the difference in cost and the importance of the extra increment of information or extra speed of data collection they provide compared with existing methods.

It is yet too early to predict the extent to which satellite recording will become a routine operation, or what observations will be most usefully and most economically made.

It can be regarded as certain that practical applications will be in operation from aircraft or satellites within the next decade and will contribute to the study and monitoring of the world's land resources.

In the near future, black and white and colour photography, including photography from satellites, appear to offer the most promise for land resource purposes.

One further comment is appropriate.

Should Australia participate in satellite systems, it is likely to be on a nationwide use basis, rather than for purely State or regional purposes, and this would have implications to the kind of programme which is developed and how this is organized.

More News In Brief

CSIRO Ski Club

The Ski Club needs new members to make more use of its hut at Perisher Valley throughout the year. The cost of membership is $60 plus annual maintenance fee of $3 (or $20 membership for juniors).

Weekly hut charges range from $15 for members ($25 for non-members) in mid ski season down to $10 in the summer. Contact Honorary Secretary, CSIRO Ski Club Limited, Box E82, P.O. St. James, N.S.W. 2000, or one of the directors.

More Land at Beerwah

The Queensland Government has agreed to lease an additional 600 acres to the Division of Tropical Pastures for its research station at Beerwah, 50 miles north of Brisbane.

This brings the total area of the Station to 1,070 acres. The extra land will be used to expand the station's studies on the ecology, nutrition, and physiology of tropical pasture species.

Beerwah provides good growing conditions for most of the plant species that interest the Division, and the growing season is longer and more reliable than at the Division's other stations.

Townsville Stylo

The Queensland Herbage Plant Liaison Committee has recommended that the common name of the tropical legume *Stylosanthes humilis* be changed from "Townsville lucerne" to "Townsville stylo".

The Committee proposed the change because it felt the name "Townsville lucerne" was misleading as the plant is not a lucerne but belongs to the Stylosanthes group.

The Chairman of the Committee, Dr. L. R. Humphreys, said people in countries without previous experience of the plant and hearing the name "Townsville lucerne" often had a false idea of where it should be sown.

Correction and Apology

Coresearch published a photograph last month of what we thought was a geep. We neglected first to count the creature's chromosomes.

The Division of Animal Health has since examined blood and tissue samples from three of the "geeps of Boort".

"The conclusion is," the Division reports, "that, notwithstanding appearances, they are not hybrids but sheep.

"They have 54 chromosomes with the 6 large metacentric chromosomes characteristic of the sheep and missing in the goat."

Coresearch regrets any embarrassment caused to Billy the goat who shared the sheeps' paddock.

The unusual appearance of the young of the paddock is now believed to be the work of a rare recessive gene.

Instant Coal

It appears that coal had its problems with competition a hundred years ago just as it has today.

Recently, while looking through a book on medical chemistry published in 1825, the Chief of the Division of Food Preservation, **Mr. M. V. Tracey**, found some interesting scribbling on the fly-leaf.

It read *"Oxygenated muriate of Pottafs, oil of Safsafras and oil of Vitriol will make common coal"*.

Deadline

Contributions to the December issue of Coresearch should reach the Editor at 314 Albert Street, East Melbourne, by Friday 14th November.

"I've finished with it, thanks."

Printed by CSIRO, Melbourne

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CORESEARCH

FOR CIRCULATION AMONG MEMBERS OF CSIRO STAFF — NUMBER 129, MELBOURNE, DECEMBER 1969

Mr. BOWEN – NEW MINISTER

Mr. N. H. Bowen is Minister for Education and Science in the new Gorton Government. He succeeds Mr. J. M. Fraser who has been promoted to Minister for Defence.

Mr. Bowen, 58, gains Cabinet rank with his appointment as Minister for Education and Science.

A member of the Liberal Party, he was elected to Parliament as Member for Parramatta, N.S.W., in 1964. He has been Commonwealth Attorney-General since 1966.

Mr. Bowen was born in Summerland, British Columbia, Canada. He was educated at the King's School, Parramatta, and at the University of Sydney where he graduated B.A., LL.B.

He was admitted to the N.S.W. Bar in 1936, and saw active service in the Second A.I.F.

He was appointed a Queen's Counsel in 1953, and was admitted to the Victorian Bar in 1954.

Mr. Bowen was Vice-President of the Law Council of Australia from 1957 to 1960 and President of the N.S.W. Bar Association from 1959 to 1961.

In 1957 and 1958 he was a lecturer in Company Law and Taxation at the University of Sydney, and he was editor of the Australian Law Journal from 1946 to 1958.

He led the Australian delegation at the United Nations International Conference on Human Rights held in Teheran, Iran, in April-May last year and was appointed Vice-President of the conference.

Mr. Fraser became Minister for Education and Science in February last year.

Commenting on Mr. Fraser's term as Minister, the Chairman, Sir Frederick White, said that right from the start Mr. Fraser had displayed a lively interest in CSIRO, visiting many of its laboratories and field stations and discussing the work with members of staff.

Mr. N. H. BOWEN

"The CSIRO Executive has appreciated the real interest shown in the Organization's work by Mr. Fraser," he said.

He recalled that Mr. Fraser had officially opened the Visitors' Centre at the Australian National Radio Astronomy Observatory at Parkes and the Long Pocket Laboratories in Brisbane.

At the Brisbane ceremony Mr. Fraser described CSIRO as "an organization of immense experience and, I believe, of great wisdom".

He said it had added enormously to Australia's wealth and progress and would continue to do so.

Big Pipes from Basalt

Large-diameter pipes made from CSIRO-developed basalt-based ceramic material had aroused world-wide interest, the Advisory Council was told at its meeting in Melbourne last month.

The material was developed by the Ceramics Technology Section of the Division of Building Research.

The Officer-in-Charge of the Section, Mr. E. Tauber, told the Council that a firm licensed to make large-diameter pipes from the material had decided to spend a large sum on the first stage of a production pilot plant.

The firm had proved in collaboration with a metropolitan water authority that the new pipes were superior to any similar products now available.

Their qualities included low shrinkage, high mechanical strength, and resistance to acid.

He said basalt-based ceramics were suitable also for bricks, blocks, floor and wall tiles, and large panels.

Mr. Tauber described to the Council a wide range of materials developed recently by his Section for cladding and finishing buildings.

He said classical ceramic building materials were facing very serious competition from metals and plastics.

A determined effort was needed to win back the ground lost by ceramics to other materials and to gain new markets by improving conventional ceramic materials and developing new ones.

NEW INSECTICIDES

Mr. G. Holan of the Division of Applied Chemistry told the Council that new synthetic compounds developed by the Division as possible alternatives to DDT and other chlorinated hydrocarbon insecticides were showing great promise.

He said it had been found recently that the potency of the compounds could be greatly increased by a special additive which interfered with the mechanism insects used to break down and detoxify insecticides.

The additive increased the potency of some of the new compounds up to 350-fold for some insect species. Several compounds had been produced which were comparable to DDT in their toxicity to insects.

The synthetic insecticides had been found to be particularly effective against insect strains resistant to DDT, dieldrin, and other insecticides in common use.

They seemed much less prone than DDT to induce resistance in insects, and they appeared to be relatively harmless to animals in acute toxicity testing.

Mr. Holan said overall development of the compounds was still at an early stage.

Because of the necessary insistence on stringent testing of new insecticides it could be some years before the new compounds were available commercially.

TEXTILE PHYSICS CHIEF

Mr. J. G. Downes was appointed Chief of the Division of Textile Physics last month.

Formerly Assistant Chief of the Division, he succeeds Mr. V. D. Burgmann who was appointed Associate Member of the Executive earlier this year.

Mr. Downes, 52, has been engaged in wool textile research in CSIRO since 1951 when he joined the Physics and Engineering Unit of the Wool Research Laboratories. This Unit became the Division of Textile Physics in 1958.

In recent years he has pioneered research on the objective measurement of wool for marketing, a field in which he is regarded as a world authority.

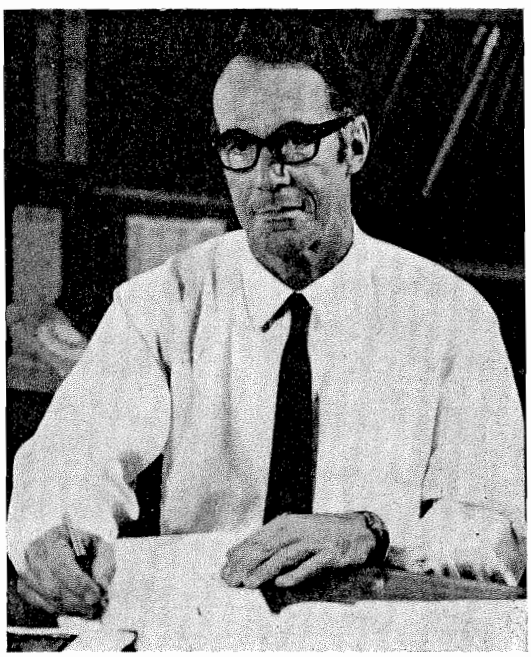
This research has led to the development by his team of a number of novel instruments for the rapid testing of raw wool, including pressure coring instruments and other wool bale sampling devices, yield and fineness testers, and a direct reading regain tester.

Other important research by Mr. Downes has included work on the sorption properties of wool fibres, the electrical properties of wool, and the compression characteristics of greasy wool.

Mr. Downes worked in the Division of Radiophysics from 1945 to 1951, and played a major role in the development of the highly successful Distance Measuring Equipment (D.M.E.) which is carried by all commercial aircraft in Australia.

From 1938 to 1945 Mr. Downes was a design and development engineer with Amalgamated Wireless (A/asia) Ltd. He graduated B.Sc. with honours from the University of London in 1946.

Mr. J. G. DOWNES



Death of Former Chief

Dr. A. J. Nicholson, Chief of the Division of Entomology from 1936 to 1960, has died at the age of 74.

Under his leadership the Division came to be regarded as one of the world's foremost entomological research institutes, gaining a particular reputation for a wise balance between essential basic research and its application to the control of pests.

Dr. Nicholson, who was born in Ireland, gained his M.Sc. from the University of Birmingham and D.Sc. from the University of Sydney. In 1922 he was appointed the first McCaughey Lecturer in Entomology at the University of Sydney.

He joined the Division of Entomology in 1930 as Assistant Chief.

Dr. Nicholson's own research into the regulation of animal populations leavened much of the other work of the Division.

He continued his research in the Division after his retirement in 1960 until a few weeks before his death.

Regarded as one of Australia's most eminent biologists, Dr. Nicholson was a foundation Fellow of the Australian Academy of Science and the Academy's first Biological Secretary.

Dr. A. J. NICHOLSON

He was one of the founders of the Royal Society of Canberra and a member of many scientific societies. He was created a C.B.E. in 1961.

S(ROR)

FLAMMABILITY OF FABRICS

Each year nearly 200 youngsters are admitted to the Royal Children's Hospital, Melbourne, suffering from burns or scalds. Presuming the same rate of injury elsewhere in Australia this means 1,000 a year for the country.

The vulnerable age is from 12 to 17 months, the exploring age. Boys are more venturesome than girls, 4 boys are injured for every 3 girls.

Scalds are the common injury — half of all patients in the burns unit — and nearly all could be avoided if adults were more careful.

Injuries from burning clothes are less common — 17 per cent. of the burns unit cases — but the mortality rate is more than double that of scalds, so burning clothing leads to over half the deaths.

Here girls are the chief sufferers: clothing fires affect 3 to 4 girls for every boy.

This vulnerability of girls is of course associated with the different clothing of the sexes: flimsy nighties and frilly party dresses are extremely dangerous as they are very flammable and readily ignited.

Accidents to children is a subject deeply charged with emotion and there is a clamour that the "government should do something about it", in this case prohibit highly flammable nightwear.

The British "Children's Nightdresses Regulations, 1964" is often quoted as a model.

The traditional nightdress in England was Winceyette, a highly-flammable, lightweight brushed cotton. The whole aim of the British regulations was to prohibit the Winceyette nightdress, but the relevant committee considered it politically undesirable just to name the fabric — it had to be rejected by a test.

Hence the adoption of BS 2963 which involves hanging a 6 ft x 1½ in strip of fabric in the vertical position, lighting the bottom, and timing the ascent of the base of the flame as it moves up the fabric.

The regulations prohibit the sale of children's nightdresses made of fabric of burning time less than 75 seconds for the 50 inches between markers.

It sounds gloriously simple and achieved its primary purpose of killing the Winceyette nightdress trade.

Unfortunately it also rejected nightdresses made from fabrics known to be safe (for example lightweight wool), while accepting as safe all thermoplastic fibres which doctors know give them some of their worst burns cases.

Apart from the way the test condemns some innocents and acquits some guilty, it presents serious practical problems in use.

This article is taken from a talk by Dr. T. A. Pressley of the Division of Protein Chemistry at last month's Advisory Council meeting.

For example, the flame base being timed is an inverted V of changing shape, and flame flashes back over apparently-burnt material. How can you time an ill-defined, oscillating flame base? Some Sydney colleagues tried high-speed photography and merely found the oscillations faster than the eye could detect. This complicated rather than simplified the problem.

Another British Standard suggests a way of overcoming the problem — the burning sample is suspended from a torsion wire and weight loss is equated to material burnt.

But once the fabric is truly alight, the fire-induced draught lifts the sample and the torsion balance can give a negative reading, returning to zero when the flame dies down.

The British Children's Nightdresses Regulations highlight two totally different philosophies regarding testing. Its originators are satisfied because it fails the Winceyette nightdress and thereby should save lives. They consider that this outweighs its inherent inaccuracies and poor overall correlation with the experience of the medical profession and firemen.

The Australian critics consider a test is unsatisfactory unless it truly tests the property under consideration — here the fire-danger of clothing in general. A test designed to exclude a specific material is basically wrong.

It is simply this difference in philosophy that has prevented the publication of a corresponding Australian Standard on which legislation could be based.

So much for the British test — what of other countries? A library search on flammability is enough to shake the strongest of men.

Richards in 1957 compiled a list of 23 different tests and numerous new ones have appeared since that time. Some hold the specimen horizontal, some at 45°, one at 80°, some vertical, some use a half-hoop of fabric.

Some tests use oven-dry fabric, some conditioned material. Ignition can be by bunsen, micro-burner, spirit lamp, match, taper, special L.P. gas burner, or alcohol tray. Tests can be carried out hot or at 20°C. Sample size and shape vary widely.

Some justification can be advanced for any chosen test because of the variety of circumstances under which textiles are used. For example sheets are used in the horizontal position but clothing in use is mostly vertical.

This variation in test methods would not matter if all gave similar results, but they do not. One test can rank Fabric A as less flammable than Fabric B, while another test can place them in the reverse order.

Additional doubt can be thrown on the whole idea of testing single fabrics on the score that this is not the practical situation.

In real life, combinations of textile material are normally used: sheets and blankets, outerwear and underwear. This can vitally affect the danger of a situation.

There were two men in a Queensland fire — one wore a nylon shirt over a cotton vest and the other a cotton shirt over a nylon vest. The former suffered only from shock, the latter spent some 40 days in hospital.

The girl in a polyamide or polyester dress or dressing gown over cotton underwear is fairly safe. Ignition is relatively difficult and burning is slow. The cotton underwear would give some measure of insulation.

Reverse the fabrics, however, and there is a high risk. A momentary contact with a flame or hot object could ignite the cotton and the really nasty accident takes place.

The readily flammable cotton ignites and melts the thermoplastic synthetic fabric which adheres to the skin. Even before they melt, thermoplastic synthetic fibres shrink and thereby give good thermal contact with the skin.

In some freak accidents mechanical damage can result, as in the oft-repeated story of the airman who wore a nylon watchband. He was relatively unhurt by a minor fire except for his paralysed left hand where the shrinking watchband had severed tendons.

In my pessimistic moments I doubt the use of flammability tests when applied to one fabric in isolation.

In my more optimistic moods I recall Dr. Grattan-Smith's description of the Afgar rating of the health of the new-born.

Marks are allocated on a somewhat subjective assessment of a large number of health aspects. Taken in isolation any one aspect gives a poor indication of the infant's health, but taken together, the sum of the marks gives a very good guide to the infant's future.

Can a similar scheme be worked out for the flammability properties of textiles?

A go/no go gauge based on one factor, for example, the British nightdress regulations based on rate of burning, can be dangerously misleading. Increase the number of factors and reliability should increase. What factors should be included?

My current belief is that at least five are important — ease of ignition, rate of burning, heat output, ease of extinction, and the thermoplastic behaviour. Possibly there are others.

Ease of Ignition: This decides whether or not there is an accident. Few children sit on a fire, the usual phenomenon is a swinging dress brushing momentarily against a flame or an electric radiator.

Brushed rayon will ignite in a flash, cotton ignites fairly readily, and wool or synthetic only with difficulty. The Fire Research Station in England states that it takes twice as much heat to ignite wool as cotton. Yet most flammability standards ignore ignition!

Rate of Burning: The rate at which a flame advances decides the time available to cope with an accident. This test, which consists essentially of hanging up a strip of fabric, igniting the base, and timing the speed with which the flame ascends the sample, is on a world-wide basis the usual test for flammability.

Some fabrics burn steadily. With others the flame accelerates as it advances. Thermoplastic fibres give an anomalous result: the flame melts the fabric above it so that the burning portion falls away and extinguishes the flame.

In everyday practice this does not happen, the burning material sticks to underwear or victim and continues to burn. A reasonable test seems to be to support the sample while it is burning with thread made from glass fibre.

Heat output: Heat output from a fire is of obvious importance in assessing the damage it will cause. There is not a vast difference in the calorific value of the various textile materials, but, in a fire, a number of conflicting factors affect its fierceness.

Heavy fabrics provide more calories per square yard but burn more slowly than lightweight materials. Slow burning enables heat to escape.

Which wins, burning rate or calorific value? In an inter-laboratory test, cotton molleton, a thick and heavy fabric, was shown to burn more slowly than flannelette so under British regulations molleton would be classed as safer than flannelette.

Yet anyone who carries out burning tests with skirt-sized pieces of fabric realizes that the danger order is the reverse of the flame-speed order. The British test gives incorrect ranking.

Heat output can probably be measured during the rate of burning test by thermocouples inserted in copper rods or blocks at the top of the draught-shielding box.

The copper mass integrates the heat output during the time of burning. Bare thermocouples are unduly influenced by the precise position of the flame.

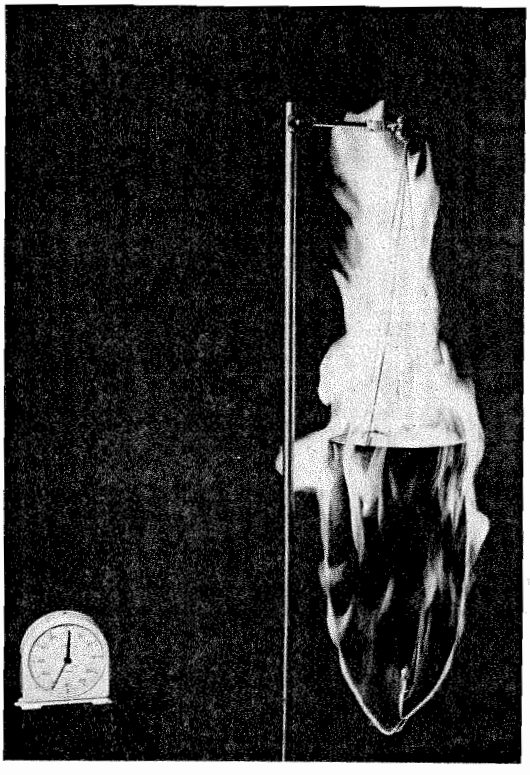
Ease of Extinguishing: In the normal rate of burning test, with flame travelling vertically up a narrow strip of fabric, there is little difference between wool and cotton of similar light weight.

Yet the experience of firemen, insurance assessors and medical men suggests there is a vast difference in the relative safety of these fibres. Accessibility of oxygen is a vital factor.

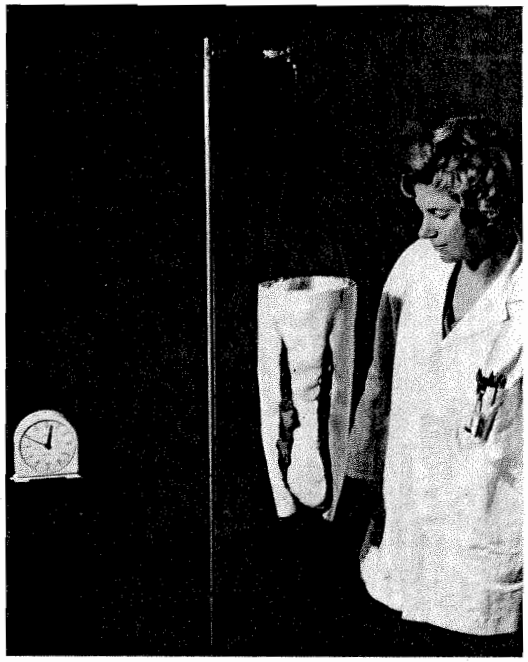
In the strip test there is ample oxygen and a chimney effect from the draught shield. When there is a large piece of fabric there can be a local oxygen shortage.

Wool is much more easily extinguished than other textiles by decreasing the oxygen content of the atmosphere — which a fire does automatically. A wool skirt on a dummy can be

(Continued on page 4)



Below: Molleton, a flannelette-type material of the same weight as the wool fabric above. It ignited immediately and 35 seconds later a mass of flame drove the assistant away from the test.



Above: Wool material shaped to simulate a child's skirt. It took 15 seconds to ignite in the test, and after burning in two small vertical strips, extinguished itself in two minutes.

News In Brief

New Footrot Vaccine

The Division of Animal Health announced last month that its McMaster Laboratory had developed a highly effective vaccine for footrot in sheep.

The vaccine protects sheep against the disease and has been found to cure a high proportion of established cases.

Footrot was the last known serious contagious disease of sheep in Australia which could not be prevented by vaccination.

It has been estimated that the disease costs Australia $16 million each year for treatment and in production loss.

CSIRO has applied for a patent to cover the new vaccine and it is hoped that it will be in commercial production within a year.

The breakthrough in the search for a footrot vaccine came when **Mr. J. R. Egerton** of the McMaster Laboratory developed a special technique for culturing the footrot organism under carefully controlled conditions.

This enabled the Division to produce a vaccine conferring a very high degree of immunity.

Many strains of the organism exist and it is not known yet how many of these will need to be incorporated in the vaccine to give protection in all districts in which footrot occurs.

Doctorate

Mr. D. E. Rivett of the Division of Protein Chemistry has been awarded the degree of Doctor of Philosophy by the University of Bradford.

State Committee Secretary

Mr. R. N. Sanders of the Division of Animal Health has been appointed Secretary of the Victorian State Committee.

Cattle Sale

World record prices for Brahman and Africander cows were set at a recent reducing sale at the CSIRO National Cattle Breeding Station at Belmont, Rockhampton.

The record price for a Brahman female was lifted from $13,000 to $23,000 and the Africander female record price was lifted from $8,000 to $10,750.

The 38 cattle auctioned at the sale brought a total of $142,850.

Insect Collection

The Australian National Insect Collection at the Division of Entomology has been given a large collection of moths and butterflies by a private collector, **Mr. V. J. Robinson.**

The collection, containing examples of about 3,500 species, will remain in Mr. Robinson's possession during his lifetime.

Echidna Film

A 25 minute colour film about the echidna (or Spiny Ant-Eater) was completed recently by the Film Unit.

The film, showing echidnas in the field and in the laboratory, was designed principally for zoology students. It shows echidnas in various stages of development, their feeding behaviour, and suckling of the young.

Microscopy Symposium

A symposium on optical microscopy will be held at the University of Sydney early in 1970. One day of the two day symposium will be reserved for papers on photo and cinemicrography.

Further details can be obtained from the sponsors of the symposium, Wild (Australia) Pty. Ltd., G.P.O. Box 5326, Sydney, 2001.

Visitor

Dr. S. Peer, Head of the Department of Construction Management and Economics at the Building Research Station in Israel is spending a year at

Dr. S. PEER

the Division of Building Research on sabbatical leave.

He is working with the Building Operations and Economics Section of the Division.

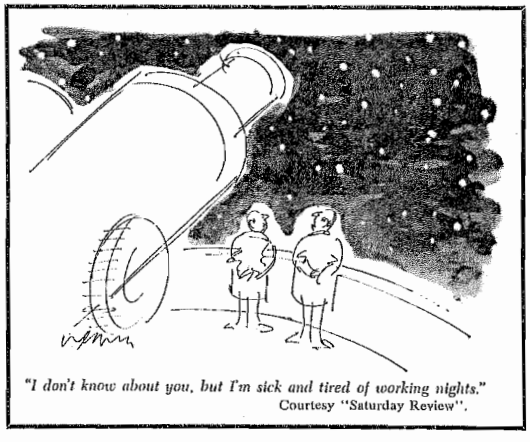
Dr. Peer, a consultant to the Israel Ministry of Housing, is an authority on construction planning, management, and work organization.

No Fire Without Smoke

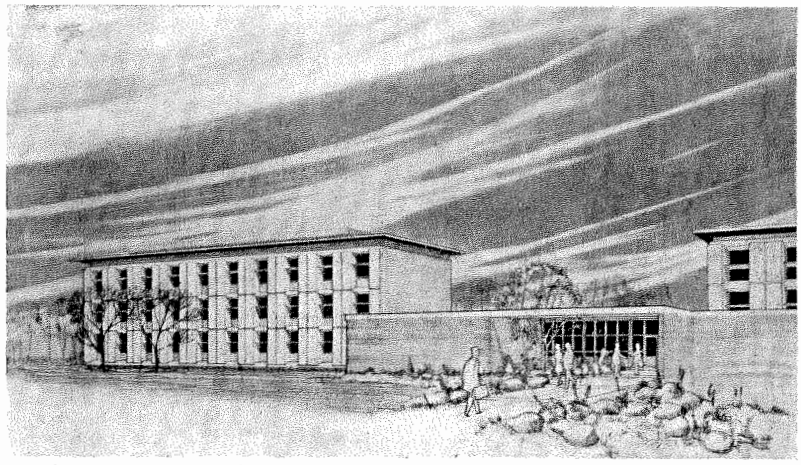
"Textile flammability should be the subject of demonstrations, not a talk", **Dr. T. A. Pressley** told the Advisory Council at the start of his talk last month (see page 2).

However practical exhibits were scarcely possible in the council meeting room. "At best I would have you weeping and coughing from smoke," he said.

"We might repeat the experience of a meeting of the National Health and Medical Research Council in Canberra: the speaker was disturbed by clanging bells and not until firemen appeared did he realize that his effective show had triggered the fire alarm system of the building."



"I don't know about you, but I'm sick and tired of working nights."
Courtesy "Saturday Review".



Tenders are expected to be called in March for an extension to the Western Australian Laboratories at Floreat Park, Perth, to house the Western Australian group of the Division of Applied Mineralogy. Our picture is an architect's impression of the new wing.

Biter Bit

Last month's rains grounded CSIRO's rainmaking plane in three feet of water at Sydney airport.

King-Size Ice Block

A 310 metre by 4 inch core of ice drilled from the Amery Ice Shelf in the Antarctic is in cold storage in Melbourne waiting for fresh scientific scrutiny.

The Amery Ice Shelf is fed by the Lambert Glacier, believed to be the biggest glacier in the world.

The core, obtained with a special drill which penetrated almost to the bottom of the huge ice shelf, may provide useful clues to variations in atmospheric and climatic conditions over thousands of years.

Its upper layers are only a few hundred years old, but the lower layers of ice may have been deposited many thousands of years ago.

The core was brought to Australia last year by members of the Australian National Antarctic Research Expedition, and its density, crystal orientation, creep rate, and stratigraphy have been studied in the Antarctic Division of the Department of Supply.

Other organizations are interested in examining some of its physical and chemical properties, but many properties still remain to be studied and the Antarctic Division invites interested scientists to participate.

It will make core material available to scientists in return for the results of their research which will aid glaciologists in their efforts to determine the history of the Antarctic ice sheet.

Enquiries should be directed to the Assistant Director (Scientific), Antarctic Division, 568 St. Kilda Road, Melbourne.

Sheep Get Short Shrift from Censors

Writing in the "Letters to the Editor" column of "The West Australian" last month, **Dr. D. W. Barrett** of Floreat Park, Perth, had this to say:

'An acquaintance who works for an Australian research organisation, highly regarded throughout the industrial and scientific world, recently returned from an overseas trip.

'His main research interests lie in the field of animal behaviour and while in Germany he was shown a series of films demonstrating the courting and social habits of Ovis canadensis (Bovidae).

'As the relatives of this humble beast play a small part in the Australian ecology, my friend arranged to have copies of the films sent to Perth for examination and closer study in the course of his work.

'The films arrived the week before last and at once were regarded by the Customs with the utmost suspicion.

'A hurried and urgent telephone call was made to the organisation concerned: "Could the Customs Department (on behalf of the censors) be assured that these films would not be shown in any circumstances in public?"

'Until now I had never appreciated this problem but it is abundantly clear that year by year hundreds of farmers in Australia are being corrupted by the courtship and mating behaviour of the relatives of Ovis canadensis (Bovidae).

'Obviously, the time has come to rid the country of this scourge. In the name of decency, the humble sheep must go'.

SAFETY NOTES

Vacational Guidance or Leisure Pleasure

The following educational films are not necessarily for Adults Only.

My Fair Lady: Most southerners are, at this time of year. Cook slowly and avoid painful sunburn. Australia has the world's highest incidence of skin cancer, caused by overexposure to the sun.

The Graduate: Like Benjamin, he will probably be a little bewildered during his first few weeks in the new job. Help him avoid the "traps". Safety was **not** a subject in his course.

Fiddler on the Roof: Painting the guttering or roof, replacing roof tiles, etc., is a hazardous occupation — take care and secure ladders properly. Roof gutters are meant to catch water, not people.

Where Eagles Dare: The best fruit always seems to be at the top of the tree. The smaller branches were designed to support a couple of dozen apples, not a fully grown (physically!) man.

Hair: If yours is long, take particular care not to get it caught in rotating machinery, or dipping into containers of chemicals (or soup).

Alice in Blunderland: We have a few of these, not all females by any means. Watch where you are going, and avoid bruises and trips.

Remember — the Mad Hatter was probably suffering from mercurial poisoning.

The Boys In The Band: That accident prone group whose names appear regularly in the injury list, classified by horticulturists as "hardy perennials".

A group that should be "censured".

The Fixer: Unless he's really competent and more particularly if it's electrical work, beware of this character.

The Sand Pebbles: To be added as an aid to steady boiling *before* the heat is on, unless you want a hot corrosive shower.

Barefoot in the Park: Not only broken glass and rusty tins on the beaches, but crop stubble, stones and sharp or heavy implements for those who wear thongs on our northern stations.

Bedazzled: Welders please note — wear the correct goggles, and shield your work so that bystanders won't be adversely affected by the intense glare from the arc.

Blow-Up: Does less damage if in a fume cupboard or behind a safety shield.

For Whom the Bell Tolls: Bad enough if it's for you, and you can't hear it. Even worse if it's for someone else, and you caused it.

They're a Wired Mob: Amateur electricians — be down to earth, and make sure your equipment is, too.

If: Make sure you are not the one to say: *"If only I had thought!"*

All This and Heaven Too: Overheard at the Pearly Gates: *"I worked for 30 years and only had this one accident"*.

Hell's Drivers: Don't be one.

Kiss Me, Kate: A copy of an excellent film on mouth-to-mouth resuscitation has been purchased and is available from the Film Unit Library. It is called "Pulse of Life", and it is recommended that it be shown at all Divisions.

Sayonara: Seen on the back of a small Japanese car *"This car floats on Saki"*. Make sure yours doesn't, make this Christmas a safe and happy one.

J. W. Hallam, Safety Officer.

NEW APPOINTEES

Dr. R. K. Day has been appointed to the Division of Applied Physics where he will work on the development of precise standards and measurement techniques at microwave and high radio frequencies. Dr. Day graduated B.Sc. with honours from the University of Queensland in 1963 and Ph.D. from Monash University in 1968. For the last two years he has been a Teaching Fellow in the Physics Department at Monash University.

Mr. J. R. Donnelly has joined the Division of Plant Industry to investigate the measurement of plant production under grazing and its relation to animal production. Since graduating B.Agr.Sc. from the University of Melbourne in 1963 Mr. Donnelly has been a sheep and wool officer with the Tasmanian Department of Agriculture. During 1966/67 he worked on a collaborative project with the Division's Grassland Agronomy Section.

Miss Janette Lee has been appointed to the Division of Computing Research to investigate new techniques for using the Division's computing equipment and to assist computer users with their programming problems. Miss Lee graduated B.Sc. from the University of Sydney in 1966 and Dip.Ed. from the same university in 1967. She has worked as a science teacher and as a computer programmer.

Mr. D. F. Moody has been appointed to the Division of Computing Research as Technical Editor. Mr. Moody graduated B.Sc. from the University of London in 1965 and since coming to Australia last year has worked as a physicist in the P.M.G. Research Laboratories.

Dr. R. J. Myers has joined the Division of Land Research to study the agronomy of grain sorghum. Dr. Myers graduated B.Rur.Sc. with honours from the University of New England in 1963 and Ph.D. from the same university in 1967. Since then he has been working in the Department of Soil Science at the University of Saskatchewan.

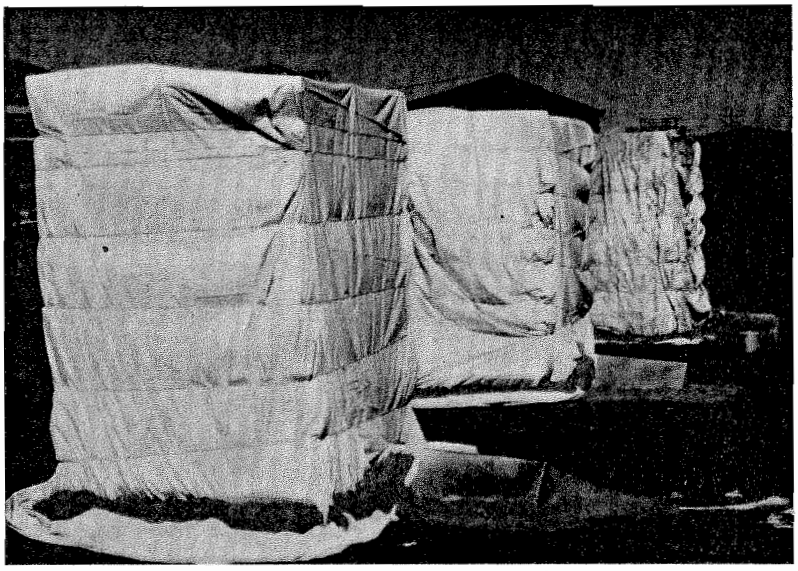
Dr. B. F. Ryan has been appointed to a fellowship in cloud physics with the Division of Radiophysics. Since graduating B.Sc. with honours from the University of Western Australia in 1962 and Ph.D. from the same university in 1966, Dr. Ryan has been working at the Cloud Physics Laboratory of the Department of Atmospheric Sciences at the University of Washington.

Dr. T. H. Spurling has been appointed to a fellowship in theoretical physical chemistry with the Division of Applied Chemistry. Dr. Spurling graduated B.Sc. with honours from the University of Western Australia in 1962 and Ph.D. from the same university in 1966. He spent from 1965 to 1967 at Brown University and the University of Marylands in the United States. Since then he has been a Lecturer in Chemistry at the University of Tasmania.

Mr. M. S. St. Clair has joined the Wheat Research Unit to study biochemical and morphological aspects of wheat quality. Mr. St. Clair graduated B.Sc. with honours from the University of Sydney in 1968. He was a wheat farmer in northern New South Wales before beginning his university studies in 1965.

Mr. R. F. Thornton has joined the Division of Tropical Pastures to carry out work on pasture evaluation and animal nutrition. Since graduating B.Rur.Sc. from the University of New England in 1963 Mr. Thornton has been studying for his Ph.D. at the University of Western Australia.

Dr. F. M. Tomas has joined the Division of Nutritional Biochemistry to study mineral metabolism in the ruminant.



It looks like a work by Christo, the wrap-up artist from New York who turned a bay in Sydney and wool bales in Melbourne into art. In fact it's a collection of pears being treated by sulphuring in P.V.C. tents at Shepparton, Victoria. The photo is from CSIRO Food Preservation Quarterly.

Dr. Tomas graduated B.Sc.(Agric.) with honours from the Universty of Western Australia in 1964 and Ph.D. from the same university this year.

Dr. F. M. TOMAS

Since last year Dr. Tomas has held a CSIRO studentship at the University of Illinois.

Dr. D. J. Webb has been appointed to the Division of Fisheries and Oceanography where he will carry out research in physical oceanography with particular reference to the circulation dynamics of the East Australian Current. Dr. Webb graduated B.Sc. with honours from the University of Manchester in 1964 and Ph.D. from the same university in 1968. He has spent the last twelve months on a divisional studentship in the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge.

Dr. B. C. Young has joined the Division of Mineral Chemistry to study the reaction kinetics of gaseous hydroxyl radicals. Dr. Young graduated B.Sc. with honours from the University of New South Wales in 1963, M.Sc. from the same University in 1965 and Ph.D. from the University of Cambridge in 1967. Since 1967 he has been a Postdoctoral Fellow in the Department of Chemistry at the University of British Columbia.

Fabric Flammability

(Continued from page 2)

self-extinguishing, while a strip of the same fabric burns freely.

Thermoplastic Behaviour: The shrinkage and melting of polyamides and polyesters present a serious hazard ignored in most tests for flammability.

Drops of molten plastic can inflict deep burns, and remember that the shock of this can be fatal even if the area affected is small. Death has occurred from a burn smaller than a 10 cent piece.

I have listed the points probably necessary for the objective assessment of the inherent danger of a textile fabric. No test method in the world covers more than a few of them; the undue weight given to the vertical rate of burning test can be misleading.

Improved tests for most of the factors have been developed at the Division of Protein Chemistry.

The suggested tests, and the somewhat Heath Robinson equipment used for them, were passed on for critical examination by a leading Australian industrial laboratory. Their reaction was surprisingly favourable — the whole scheme was accepted in principle.

The ball is now back in our court. The equipment used is to be refined and a draft specification drawn up. After that must come inter-laboratory trials to find whether adequate agreement is attainable.

Should consumers be protected by legislation? Should Australian States have nightdress regulations on the U.K. pattern?

Perhaps, but even more urgent is education. This aspect is covered in the recently-published Australian Standard CL3 — 1969.

Ski pyjamas are safer than nightics, track suits than dressing gowns.

Avoid the hanging edge of a frock or coat or gown that ignites so freely. Place fireguards round open fires and radiator bars.

There has been too much stress on the flammability of fabrics and too little on clothing design.

At present there is no test available on which sound legislation can be based.

A meaningful test for a single fabric may be possible provided a large number of factors are considered.

The practical experience of a medical specialist in the burns field is the final reference point for judging fabric flammability. Too many ivory-tower scientists have developed methods based on laboratory convenience rather than practical usefulness.

From a research viewpoint, work on flammability tests is a thankless task as conditions in real life vary. You cannot formulate a clear-cut problem with a good chance of solution. However the sheer challenge, the need for a reasonable test, is a driving force.

An American task group working on the problem has over 100 members. The British Home Office has allocated the equivalent of $127,000 for flammability investigations, yet our Australian work has had an impact as a recent Zurich conference has shown.

A European speaker spoke on the need for a range of tests, not simply flame speed, in assessing fabric safety. He acknowledged his dependence on Australian work.

The work here has been financed from wool funds and rightly so; traditional tests methods conflict with everyday experience and give a poor rating to wool.

This talk has covered only work on test methods. A parallel project in the Division of Protein Chemistry has concerned flameproofing wool fabrics for special purposes, for example, for use in the upholstery of aircraft where extreme resistance to fire is necessary.

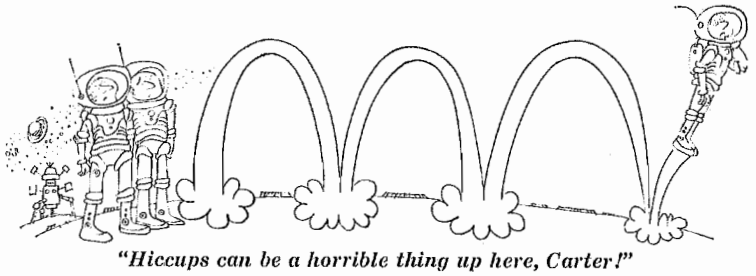
EVERY ONE I SEES, I SHOOTS

Conservationists still have a lot of campaigning to do. The following poem appeared recently in the Bourke newspaper "The Western Herald" over the nom-de-plume "C. W. A. Husband".

"Kangaroos do not compete
With sheep, for what there is to eat."
So spoke the learned Boffin, who
Had studied long the kangaroo;
This scientific bloke in tweed
Who'd crawled around midst grass and weed
And watched the old marsupial feed.
"Kangaroos do not eat grasses
Relished by the woolly classes;
They're harmless, helpful little chaps
Who live on nettles, burrs and scraps.
You'll never, never see a 'roo
Competing with a poor old ewe;
In fact, he'll do his best to show
Her where the finest grasses grow."
They told me thus, when first I came
To join the bloomin' grazing game
But sad I am, and wiser, too,
From pitting wits with kangaroo.

THEY'RE DIRTY, THIEVING, STINKING COOTS,
WHO'LL GOBBLE EVERYTHING WITH ROOTS,
AND EVERY ONE I SEES, I SHOOTS

(Their hides make quite attractive boots).



"Hiccups can be a horrible thing up here, Carter!"

LIVE LINE

"I never think at all when I write nobody can do two things at the same time and do them both well."

From "archy's life of mehitabel" by Don Marquis.

DEADLINE

Contributions to the January issue of Coresearch should reach the Editor at 314 Albert Street, East Melbourne, by Thursday, 15th January. Letters to the Editor would be welcomed.

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