

June 1983 Volume 47 No. 3

Chemistry

in new zealand

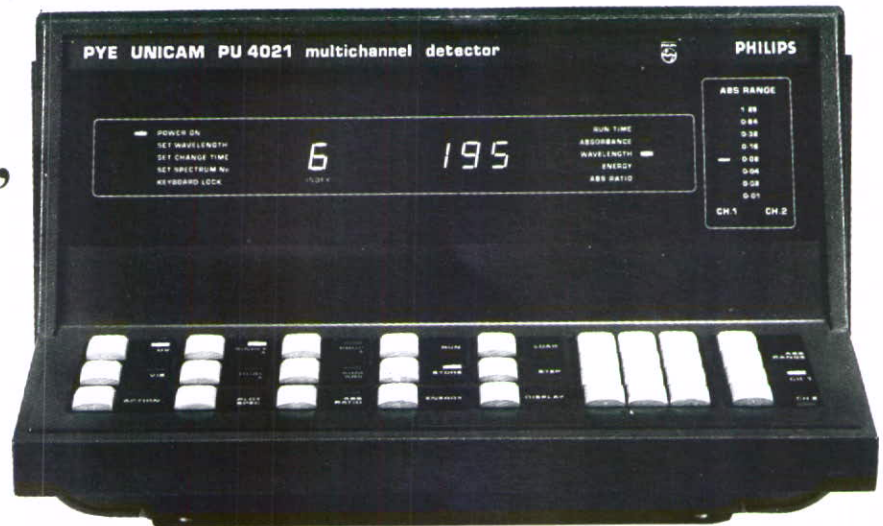


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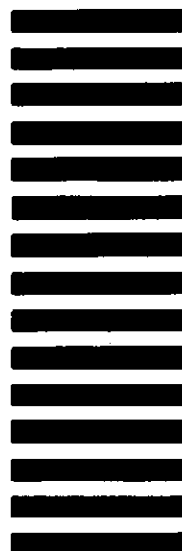
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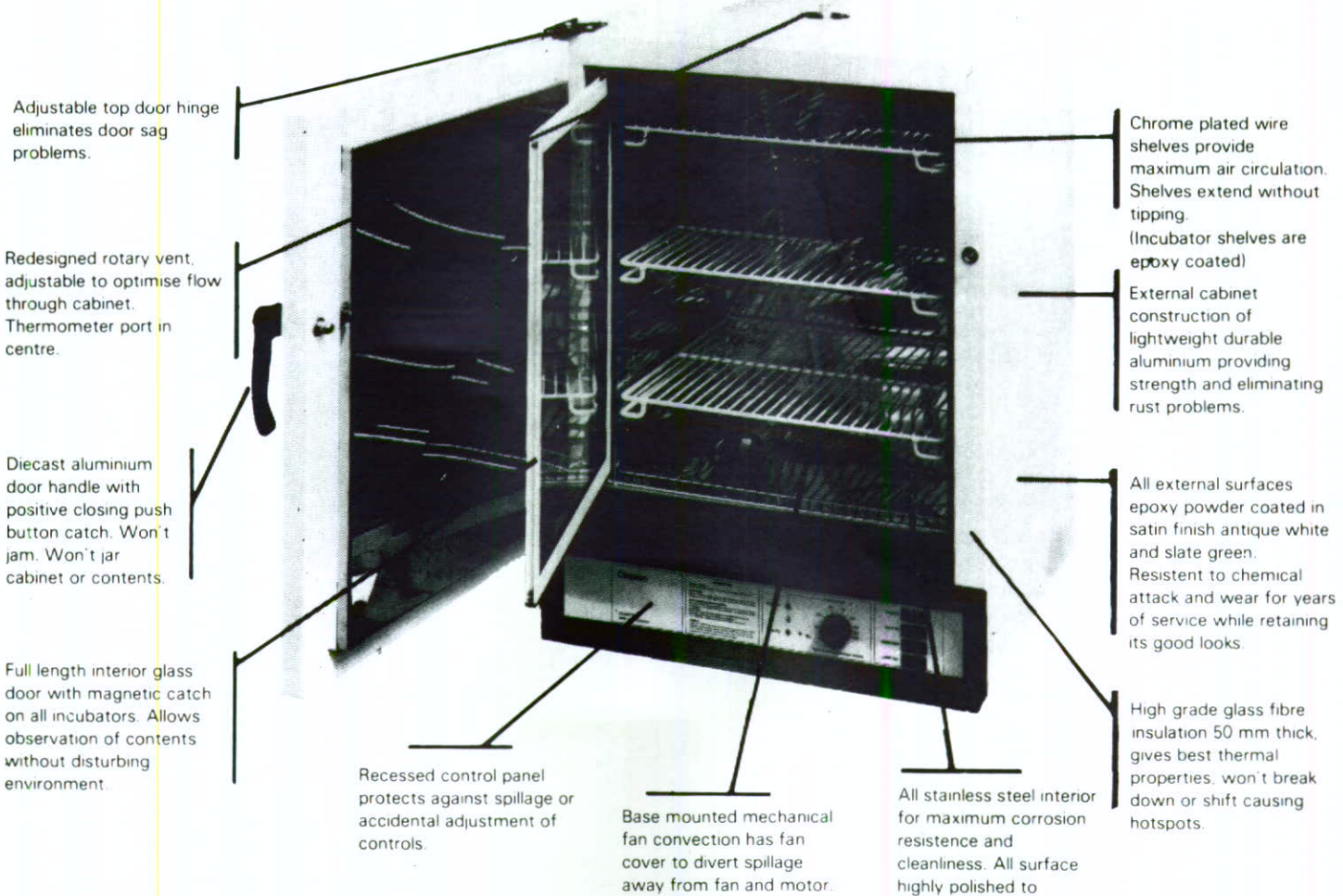
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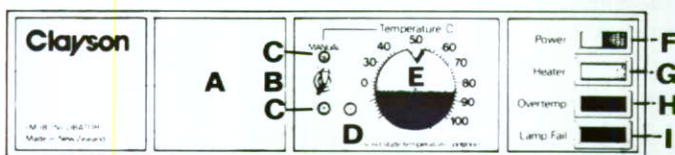
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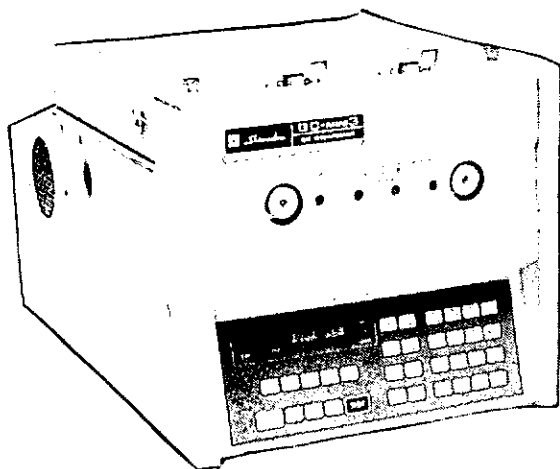
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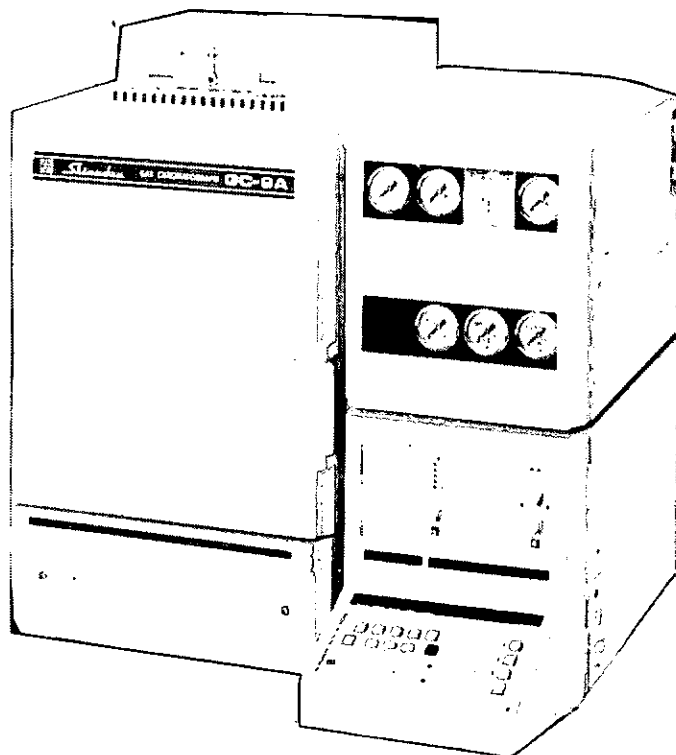


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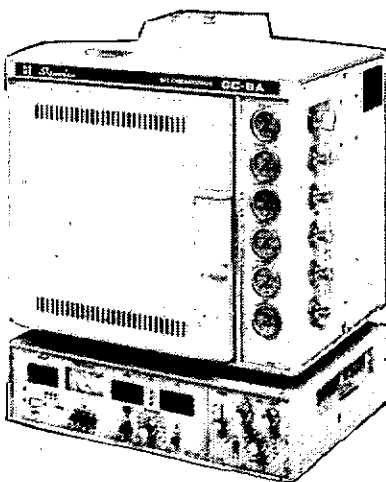


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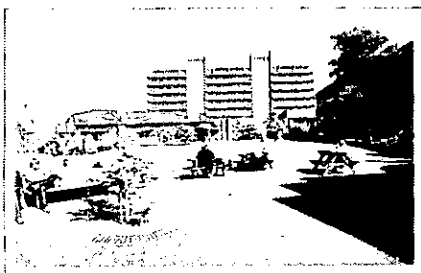
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FRONT COVER



A Century of Chemistry



The University of Auckland
1863 - 1983

By R. C. Cambie and
B. R. Davis

Front Cover: This month's cover is taken from a publication celebrating the University of Auckland's centenary. Authors Con Cambie and Brian Davis printed and published by Percival Publishing Ltd have produced a 48 page illustrated history of the university's chemistry department. For further details see University News p67

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GUEST EDITORIAL

INDUSTRIAL MEMBERSHIP

Each year many industrial members of the Institute probably weigh up the pros and cons of continued membership. For many it is a little like the annual decision on whether or not to remain in the old pupils' association of one's high school. Membership maintains nostalgic links with the past—with fellow-students who have moved on other career routes.

There should and must be more positive reasons, than nostalgia alone, to retain a strong industry representation. What are they?

1. The intra-industry links

As different industries have developed in New Zealand there has been an interest by engineers, chemists and other scientific staff to form an industry-wide technical group. Often such a group has developed close ties with a sister organisation in Australia. Qualifications for membership are very loose and the main criterion is usually an interest in participating in technical progress within the industry con-

cerned. Industrial chemists with papers to present on their work will normally choose to present them before their peers at their own industry annual technical conference rather than at an Institute Conference. Often, senior management of companies in the Industry attend technical meetings, so there is an opportunity for younger staff to associate with top management. Many of the new industries have been geographically remote from the Institute branches, so that members have often not been prepared to travel long distances to meetings. The industry technical associations have also developed a social function which most members regard as a positive feature.

The Institute has lost from the development of these technical associations but their development was inevitable and there is no counter to it.

2. University/industry links

In a country where so many university and industry chemists know each other so well, it is surprising how ineffective are these links. For national development they should be strong. How can we interest more university staff members to tackle fundamental problems that might eventually benefit the New Zealand industries?

There could be university contributions to new technical developments, selection of some university research that might

better prepare some graduate chemists for work in industry, and some university staff might eventually develop such special expertise that they could be used as consultants for industry. I know that it has been difficult for university chemistry departments to obtain funds from companies for special projects, but some more examples of successful project work might help this.

3. Inter-industry links

As the different industry technical associations grow, so, strangely, should the reasons increase for membership of the Institute. The Institute can provide a cross-link through the different industries. There should be opportunities for courses or seminars on chemical analyses which are used by many industries. Certain chemical processes and products from one industry will be of interest to chemists in other industries so that an industrial chemist might well attend the annual Institute conference to find out not more of what is going on in his own industry, but what is happening in related industries in New Zealand.

In my membership of the Institute I have valued most the inter-industry links which it provides.

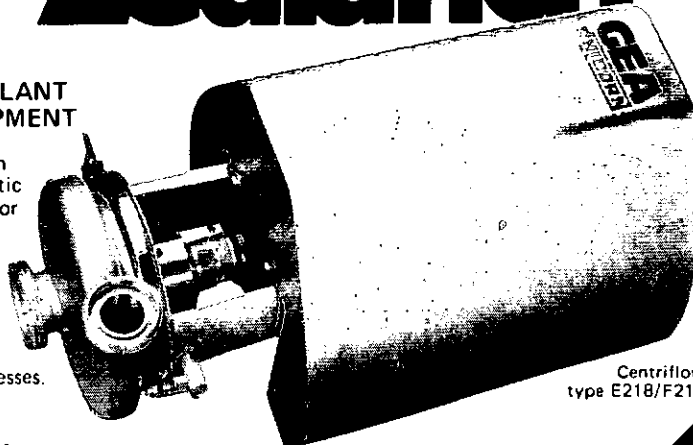
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PROF. F. BASOLO

ACS PRESIDENT TO VISIT

President of the American Chemical Society, Fred Basolo, will visit NZIC Branches 25 June-2 July. He is the Morrison Professor of chemistry at Northwestern University in Illinois, where he was born in 1920. An inorganic chemist, he feels that the goal of the ACS is to enhance the position of chemistry and chemists by re-emphasis of its learned society publishing activities.

After taking a B.Ed. in 1940 at Southern Illinois Normal University, Fred Basolo obtained M.S. and Ph.D. degrees at the University of Illinois. In 1943 he joined Rohm and Haas as a research chemist and in 1946 began his teaching career as an instructor at Northwestern University, where he progressed to chairman of the Chemistry Department, 1969-72.

Professor Basolo has more than 250 publications and has received numerous honours including the first Baïlar Medal Award in 1972 and the ACS Award for distinguished service in inorganic chemistry in 1975. He maintains two research programmes, one on synthetic oxygen carriers and one on metal carbonyl chemistry with the aid of post-doctoral and postgraduate students, in collaboration with a younger faculty colleague.

The Board of Directors of the ACS are paying Fred Basolo's air fares to and from this country, following the first visit here by an ACS President, Professor Bob Parry, accompanied by the Executive Secretary, Dr Raymond Mariella. In New Zealand Professor Basolo will be the guest of the Institute. He will then visit the RACI in Hobart, Canberra and Brisbane.

"The most frustrating thing for chemists at the moment is the perception that the lay public has of chemistry. If you mention "chemists" to an ordinary person in the US, by and large his feeling is that these are the bad guys. If we do not

PEOPLE

manage some way to better educate the lay public, we shall be really in trouble in terms of funding, in terms of all the supportive actions needed, and in terms of getting young people interested, excited and motivated in chemistry and science generally". These words will kindle responses in many New Zealand chemists and illustrate some public concerns of our distinguished visitor.

RACI PRESIDENT TO SPEAK AT CONFERENCE



DR D.E. WEISS

Dr D. E. Weiss has been active in the affairs of the Royal Australian Chemical Institute since 1955 and is its current President. He will be visiting New Zealand from 20th August until 2nd September. Don will be the inaugural NZIC-RACI Visiting Speaker at the NZIC Annual Conference on 26th August in Hamilton. The subject of his keynote address will be "Processing with Magnetic Particles".

Born in 1924, Dr Weiss was educated in Adelaide at Scotch College, the South Australian School of Mines and the University of Adelaide from which he graduated B.Sc. in 1945 and D.Sc. in 1960. He is the only member of the RACI to win all its major awards (Rennie Medal, 1951; H.G. Smith Medal, 1966; the A.D. Olle Prize, 1971; the Leighton Award, 1977 and the Applied Research Medal, 1982).

After a year in the paper industry and another at the Commonwealth Serum Laboratories, Dr Weiss joined the CSIR's Division of Industrial Chemistry in 1948. Prior to his current appointment as Director, Planning and Evaluation Advisory Unit, responsible for the strategic planning within CSIRO, he was Chief, Division of Chemical Technology, 1973-79.

Technical interests have included ad-

sorption technology, water treatment, forest products and plastic composites.

In "Chemistry — The Enabling Science", the 1982 K.L. Sutherland Memorial Address, Dr Weiss asked the RACI if arrangements in Australia were right for:

1. Teaching chemistry in schools and tertiary institutions and RACI relations with the general public.
2. Organising chemical research, particularly for concentrating resources in interdisciplinary areas involving chemistry of national relevance.
3. The interactions of chemistry with other disciplines.
4. The balance of effort between scientific and technological pursuits in facets of chemistry particularly appropriate for study and development in Australia.

P.H. Wilson a chemist at NZFP, Kinleith has been awarded an overseas study grant under the Selwyn J. Robinson Scholarship scheme. He will investigate recent developments in paper colour measurement and control, attending seminars and visiting North American research establishments and mills using colour control equipment.

NEW DIRECTOR FOR DSIR'S APPLIED BIOCHEMISTRY DIVISION



DR R.T.J. CLARKE

On 28 April Dr R.T.J. (Dick) Clarke became the Director of Applied Biochemistry Division, DSIR in Palmerston North. Research in this Division is directed towards understanding some as-

PEOPLE CONT.

pects of plant-animal interactions leading to the use of plant and animal products as foods. Some of this work is concerned with problems of plant and animal production. The Division's scientific staff consist of biochemists, organic chemists, microbiologists, animal physiologists and nutritionists.

Dr Clarke, a well known microbiologist, joined the staff of the Division (then known as Plant Chemistry Division) on graduating M.Sc. from Otago University in 1958. In 1964 he was granted the first Ph.D. degree awarded by Massey University. He has been group leader of the Biochemistry and Microbiology Group of the Division. His work has resulted in the publication of about sixty scientific papers and reviews and he is co-editor (with Dr Tom Bauchop) of the book "Microbial Ecology of the Gut", which appeared in 1976.

Dr Clarke is a Fellow of the American Academy of Microbiology (elected 1981), is Vice President of the N.Z. Microbiological Society and is a member of the American Society for Microbiology. He is the N.Z. representative on the International Committee for Microbial Ecology, is a member of the National Committee for Microbiology and he is a member of the Management Committee of the O.E.C.D. Co-operative Research Project on Food Production and Preservation.

During 1964-65 Dr Clarke undertook research, with Professor R.E. Hungate at the University of California at Davis, on rumen holotrich, protozoa. He returned to Davis in 1973-74 on a U.S. International Public Health Fellowship to study immunofluorescent techniques. In 1979 he was awarded a fellowship by the Nederlandse Organisatie for Pure Research (ZWO) to study lactic acidosis in cattle at the University of Utrecht, Holland. Immediately following, in 1980 on a fellowship awarded by the Alberta Research Council, he spent five months at the University of Alberta, Edmonton, Canada, studying urea transport in ruminants. He has also visited numerous other overseas research establishments and has attended several international conferences on ruminant nutrition and physiology.

Dr Clarke's non-scientific interests include music, woodwork and fishing.

HARKNESS FELLOWSHIP

Dr Dave Buisson, a DSIR scientist at the Mt Albert Research Centre, Auckland, has been awarded a Harkness Fellowship of the Commonwealth Fund of New York.

Dr Buisson, who heads the Fish Processing group of DSIR's Division of Horticulture and Processing, will leave at the end of May for a 13-month period of study and travel in the United States. He is to



DR D. BUISSON

undertake the Alfred P. Sloan Fellows Programme at the Sloan School of Management, Massachusetts Institute of Technology, Boston, leading to the degree of Master of Science in Management.

The Commonwealth Fund is an American philanthropic foundation established in 1918 by Mrs Stephen V. Harkness and endowed by her and by Mr and Mrs Edward Harkness. Its name reflects the founder's wish that the resources should be used for the "common welfare of mankind", and grants from it have since provided more than \$US230 million, mainly for medical education and health care.

In addition, the Commonwealth Fund has been active in international education since 1925, when Mr Harkness founded the fellowships which now bear his name. Their broad purpose is to promote international understanding, by "providing opportunities for education and travel to young men and women of character and ability". The awards, originally made available only to graduates of United Kingdom universities, are now offered in both Britain and Australasia to selected young people in any professional or academic field. Two Harkness Fellowships are at present available annually to candidates from New Zealand.

EDITORIAL COMMITTEE

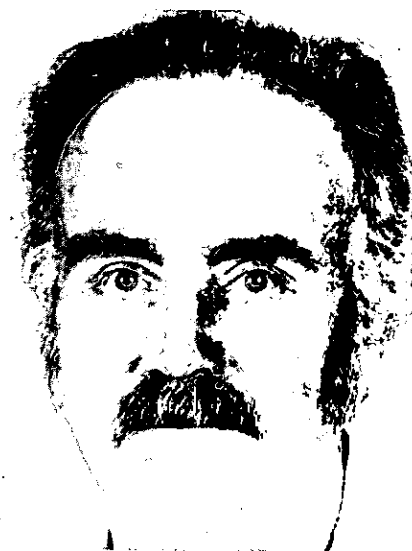
Due to increasing demands upon his time at Abels Ltd, Auckland, *Dr Laurence Eyles* has relinquished his position on the Journal's editorial committee. Laurence has put a vast amount of work into the NZIC via both the publications committee and the editorial committee of the journal. His down to earth efficiency would have been missed had he not had the foresight to introduce *Diana Fenton* to the editorial committee as his replacement.

Diana, currently Abels' Research Chemist gained an MSc in chemistry from the University of Auckland in 1982 and has worked with Abels for two years.

BRANCH SECRETARIES

Although often bearing a large proportion of the branches workload, branch secretaries usually get little NZIC recognition outside of their own committees. This months Chemistry in New Zealand drags some of the current crop screaming into the limelight.

Waikato's branch secretary *Ron Newth* was born in England and after leaving school spent two years in the R.A.F., followed by one year as a technician in the laboratories of Coates Bros. The next four years were spent as an Assistant Experimental Officer (Analyst) with the UK Atomic Energy Authority, before marriage and emigration to NZ in 1959. At Ruakura Research Centre he became the first technical analyst in the Nutrition Section under Dr J.B. Hutton. After commencing with a single laboratory in 1959, the group has expanded to encompass 12 laboratories, employing 16 technicians at maximum, and providing a wide range of analytical services under his management. Ron acquired NZCS in 1972, became a full member of the NZIC in 1978 and is currently in his second year as branch secretary.



DENIS BODY

Denis Body, secretary of the Manawatu branch, was born in Wellington, educated in Lower Hutt and attended Victoria, University of Wellington, where he received his B.Sc. (1959) and M.Sc. (1960) with first class Honours in Bio-physical Chemistry under the late Professor Brian England.

His career commenced in the Fats Research Laboratory (under Dr Brian Shorland) and was awarded a National Research Fellowship (1961) to pursue studies at the Lister Institute of Preventive Medicine, London (1964-68) on the lipid com-

position of lung surfactants related to respiratory distress syndrome with the guidance of the late Dr Maurice Gray.

When he returned home he was transferred to Palmerston North (1970) and has continued at the Applied Biochemistry Division. Here he has extended his interests to identify the unusual lipid components isolated from a variety of biological of the sources. He believes you must understand the chemical nature of the identified compounds before you can attempt to elucidate their biological role.

After assisting to raise a family of two sons with his wife Jenny, he has been able to have other interests. Earlier he has served as a Secretary to the Taita Rugby Football Club. Currently he is engaged as the Session Clerk (to a Presbyterian Parish) and an active member of a Boys' Brigade Company. In his spare time he became a member of the Institute (1963) and now helps as one of their Branch Secretaries.



PHILIP BEST

Wellington branch secretary, *Philip Best*, was born in England in 1952 and immigrated to New Zealand in 1960. He was educated at Tawa College and received his BSc in Chemistry and Biochemistry from Victoria University in 1974. On leaving University he did not immediately look for a career position preferring instead to run his own small business. In 1975 he joined Mobil Oil Ltd as Assistant to the Special Products Manager. Since 1977 he has worked with the Marketing Division of New Zealand Industrial Gases firstly as Product Manager (Special Gases) and latterly as Manager (Gas Products). He gained his Management Diploma from Wellington Polytechnic in 1980. Philip's out of work interests, besides the Institute of Chemistry, include photography. Philip is married but with no children since he says that with a wife a medical doctor, there doesn't seem to be time to have children.

Dr Wayne Temple secretary of the Otago branch, was educated at the University of Otago, gaining a B.Sc. Honours degree in Chemistry in 1971 and a Ph.D. degree in 1975 under Prof P.K. Grant. His Ph.D.

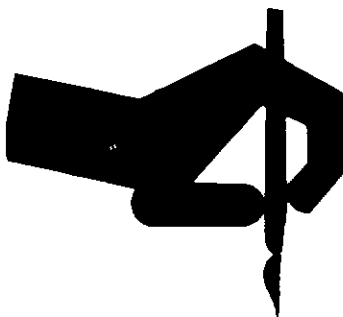


DR W. TEMPLE

research involved the transformation of manool, a diterpene alcohol, into potentially useful perfume additives. Then followed 15 months of post-doctoral research on alkaloid synthesis under Prof E. Wenkert at Rice University, Texas.

On his return to New Zealand in 1977, Wayne took up medical research when he joined the Department of Medicine at Otago University where he became engaged in aspects of research into lipid metabolism. In 1979, he joined the New Zealand National Poisons and Hazardous Chemicals Information Centre where he is currently Scientific Director with responsibility for Hazardous Chemical information. He also has a University appointment as Safety Officer.

Wayne has been a member of the Institute since 1977 and is currently Chairman of the Institute's Hazardous Chemical Committee and Secretary of the Environmental Committee. Outside interests include raising two small children, playing squash, jogging and hunting.



LETTER

Dear Sir,

There appears to be considerable lack of available practical short term training programmes being offered generally to Chemists in industry. Neither the manufacturers of scientific equipment nor the teaching institutions appear to be aware of this problem.

I would be interested to hear the views of other practicing Chemists in Industry.

Yours faithfully
J.C. Wallaart.

Industrial Chemist

THE SCEPTICAL CHEMIST

The recent publicity regarding the seepage of dioxin from a dump at New Plymouth raises some interesting questions. The samples assayed by analysts reported to be experienced in the testing for pesticide residues were shown to have 1 part in 10^9 (1ppb.) of dioxin. The first question is how far this result is significant analytically. While not questioning the ability or the sincerity of the chemists concerned, we are entitled to ask whether we can rely on a result involving such small quantities. This was a point raised by no less an authority than Dr William Horwitz, Editor for many years of the authoritative 'A.O.A.C.' Methods, when he was in New Zealand a little time ago. He quoted the case of a sample of blood taken with a stainless steel syringe which contaminated the sample sufficiently to give amounts of Cr detectable by modern analytical methods.

A recent article in 'Science' for January 28 deals with events at Times Beach, Missouri. It begins with the statement that dioxin is 'perhaps the most toxic chemical known' — a statement which is hardly provable or disprovable, and goes on to recount how contaminated oil was used to lay dust in arenas used for horse shows. Levels of dioxin as high as 33000 ppb. were found in soil samples. Many horses died, also birds, chickens, and even house flies. However, as far as humans were concerned, the only ones affected were the proprietress of one of the arenas and her daughter, who became seriously ill and are reported to be still showing some effects some twelve years later, but still alive. It is probable that their medical state was due to dioxin, but this could not be proved despite exhaustive medical studies. It could therefore be fairly claimed that while dioxin is lethal for animals, it is much less dangerous for humans. This would not be the first case where results on animals have not been reliable guides to the effects on humans.

Another puzzle is the stability of dioxin. Estimates seem to vary from a half-life of one to ten years. It can be destroyed by photolysis, so is burying it in the ground the right thing to do?

As a footnote, in a recent report New Scientist (24.3.83) on the yellow rain claimed to be sprayed on the Vietnamese, an Australian scientist has declared that the samples were faked, and the 'rain' did not contain the deadly microtoxins — which could have formed naturally. The report ends by saying that U.N. scientists found microtoxins in control samples, but missed them in samples where the toxins had been deliberately introduced.

Quote for this issue — "The universe could be the ultimate free lunch." (Alan H. Guth of M.I.T.)
'Quidnunc'

OBITUARIES



DR H.R. WHITEHEAD

H.R. WHITEHEAD

Dr H.R. Whitehead died suddenly on the night of Saturday, 12 March 1983.

Dr Whitehead was educated in Leeds and served as a biochemist in the College of Medicine of the University of Durham at Newcastle-upon-Tyne. In 1928 he took up the position of Chief Bacteriologist in the newly-formed Dairy Research Institute in Palmerston North, New Zealand. He was Director from 1959 to 1964 and after retirement he took part-time employment with the Institute until the day before his death. Thus he contributed to both the Institute and the dairy industry for some 55 years.

Over the period 1921-1960 Dr Whitehead was the author of some 64 scientific and technical papers. His contributions to science and to the dairy industry were

he received the Gold Medal of the Australian Society of Dairy Technology; in 1964 he was awarded the OBE; and in 1967 he received the Distinguished Service Award of the New Zealand Society of Dairy Science and Technology.

In the present day, it is difficult to imagine the enormous impact Dr Whitehead and his colleagues, Dr McDowall and Professor Riddet, had on the hardened dairymen of New Zealand. The fact that Dr Whitehead and his miniscule staff gained almost universal respect from the cheesemakers of the time while producing a number of milestone publications on the fundamental bacteriology of dairy processing, is a tribute to his ability and dedication to the industry.

Dr Whitehead had a faculty for perceptive criticism, and a capacity to strike quickly at the fundamental issue in any discussion. He had a flair for concise writing, and the advice and help which he freely gave were fully appreciated by his colleagues and friends.

He was a scientist of considerable eminence, known nationally and internationally for his role in transforming cheesemaking from an art to a science. Foremost amongst his many achievements was the demonstration, in the 1930's, that sudden failure of acid development during cheesemaking was caused by virus-like particles known as bacteriophage. Such failure, known as "dead vats", was the bane of cheesemakers. His deduction that acid production failure was caused by bacteriophage attack on the acid-producing bacteria (starter) was the outcome of painstaking experimental work, careful observation in cheese plants, and the application of a logical, analytical mind. He also evolved methods for combatting bacteriophage: a development of enormous economic significance to cheesemaking, because they were costing the dairy industry millions of dollars a year (in present day terms).

His conclusion that cheesemaking was severely hampered by the tradition of using mixed-strain starters for acid production and that it was possible to replace these mixtures by defined single strain cultures had important commercial benefits. It speeded cheesemaking and, by use of appropriate strains, overcame the problem of open-texture in cheese. Thus, the use of single strain starters, combined with an understanding of bacteriophage and means of preventing 'phage' attack, provided the basis of modern cheesemaking.

Dr Whitehead and his late wife, Nell, are

survived by sons Philip and Brian and six grandchildren. The Whiteheads were noted bridge players: they were foundation members of the Palmerston North Contract Bridge Club. They were also keen golfers and maintained a long association with the Hokowhitu Golf Club.
P.S.R.,L.K.C.

R. HICKS

Mr Ronald Hicks who passed away recently was a Chemist who will long be remembered both in this country and overseas. He was an industrial chemist of the old school, who had learnt not only his chemistry, but also how to put it into practice. He could talk chemistry to chemists, engineering to engineers, costs to accountants, and politics to politicians. Yet first and foremost he was a scientist who had devoted his life to the treatment, disposal and use of wastes.

New Zealand, and especially Auckland has much cause to be especially grateful to Ron Hicks (or RONIX as he liked to be called in his latter days,) for his outstanding work with the Auckland Metropolitan Drainage Board as it was then, to which he was appointed Chief Chemist in 1949. Those were the days when D.M. (now Sir Dove-Myer) Robinson battled with the late J.C. (later Sir John) Allum over the Browns Island scheme, with Hicks supporting Robinson to the uttermost. And what battles they were, with characters such as these and others on stage!

There was no such thing as retirement for Ron. His restless energy, and the need of so many for his services...Industry, Local Bodies, Planning Organisations... ensured that he was in demand right up to his death. In latter years he suffered from ill-health, but this never deterred him from answering a query, or writing a report, or speaking in his inimitable, forthright, sometimes pungent, but always commonsense and authoritative style.

But above all he was a teacher, always ready to pass on his knowledge and experience, and there are many in NZ today who continue to benefit from his expositions.

Those of us who are old enough to remember will always think of Ron Hicks when we stand on Achilles Point and look across to Browns Island, and to the beaches from Auckland to St Heliers and beyond, protected for all time largely by the work of Ron Hicks.

T.J.S.

CHEMISTRY IN N.Z. COMPETITION

Dr T.M. Kitson of the Department of Chemistry, Biochemistry and Biophysics is interested in collecting chemical mnemonics that members find useful in their teaching of any branch of chemistry at high school or university level.

Chemistry in New Zealand is offering a prize for the best (in the editor's rather

distorted view) mnemonic submitted to the editor by July the first 1983. The winner, and a selection of mnemonics will be printed in the August issue (Names withheld by requests and lowest or any mnemonic not necessarily printed). All entries will be subsequently forwarded to Dr Kitson.

An Appraisal of the Official Information Act 1982

**Michael Kingsford,
Chemistry Division,
D.S.I.R., Auckland.**

Michael Kingsford is the Government Analyst, Auckland. He was educated at King's College, and University of Auckland, completing his Ph.D. in Chemistry in 1963. From 1961-66 he was a Tutor in Pharmaceutical Chemistry at the N.Z. School of Pharmacy. In 1966 he was appointed Leader of the Food and Drug Section, Chemistry Division, D.S.I.R., Gracefield. This position evolved into Leader of the Pharmaceutical Section and from 1977-81, he was Group Leader over a number of sections including Forensic Science, Food, Water, and Toxicology as well as pharmaceutical. In 1982 he was appointed Government Analyst, Auckland.

Outside of the D.S.I.R. he has served on the Drug Assessment Advisory Committee (Health Department), both the Biological Testing Registration and Chemical Testing Registration and Advisory Committees of TELARC, and chaired the Medical, Dental and Pharmaceutical Sectional Committee of SANZ.



DR M. KINGSFORD

In the early hours of a December morning, the Official Information Act 1982 was read a final time and now comes into effect on 1 July, 1983. Its principle of more open government should be applauded by all but the effectiveness of the mechanisms for its operation remains to be tested. This is recognised by Part 6 of the Act which sets up an Information Authority whose three members were appointed in January under the Chairmanship of Sir Alan Danks. The functions of this Authority are essentially to review the workings of the Act, to recommend any amendments or regulations which may make the Act better fitted to carry out its purposes, and to enlarge the categories of information to which public access is given as a right. It is not authorised to inquire into the operation of the Wanganui Computer Centre. The Authority self-destructs on 1 July 1988, presumably on the assumption that the mechanisms will have settled down by then.

This article does not seek to deal comprehensively with the Act which in its 48 pages comprises 53 sections and three schedules. Instead, it attempts to cover the salient details, to outline the procedures involved in making requests for information, and to comment briefly on the implications for members of the Institute. Should you, after reading this, feel that the Official Information Act will affect you or your work then you should read the full text of the Act and get legal advice if appropriate.

The purpose of the Act is to increase progressively the availability of official information to the people of New Zealand so as to aid their participation in law-making and to promote the accountability of Ministers of the Crown and officials. Its basic principle is that official information shall be made available unless there is a

good reason for withholding it. With a few exceptions, official information is defined as any information held by a Department, a Minister of the Crown in his official capacity, or an Organisation. Departments are those listed in Part I of the First Schedule to the Ombudsmen Act 1975, excluding the Legislative Department and the Parliamentary Counsel Office. Ninety six Organisations are listed in the Ombudsmen Act (First Schedule Part II) and in the First Schedule of the Official Information Act. These include, for example, The Higher Salaries Commission, The N.Z. Lottery Board, the NRAC and the UGC. There is, of course, information which does not constitute Official Information, including evidence given to Royal Commissions or Boards of Enquiry.

Any citizen, permanent resident, or body corporate of New Zealand may request any official information. The request must be specific about the information needed, and if urgency is sought, reasons for the urgency must be given. The inquirer is entitled to reasonable assistance in making a request and is entitled to have the request directed promptly to some other Department or Organisation if that is the appropriate action. The recipient of the request must decide, "as soon as reasonably practicable," whether the request is to be granted and if there is to be a charge for it. It is not clear if warning of the charge need be given, but at times payment may be required prior to the provision of the information.

Where the information requested is contained in a document, several operations are specified, ranging from providing a copy of the document to providing oral information about its contents. "Document" includes tape recordings, computer files and photographs. Except for certain specified situations, the information

must be made available in the way preferred by the inquirer. If this is not done, reasons must be given and, if further requested, the grounds in support of the reasons, unless this prejudices interests protected by various sections of the Act.

These Sections cover reasons for withholding information, including prejudicing security or defence or international relations, prejudicing the entrusting of information to the Government of New Zealand on a basis of confidence by other governments or international organisations, prejudicing the maintenance of the law, or disclosing prematurely government economic or financial policies. Similar provisions apply to official information related to the Cook Islands, Tokelau, Niue or the Ross Dependency (section 7), and to competitive commercial activities of the Crown or its organisations (section 8 (1)).

A further series of reasons for withholding information covers situations where the public interest may override the reasons for withholding (section 9). Amongst these are the protection of personal privacy and the withholding of information supplied in confidence, where availability of information would prejudice the supply of similar information, or where withholding is otherwise in the public interest. This latter, delightfully amoral subclause cheerfully ignores the desirability of respecting confidences for their own sake. Nevertheless, commercial secrets should continue to be safe although such information supplied to the government should be clearly labelled as confidential. Other examples include prejudice to measures protecting health or safety, maintaining the effective conduct of public affairs through permitting free and frank expression of opinions, maintaining legal (but not other kinds of) professional privilege and preventing the use of official information for improper gain or improper advantage. The Crown is exempt from actions for defamation, breaches of confidence or infringement of copyright resulting from the release of information. The author of such information is also protected.

Fishing expeditions for the existence of certain information pertinent to Sections 6, 7 or 8(1) can be discouraged in certain circumstances by an Orwellian statement which "neither confirms nor denies the existence or non-existence of that information." There is also provision for deletion of information from documents but in such cases the reasons for the deletions must be provided.

Section 18 of the Act lays out the reasons for which requests may be refused. These include: that the information is or will soon be publicly available, that the document alleged to contain the information does not exist or cannot be found, that the information is not held by the organisation approached and that there is no reason to believe that it is held by any other official source, and that the request is frivolous or vexatious. Probably of most interest to members of the Institute is the justification that the information cannot be made available without substantial collation or research. This implies that there is no onus to provide sets of data unless compilations of those data already exist. Again, reasons for a refusal must be given to the inquirer.

The State Services Commission is required to ease the task of applicants by publishing a directory of Departments and Organisations. This is to include a description of the structure, functions and responsibilities of each body, a general description of the docu-

ments held by it, a description of any manuals containing policies, principles, rules or guidelines which govern decision making, and a statement of any information that needs to be available to members of the public who wish to obtain official information, including particulars of the officer or officers to whom the request should be addressed. It is further required that this document should be updated annually.

Subject to the usual restrictions and mechanisms, there is a right to access to any document containing guidelines governing decisions made by Departments or Organisations where those decisions affect a person or group in a personal capacity. For specific decisions, those affected have a right to a written statement of the facts behind any such decision and the reasons for the decision or recommendation. Every person is also entitled to access without charge to any personal information held about him which is held in such a way that it can readily be retrieved. However, there is an onus on the Department or Organisation not to give the information unless it is satisfied concerning the identity of the person making the request and ensures that the information is received only by that person or by a duly authorised agent. The inquirer may request correction of this personal information and must be notified of the action taken. Section 28 covers reasons for refusing requests for personal information.

Complaints may be made in writing to the Ombudsmen about a refusal to make official information available, or any conditions under which information is made available, or the charge made for that information. The recommendation of an Ombudsman must be observed within 22 days after it has been made unless the Minister responsible directs otherwise in writing, in which case the direction (with its grounds) must be published in the New Zealand Gazette and laid before Parliament.

Among its miscellaneous provisions, the Act empowers the making of regulations, repeals the Official Secrets Act 1951, and specifically does not authorise the making available of any official information if this would constitute contempt of court or of parliament. This last provision could lead to tricky situations.

Members of the Institute will be concerned with both sides of operating the Act. Those in the private sector may well find that official information becomes more accessible, albeit at a charge which may not have been made hitherto. Recent environmental controversies come readily to mind. Those providing confidential information to government should study section 9. Members in the Government Service may well find that the increasing load imposed on them by requests for information will not be accompanied by additional staff to meet those loads. One can conceive of the situation where the more normal work of a government department or organisation could be impaired by excessive demands for information. Section 14 of the Act takes into account possible impairment of efficient administration and provides for the making available of information in a manner other than that preferred by the inquirer. However, these grounds cannot be used to refuse a request unless "substantial collation or research" are involved in responding to it. Only time will tell how severely the operations of the Act will impair the efficient running of New Zealand's Government Scientific Organisations, and of the Ombudsmen. Certainly the Official Information Act is a step forward in protecting the public interest, but how great a step remains to be seen.

To Make a Cosmetic, TAKE

C.L.H. Stonyer, Smith-Biolab Ltd.

The author of this article, Mr C.L.H. Stonyer, revealed much of his chemical life in "What is an Industrial Chemist — A Sort of Autobiography" in this Journal, November 1978, page 108, but since then he has retired from ICI Tasman in Upper Hutt and moved to the more equable climate and greater industrially stimulating environment of Auckland. After spending several months buying and renovating a house, doing a few consulting jobs, and generally loafing around (his own words, Ed) he took a temporary position in the manufacturing bit of Smith-Biolab, where he formulates new products, tests manufactured products, encourages good Q/C practices, and tries to keep from being utterly exhausted, so that he can finish the house alterations at weekends.

He also helps produce this journal, by being on the Editorial Committee, where he is trying for a medal by attending more meetings than anyone else, and, when called upon by Her Majesty, sits and thinks on a syllabus committee of A.A.V.A., where those much more expert in both chemistry and the teaching thereof decide what students will have to study for N.Z.C.S.

The following is based on a talk to the N.Z. Society of Cosmetic Chemists at their 1983 Conference, entitled "The Manufacture & Quality Control of a Facial Moisturiser", but it is relevant to almost any cosmetic cream or emulsion, and some of it applies to manufacturing and product development in general.

So you want to make a facial moisturiser? Good: then start asking questions. The questions you ask will depend on who you are, and what follows assumes that you are a production person of some kind, or even the "cook" in the kitchen of your home business.

In management books, MEN, MONEY AND MATERIALS are the prime requisites for making a product, but you also need PLANT and ORGANISATION. If you look at factory staff, and in the offices and laboratories and, in our industry, on the road, this should be enlarged by adding WOMEN.

Many books have been written on quality control, but not so many on manufacturing. The latter are usually disguised under such titles as "Product Management" "Planning for the Small Business" "Emulsions and Emulsification" and none of them will tell you exactly what you want to know. What follows may fill in a few gaps.

THE SCALE

The question here is — who are you making it for?

The answer to this question tells us the scale of manufacturing you must plan for, because without knowing how much you are going to make and when, planning is impossible. I don't know about all marketing departments, but most of those I've known find the question of how much is the one they least want to answer.

Once you have decided how much you are going to make, and when, and what the possibilities of fantastic success or miserable failure are, you can get on with the rest of the details. Some, such as the formula, may not be affected much by the volume to be made, but others (see MONEY) are directly connected.

THE FORMULA

"Pure" chemists will interpret this to mean the molecular formula, or the structural formula, but in the world where products are made by mixing or reacting various pure or

not so pure chemicals, it means the basic list of raw materials used to make the product.

The question here is — where did it come from?

Many suppliers give out books of formulas — e.g. Amerchol, Croda, Carbopol, G.A.F., Henkel, ICI, — and these are very useful. You will also find these copied in books and journals, where they look good, but the trap here is that the fine print saying "No responsibility ... tried only in our laboratory... perfume and preservative Q.S. ..." is often left out in these secondary sources.

If you study enough formulas, you will sometimes find missing essential raw materials, and materials added for no apparent reason. The other trap is that materials are given under the supplier's brand names, and you may find yourself locked into an expensive source of something which you could get cheaper elsewhere.

Avoid this if you can.

The level of some materials can be excessive — if you are selling an emulsifier are you going to put out a formula with the absolute minimum quantity, or one with plenty?

Another source of formulas is your principal's development laboratory in some other part of the world. When you get one of these start asking questions again, for example: Do we have all these raw materials? If not, can we use an equivalent that we have? Will our Head Office object? (Will we tell them?) Do the trade names used mean we have to buy these brands? Is deionised water necessary in a product containing calcium and magnesium? Is absolute alcohol necessary to dissolve the dye?

Any good chemist can think of lots more questions.

Your own development chemist may be the best source, but this is a much more difficult method, because he or she will probably start asking questions such as — What age group are we selling to? What time of day will we recommend putting on our moisturiser? Is it to be

suitable for all skin types? Will any special claims be made? Can we install some new plant to make it with? Is a cream, lotion or gel preferred? How is it put on — spray, wipe, dip...?

One essential in a locally formulated product, regardless of the skill of the chemist, is consumer trials. There are marketing consultants who will organise these for you, or you can use the "do it yourself" method. Marketing people ultimately determine the success or failure of any product, so they must be heavily involved at this stage. Try and get them to allow your development section adequate time — a year?

If you are into contract manufacturing you get formulas from customers, which you should look at very carefully. One formula I know of came from a U.S. raw material manufacturer to the local agent, then to his friend in a distant town, then to the contract manufacturer in another city. Fortunately a lab. batch was made first, because the finished product didn't work!

At the bottom of the scale of value are the lists of raw materials found by law on products made in the U.S.A. These list the contents in decreasing order, and if you are skilled in the art and want to match a U.S. product you might succeed, using this information.

THE PACKAGE

Everything must be in something, and if it's going to sell it must be in something good. As a production person you may not have much say in the design of the bottle, jar, cap, carton, label or leaflet, but try and make your views known at an early stage. Some bottles just won't feed down a conveyer line, some caps can't be put on by automatic machinery, some containers have necks too small for your thinnest filling nozzle, some tubes must be positioned with ridiculous precision in the filling machine, some inks on the container will dissolve in your product, some labels have no space for the batch number.. there is plenty of scope for improvement on most packaging!

Incompatibility of the package and product is less likely than it used to be, but ask yourself if something too good is being used. I was surprised to discover that a raw material which almost destroys a cheap plastic if tested in it, was perfectly satisfactory when made into an emulsion.

THE BATCH SHEET

Codes of good manufacturing practice say a lot about written instructions and some chemists not a million metres from here have issued page after page of details about how to make a product, only to find that after making a product several times an intelligent processor gets a bit bored with it and stops reading, with results that you can guess.

The absolute minimum of instructions is in the formulas from raw material suppliers:

"Melt all A at 80°, dissolve all B in water and emulsify at 75/80°." To a technical person this may be enough but I can't recommend trying it in the plant with your next products.

My recommendation, for most N.Z. manufacturing plants, is for a clear record on one page of the weights or volumes of all the raw materials, showing the names that the processor will find on the containers, as well as any codes and numbers that you may have added on receipt. If your formula calls for "Petroleum Oil, Light, U.S.P." and your drums are branded "Octavius 890"

then you deserve all the problems that may result. (Fig. 1).

On the next page should be a warning about possible hazards and any special precautions that need to be taken. (Fig. 2).

Smith-Biolab Q/C				
Batch Sheet for Moisturiser A1; (1000 kilos; 3600 x 250ml)				
Page 1 of 4		Batch No. _____		
Approved _____		Production _____		
This issue dated 9/9/89 which supercedes 8/8/88				
Code	%	Name	Wt/Vol	Unit
C92	5.1	Cetostearyl Alcohol	51	kilos
G19	2.0	Glyceryl Monostearate	20	kilos
K18	1.3	Isopropyl Palmitate	13	kilos
A75	0.5	Meth Spirits WP	5	litres
944	-	Distilled Water	-	-
Q68	0.8	(Cetrimonium Chloride 25)	(8)	kilos
NOTE WHICH BRAND IN USE:				
		Cetoquat 4	8	kilos
		Biokwat 50	4	kilos
Z53	0.094	Zinc undecylenate	940	grams
WT	3.5	Clavious Oil 890	35	kilos

Figure 1. Representation of page one of a hypothetical batch sheet.

Smith-Biolab Q/C			
Batch Sheet For Moisturiser A1			
Page 2 of 4		Batch No. _____	
Issue Dated 9/8/99			
Precautions and Special Notes			
Do not get cetrimonium chloride in the eyes; WEAR GOGGLES			
Receipt No.	METHOD	wt/vol	Unit
	1. Load distilled water into mixer A.	520	litres
	2. Start heating.	-	-
	3. Load Cetostearyl Alcohol.	51	kilos
	4. L.G.M.	20	kilos
	5. Mix at speed 1 until temperature is 75°	-	-
	6. Into mixer C, put distilled water.	100	litres
	7.		

Figure 2.

Smith-Biolab Q/C		
Batch Sheet For Moisturiser A1		
Page 4 of 4		Batch No. _____
Issue Dated 9/8/99		
Code	Packaging Component	No.
B95	Bottle 250ml Printed	3600
L22	Oversticker "Now with Mineral Oil"	3600
C75	Carton, Printed	3600
W8	Outer Wrap	25 kilos
L5	Shipping Label	36
Inspection Schedule		
On startup, samples. Wait for test result.		
Each hour Do not wait for results.		

Figure 3.

Then must come clear simple directions on those points which are necessary, more as a reminder to the processor than an instruction as to what sized bucket to use!

You will have had qualified staff present during the first batch or two, to discover what the key points are, so don't write too much in the first edition. Try to allow for the fact that at some time perhaps because containers or materials haven't come, or you want to wind up a production run, the standard batch size may have to be changed. (We all know that the Health Dept. hates handwritten instructions, but there must be very few factories that never make a non-standard batch). You should allow only one person to alter batch sheets, and have another equally competent person checking the alterations.

Finally, most batch sheets will have space for recording the yield — in a batch situation it must be recorded. You can have problems when a filling tank is never emptied, but just refilled from the mixing room. The C.G.M.P. reads as though this never happens, but in the real world it does.

THE C.G.M.P.

The volume of production will greatly affect the way you conform to the Code of Good Manufacturing Practice, because although it may appear that the same standards must be applied to a hundred bottles as to a hundred thousand, this is true only in a very narrow legalistic sense. Do we really believe that the man or woman running a home business, (or even one which has grown to the extent that an employee or two have been engaged) uses all the forms, Q/C stickers, batch sheets, written protocols, packaging specifications and laboratory tests that most of us in medium to large businesses do? The exact level of conformity to the details of the C.G.M.P. is something each manufacturer must decide for himself — or possibly the Health Dept. will decide for him!

THE RAW MATERIALS

Variables here are price, quality and quantity, but we should add another one, presentation.

Not so long ago many wax-like solids came in large cakes, or huge solid lumps in drums, but most of these are now sold in flake or granular form. It pays to ask!

The package is important for another reason, since the quantity in a pack will hardly ever work out to what you need, and you will have to reseal the pack and put it back in the store. Polythene, and fibreboard drums have been a big help here, but have you recently bought a sack of caustic soda?

Discounts for buying larger quantities, or penalties for buying small packs, must be taken into account, which is where your accounting/costing systems are important.

The production people will want to buy at the lowest price but there may be a directive from above never to have more than three months stock, or 10% over your needs, or a restriction in dollar terms. Such restrictions are inevitable, but inflexible adherence to the rules can be costly. What is the cost of issuing a purchase order, receiving an item into your store and recording it, and paying an account? If it costs a bank \$1.75 to process a cheque, say \$50 — \$100 for this cost?

Get the real cost from your accountant, if you can!

If you decide that every raw material must be of Pharmaceutical quality, you're in trouble immediately because lots of cosmetic materials don't appear in pharmacopoeia. Fortunately there are lots of suppliers who specialise in cosmetic materials, and you can buy their goods with confidence.

One book you must have is the C.T.F.A. Cosmetic Ingredient Dictionary.¹ It covers an enormous number of materials, including many surfactants and other chemicals you might not expect to find used in cosmetics; it lists suppliers' names and addresses; it indexes brand names; and it gives structural formulas for almost everything.

THE PLANT

Most people will have a building but for the lucky few who might get a chance to build, I suggest lots of visits to other plants and as much reading on the subject as possible.

When we come to plant we get a different picture. When a small firm is expanding, the temptation to buy secondhand is almost irresistible, which is a pity because it will seldom be what is really needed. If your product is an emulsion you must have some way of supplying energy to disperse one phase into particles, surrounded by the other phase. It is possible to make a coarse mixture of the two phases and pass the mixture slowly through a very small homogeniser, but a compromise is usually made between time and homogeniser size. It is worth considering whether all the batch needs heating, or only a portion of it, followed by dilution with cold water.^{2,3} For the size of batches common in our industry it is not too expensive to put a homogeniser into the whole batch, but this is by no means the most efficient — a system where a fairly good emulsion is finished by passing it through an in-line homogeniser is best.

The most versatile mixer for the coarse emulsion formation is one with two sets of blades rotating in opposite directions. Variable speed will enable practically any cream, lotion, gel, paste or solution to be made. Importers will show you pictures of their latest mixers, often with a rotating head inside a rotating bowl, and some of those are very efficient, but they often fail if asked to handle product too far from the optimum viscosity, and are usually very expensive. Ask if anyone else has bought one!

When it comes to heating you need a chemical engineer to calculate the cost of the source — wood, geothermal steam, gas, electricity or whatever — in terms of what you want to heat, in what time, to what temperature. The cost of converting your source into useful heat is another factor. Why do we use steam so much? Few cosmetics need anything over 80°, and the use of zero-pressure hot oil would enable economies to be made in the construction of heated vessels.

Weighing raw materials involves plant of a different kind, with rapid improvement in technology making ordinary scales redundant. Mixers on load cells, with all raw materials fed from bulk tanks, looks like the method of choice. If your volumes and product mix do not justify bulk raw materials, at least get the mixers on to load cells with large displays showing the weights in them. Materials used in smaller quantities, can be weighed on one of the sheets of stainless steel which through the magic of chips and ICs will show you the weight to a quite unnecessary accuracy.

This is another point to watch, and one which, formulators often forget — do not ask your processor to weigh out more accurately than his equipment will allow. Some chemists ask for 290.321 kilos of material, knowing that on a 0-500 kilo scale a kilo is about the best you can measure. Hence — know what quantities are critical or costly, and specify the accuracy accordingly.

Having made your product it has to be put into something, which means a filling machine. The range here is very wide — from a plastic funnel to a multiheaded monster costing as much as a respectable suburban house. If you are going to buy, look for the simplest — not necessarily the cheapest — machine that will do your anticipated throughput.

Don't forget to allow reasonable time for maintenance, and find out how breakdowns will be fixed and where spare parts are kept.

Filling (and labelling) machines use mechanical, pneumatic, electrical and electronic controls, and you will be faced with sales people making all sorts of claims about the virtues of whichever their particular machine uses. The experience of other users is the best guide.

Few products in the cosmetic field are filled by weight, even if a weight is shown on the label, because it is so much easier to fill by volume. Modern electronics may change this — a feedback from an automatic weighing pad in a conveyer line to an adjustment in the filling machine is relatively simple.

As you get bigger, you will need a carton assembling machine. Here too, lots of agents will extoll the virtues of their brand, but my advice is the same as the slogan once used to sell cars — "Ask the man who owns one!"

QUALITY CONTROL

Over a certain size you will have a place called a Quality Control Laboratory. The staff may include chemists and technicians who do the physical and chemical testing, as well as inspectors who take samples of raw materials, work in progress and finished product. They sometimes look at materials being weighed, and how the product is being made and packed.

These functions, are a part of the wider responsibilities of the Quality Assurance section, and are best dealt with as part of Quality Assurance.

QUALITY ASSURANCE

Many quality controllers realised that their influence and their responsibilities extended far beyond the confines of their laboratories or manufacturing plants, but now quality control has been more closely defined, with quality assurance being much broader in scope.

Quality Assurance, by setting up and policing appropriate procedures assures all levels of management that their products conform to agreed standards. Multinationals usually have the Q.A. business well-defined, but this is not always the case for local organisations: Who is in charge of your Q.A.?

The Health Dept., the D.S.I.R. and some tertiary educational institutions have people who are very knowledgeable about Q.A., and if you haven't got it, it might pay to ask.

Has your production line ever been held up because the laboratory analysis is 4.94%, but the standard for the product is 5.0 — 5.5%? And can the production manager or the sales manager over-rule the laboratory decision? This problem is a management one, because not only must the standards set be realistic and meaningful, but

the action to be taken should have been laid down beforehand. If you have made lots of batches, your control charts will show you how abnormal the result is, which is a big help.

For a product like a moisturiser examination of the finished product may not tell you a lot. Your development department could have specified viscosity, colour, pH, particle size of the emulsion, surface tension, thermal stability or other parameters, but how are these affected by variations in raw material contents, or raw material quality? A standard for a product, and for its manufacture, must be developed at the same time as the product. Developing the standard may take a lot of time but it can save a lot of argument.

You will find that the excessive cost of Q.A. is raised from time to time, and "It is impossible to make perfect products because they would cost an infinite amount of money". This is a fallacy — what is perfection? Perfection is making a product that performs exactly like the one originally specified, and is not an impossible dream. Have you seen the whisky slogan "The Whisky is Perfection" — and do you think anyone ever bought a dud bottle of it?

What does a rejected batch cost? How much rework do you have lying around?

MONEY

A lot of small and not so small businesses refuse to believe the facts in this area that a few remarks may be helpful. Technical staff too, are often very naive, and refuse to believe that a tube containing 10 cents worth of raw material, and sold for say \$4, is not lining the pockets of greedy intermediaries with gold.

Table I shows roughly how costs add up all the way from your raw materials to the customer who buys your moderate sized pack of facial moisturiser.

	\$	As % of the price paid by the customer
Raw material cost	0.26	4.8
Bottle or jar, plus carton, label, leaflet	0.55	10.1
Labour to make & fill	0.09	1.6
Factory costs e.g. management, Q/C, heat, rates, repairs	0.35	6.4
Warehousing, selling, advertising, accounting, management, profit	1.85	33.9
Sales tax	0.31	5.7
Total = absolute minimum price to wholesaler or retailer	<u>3.41</u>	
60% retail margin	2.05	37.5
Selling price to customer	<u>\$5.46</u>	<u>100.0</u>

Table I : Breakdown of costs of a small bottle of moisturiser

Pity the poor customer — of her sales dollar only 4.8 cents is going to the raw materials she wants! Or you could say, if she came to the factory gates she could pay only \$1.25, which is 23% of the price she actually pays.

The biggest slice goes to the retailer in this example, and in fact if you look at the annual reports of any retail organisation you will see that they can hardly survive on a lesser percentage. (Is this why alternative methods are developing?)

Chemists should note how small a proportion of their

own company's final selling price goes to raw materials. (8%). The implications of this figure when it comes to cutting the cost of a product, or of not buying or using the best possible materials, are obvious.

We must also learn about the two kinds of money called capital. Everyone can see the capital involved in buying plant, machinery or buildings, and will make provision for getting it and paying for it, but what about this thing called working capital? There may be businesses that don't have it, but if you are going to start making a tangible object or product, you must have it. Before you sell one gram, ounce or scruple of your new moisturiser you will have spent a lot of money on materials, on labour, on warehousing, on advertising and similar direct costs, not to mention what research and development, executive time and other costs you have probably incurred. Once you have established a market, you can predict your sales over some future period, you can calculate with reasonable accuracy how much money you have invested in this sort of way, and someone can say "For \$X of sales each year we need \$Y of working capital", but how many do the exercise first?

PEOPLE

Listed last, but first in importance, are the people in your organisation, because an organisation is nothing but people. Mixers, telephones, computers, copiers, cars, homogenisers, Health Depts., tube fillers, telexes and test tubes may all be part of your life, and may even be necessary to make and market a product, but without people they are useless.

From the production point of view, the people in the plant are the most important, and of these the most important (next to the chemist of course!) is probably

the man or woman operating the weighing/mixing/homogenising/cooling gear used for your product. The most brilliant G.M., the wizard accountant, the best sales force in the world, can't make money from a product which varies from batch to batch, comes out differently from the development samples, or fails to keep its consistency in storage, and a lot of these facts are under the control of the processing person.

The man or woman operating the plant is a vital cog in the wheel (or should I say silicon chip in the circuit?).

How do you get good people in jobs like these?

The standard answers of experience, education, and training are true, and each plant supervisor must decide how much of each is necessary. There are companies who use N.Z.C.S. or university graduates to make their products, clean their kettles and wash their floors, and good luck to them, but there are others who take intelligent school leavers and train them for the job.

Finally, in talking about staff, is the need for them to be organised into groups, and for each to be responsible for a particular function. Our Prime Minister has just discovered the use by the Japanese of Quality Circles, which as good production people we all read about a year or more ago. There are no tablets of stone with rules for organising humans in companies, so if your people have the correct degree of rigid organisation as against complete freedom you are indeed fortunate!

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- Strong interest in analytical chemistry and ability to interpret test results and report.
- Previous experience in an industrial laboratory and an appreciation of industrial and commercial requirements.
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Cellulases From Extremely Thermophilic Bacteria

K.R. Sharrock*, C.H. Sissons, R.M. Daniel,
H.W. Morgan

Department of Biological Sciences,
University of Waikato

(Originally presented at the 1982 Conference at which
Keith Sharrock won the Student Paper Competition).



Keith Sharrock, a D.Phil. student of Waikato University, is studying the biochemistry of cellulases from extremely thermophilic bacteria. He graduated B.Sc. from Waikato in 1976 and M.Sc. (Hons) in 1979 at the same university. His M.Sc. research

involved a study of nitrogen fixation and translocation in *Coriaria arborea* (tutu). During 1980 he was a Teaching Fellow in the Botany Department, Canterbury University, and completed his LTCL (Performers) on the violin. In 1981 he returned to Waikato University to join the thermophile research group.

Roy Daniel is Senior Lecturer in Biochemistry at the University of Waikato. He graduated in Chemistry, B.Sc. (Hons) at the University of Leicester in 1965 and Ph.D. in Biochemistry in 1968 at the same university. After working as a Postdoctoral fellow at the Agriculture Research Unit for Nitrogen Fixation at the University of Sussex and the Division of Plant Industry, CSIRO, Canberra, he took up a lectureship in the Department of Cell Biology, University of Glasgow in 1971. He has been at Waikato since 1975.

Hugh Morgan is Senior Lecturer in Biological Sciences at the University of Waikato.

After graduating B.Sc (Hons) in Agricultural Botany at the University of Wales, Aberystwyth in 1965, he completed his Ph.D. in Soil Microbiology at the University of Guelph, Canada in 1970. He was awarded an ICI Postdoctoral fellowship to work at the Macaulay Institute for Soil Research Aberdeen prior to taking up the lectureship in Waikato in 1972.

Chris Sissons joined the Thermophile Group of the University of Waikato in 1981 as a Research Fellow, working on cellulases. He graduated in Biochemistry (M.Sc.) at Victoria University of Wellington in 1965, with a thesis on insecticide detoxification and Ph.D. in Cell Biology at Auckland University in 1971, studying cell free protein synthesis in yeast and including a year lecturing in the Biochemistry Department at Auckland. He then spent six years doing post-doctoral research on enzyme synthesis in the yeast cell cycle in the Zoology Dept. at Edinburgh University and four years at Ruakura as a NRAC Facial Eczema fellow studying mycotoxin detoxification.

INTRODUCTION

Cellulose is the most abundant biopolymer on earth, and is the major component of urban waste. Thus cellulose must be seen as a very significant renewable source of chemical foodstocks when fossil fuels become restricted.

Cellulose is a β (1-4) — linked glucose polymer with a complex secondary and tertiary structure.¹ The glucose molecules exhibit alternating orientation so that the basic repeating unit is cellobiose.

The polyglucose chains align to form microfibrils. These are ordered structures so that about 70% of their length can be termed "crystalline".¹ In these areas the polyglucose chains are cross-linked by one hydrogen

bond per glucose. In addition, there are two intra-chain hydrogen bonds per glucose. The gaps between adjacent polyglucose chains are too small to allow enzymes to penetrate the crystal, and even the exposed exterior chains are difficult to break up. This is because several bonds must be broken simultaneously; the β 1-4 glucosidic bond, and also three hydrogen bonds, if a glucose molecule is to be removed to create a "nick" in the chain.

Thus the intervening amorphous regions, where some irregularities opening the structure may already exist, are initially the targets for hydrolytic enzymes.

Most cellulose occurs naturally in a lignin-cellulose — hemicellulose complex which is often extremely resistant to hydrolysis. Lignin is the plant's equivalent of

concrete, and cellulose fibres act as the internal reinforcing. Woody materials generally require some pretreatment to open up the lignin-cellulose-hemicellulose complex sufficiently for effective enzymic hydrolysis of the cellulose. We have centred our studies on the enzymic hydrolysis of pure cellulose as an initial step in understanding cellulose hydrolysis in the natural lignin-cellulose-hemicellulose complex.

SOURCES OF CELLULASE

Most of the cellulolytic enzymes available for commercial purposes are of fungal origin. More recently a thermophilic anaerobic bacterium *Clostridium thermocellum* (growth optimum 60-65°C) has been shown by overseas groups²⁻⁶ to produce cellulases capable of completely hydrolysing crystalline cellulose. Since these enzymes possess specific activities which are similar to those of the best fungal cellulases but are more heat-stable,^{6,7} they are potentially of commercial interest. This being so, it seemed worthwhile to look for a source of even more thermostable cellulases, in extreme thermophiles (i.e. organisms with growth optima above 65°C).

ENZYMIC DEGRADATION OF CELLULOSE

No single enzyme has yet been discovered that alone is capable of hydrolysing crystalline cellulose to any great extent. Fungal systems have been most intensively studied, and they are often based upon the concerted action of two or three types of enzyme, endocellulase, exocellulase (probably physically associated) and β glucosidase.⁸⁻¹⁰ Many fungi have been shown to produce several different enzymes within each of these basic types,^{9,10} so the term "cellulase" refers to an enzyme complex, not a single enzyme.

HOT POOLS SCREENED FOR CELLULOLYTIC BACTERIA

The first step in our study was to find extremely thermophilic bacteria that produce cellulases. We were particularly interested in cellulases with high thermal stability and high specific activity. The level of cellulase production was not considered to be so important at this stage since the yield of enzyme by the bacterium can be genetically raised. Thermal stability and specific activity, being characteristics of the enzyme itself, will be extremely difficult to improve.

Water and sediments were collected from about 50 natural thermal sites and bacteria from them were grown at 75°C in cellulose-containing enrichment media, both aerobically and anaerobically. After six and 21 days growth we subjected the cultures to the first screening step. This involved assay of the cell-free supernatants for endocellulases. Only eight cultures fulfilled this requirement. All were anaerobic.

The second screening tested for the ability to degrade crystalline cellulose, since the ultimate objective was to find bacteria capable of degrading natural cellulosic materials with a minimum of pretreatment. Two of the cultures, TP8 and TP10, could be seen to consume crystalline cellulose from their growth media, and assays on the cell-free culture supernatants confirmed that they were producing cellulases capable of hydrolysing crystalline cellulose to reducing sugars.

Specific activities of the cellulases of both crude culture supernatants compared well with that of the cellulase we obtained from *C. thermocellum*. We included

C. thermocellum as a reference in most of our comparisons, although it had to be grown at 60°C whereas our bacteria grew at 75°C.

Apart from TP8 and TP10, none of the other cultures produced enzymes that would release significant quantities of reducing sugar from crystalline cellulose.

Stage 3 of the screening involved a comparison of the thermal stabilities of the supernatant endocellulase activities (Figs 1). These exhibited half-lives at 85°C of five hours, 20 minutes and less than five minutes from TP8, TP10 and *C. thermocellum* respectively. Thus TP8 was selected for further study.

Some of the bacteria which we rejected after stage 2 of the screen subsequently proved to have extremely stable endocellulases, with half-lives at 85°C in excess of 20 hours. Unfortunately these bacteria are not able to attack crystalline cellulose by themselves.

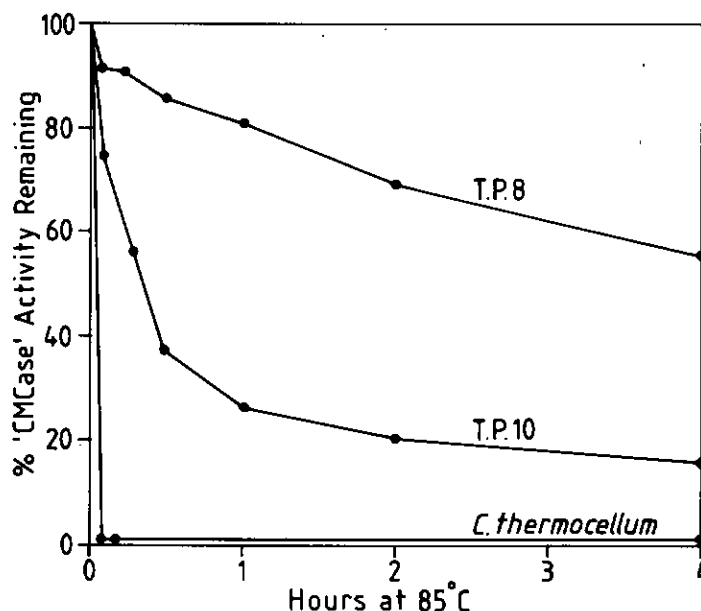


Fig 1 Thermal stabilities of endocellulases

Culture supernatants were incubated at 85°C and samples taken at the times indicated were assayed at 75°C for remaining endocellulase (CMCase).¹³

ISOLATION OF BACTERIA IN PURE CULTURE

In order to study the cellulases of TP8 further, it was necessary to isolate the cellulolytic bacteria in pure culture. Cellulolytic anaerobes are renowned for the difficulties they present in the face of any effort made to isolate them¹¹, and those from the TP8 culture proved to be no exceptions. We had additional problems in dealing with extreme thermophiles in that agar dries out or melts at their growth temperatures. Eventually we developed a system which allowed isolation and cultivation from individual colonies, each of which originated from a single bacterium. Two different cellulolytic strains were isolated from TP8. The more stable endocellulase was produced by a strain which didn't attack crystalline cellulose to any extent. The other strain was considered more worthy of further study since it produced enzymes capable of hydrolysing crystalline cellulose to reducing sugars.

SEPARATION AND CHARACTERISATION OF CELLULASE COMPONENTS

Purification and study of the cellulases from this isolate has only just begun, and so far we have preliminary information only.

Enzymes from the supernatant of 80 litres of culture

were concentrated by ammonium sulphate precipitation, redissolved and washed over a 10,000 M.W. cut-off ultra-filter. The concentrate was then applied to a G-100 Sephadex column and the fractions collected were subjected to four different assays (Fig. 2).

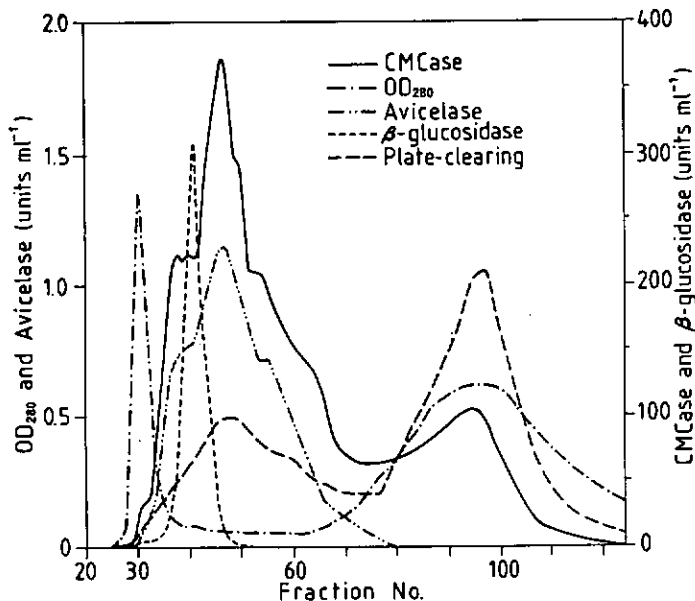


Fig 2 Elution profile for cellulases and β -glucosidase on a Sephadex G-100 column

All assays at 75°C, with units as follows:

"CMCase" and "Avicelase": One nmol.glucose equivalents.min.⁻¹

β -glucosidase: 130 pmol. p-nitrophenol.min⁻¹

Plate-clearing assay: Units arbitrary, based on antilog. of cleared diameter around wells in CMC-agar.¹⁴

Optical density at 280 nm was measured to roughly monitor protein concentration, and showed two major peaks. The first contained proteins of the void volume, and the second appeared much later and tailed considerably.

β -glucosidase¹² eluted as a single sharp peak of activity. Endocellulase activity was measured by two methods. The first, denoted the "CMCase" assay, involved incubation of column fractions with sodium carboxymethyl cellulose and measurement of the reducing sugars produced.¹³ The second was a plate-clearing assay, presumably dependent upon shortening of the carboxymethyl cellulose molecules¹⁴. The plate-clearing assay was therefore more sensitive to centrally-acting endocellulase than was the "CMCase" reducing sugar assay. Both assays produced two broad peaks of activity, but the relative magnitudes of the first and second peaks were reversed, suggesting that the endocellulase in the second peak was the more centrally-acting.

The fractions were also incubated with Avicel, which is crystalline cellulose, and the reducing sugars produced were measured.¹⁵ This resulted in a single peak. There was "Avicelase" activity only in the first "CMCase" peak.

Thus it appears that there are at least three different enzymes involved in cellulose hydrolysis by this bacterium. One has β -glucosidase activity, and has a molecular weight of about 55,000.

There may be a single enzyme or group of enzymes, each exhibiting both exo- and endocellulase activity, since crystalline cellulose and CMC hydrolysis peaked

in the same fractions. Alternatively, each of these activities may be due to separate enzymes of similar molecular weights.

The second protein peak had endocellulase but no exocellulase activity. Its late appearance from the column could suggest an extremely low molecular weight (< 2000), but more probably it was retarded by binding to Sephadex. Such binding was expected since at 75°C the enzyme concentrate had been shown to hydrolyse Sephadex G-100 (which is a dextran) almost as efficiently as it hydrolysed crystalline cellulose. However, no detectable release of reducing sugars from Sephadex occurred during incubation at room temperature overnight. In preliminary work with a Biogel acrylamide-packed column the second endocellulase peak was absent, which may suggest that its molecular weight is actually quite similar to that of the first endocellulase, and that their differing affinities for Sephadex allowed their separation.

FUTURE WORK

Further fractionation techniques such as affinity and ion exchange chromatography and isoelectric focussing should allow purification of the individual components of the cellulase complex. The components will then be characterized independently and investigated for their possible co-operative action.

ACKNOWLEDGMENTS

We wish to express our gratitude to the following organisations for financial support in this project: New Zealand Energy Research and Development Council, British Petroleum (N.Z.) (for C.H.S.) and Development Finance Corporation of New Zealand (for K.R.S.) Our thanks also to Colin Monk for his excellent technical assistance.

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COUNCIL NEWS

Dr Douglas Wright presided over meetings of Council in Wellington on Thursday and Friday 17 and 18 February.

Subscriptions

Council resolved to raise the 1983/84 subscriptions to \$50 for Fellows and Members and \$40 for Associate Members with a rebate of \$5 until 31.8.83. The rebated subscription increases \$5 from \$40 to \$45 for Members and Fellows and from \$30 to \$35 for Associate and Local Members. For Graduate and Technician Members the rebated subscription remains \$22 (\$27 less \$5). For students the subscription is held at \$10.

Graduate Members who are not in full time employment and earn less than \$10,000 per annum may request Branch approval to pay the student rate.

It was also resolved that Local Members may elect not to receive the Journal. Their subscription will then become Council's Branch member allocation at the time — \$7.50 in 1983/4. This policy change aims to encourage scientists in disciplines other than chemistry to participate in Branch meetings.

The President informed Council that he had ascertained a subscription increase would be in order from the wage and price freeze authorities.

Some members of Council questioned the rise of about 12% being sufficient to meet the increasing costs of publishing "Chemistry in New Zealand" and other items of Institute expenditure apart from the cost of the proposed new policy of assisting Branches to finance students to attend the Institute Conference. It was noted that Council's investments are only the equivalent of about six months income.

Appointments

Mr W. Freitag, Chief Chemist, BP Oil NZ, Wellington, was reappointed to represent the Council on the Course Committee for Science of the Authority for Advanced Vocational Awards (AAVA) for three years from 1.4.1983 with *Mr N.R. Edmonds*, Auckland Technical Institute, as his deputy.

Mr J.G. Fletcher, Director, Heavy Engineering Research Association, has accepted reappointment as a Council representative on the Standards Association of New Zealand (SANZ) for two years from 1.4.1983. *Dr G.R. Burns*, Chemistry Department, Victoria University of Wellington, was reappointed as Council's representative on the New Zealand National Committee for UNESCO.

Dr H.J.K. Powell, Chemistry Department, University of Canterbury, was appointed to the Membership Committee for a term ending 31.12.85 in place of *Dr D.J. Brasch* who was thanked for his three years service.

Mrs N.E. Wignall was reappointed as Administrative Secretary to 31.12.1984 and *Dr A.C. Herd* Editor to 31.12.1983.

NZIC-RACI Visiting Speakers

To foster contact between members of NZIC and RACI it was agreed in principle to join with the Council of the Royal Australian Chemical Institute in establishing awards for a Visiting Speaker from Australia to New Zealand and vice versa in alternating sequence on an annual basis subject to finance being available.

Overseas Visitors' Fund

Prof Batt, the General Secretary and Registrar were asked to prepare guidelines for consideration by Branches for a proposed allocation of up to \$500 per Branch for the support of visiting chemists from overseas. May 1984 is the target date for a trial of these proposals. The aim is support of visitors from overseas and within New Zealand by the Institute to be initiated by a Branch with the responsibility of advising other Branches of the project.

Visitors expected in 1983 are *Prof. Fred Basolo*, President, American Chemical Society 25 June — 2 July, *Dr A.C. Moffat*, UK Home Office Central Research Establishment, September and *Prof. K.L. Rinehart*, University of Illinois in July and August.

Publications

The Editor reported that the Magazine Factory did not wish to continue publishing "Chemistry in New Zealand" after the February issue. *Dr Herd* was authorised to arrange for production of the April, June, August, October and December issues on the terms outlined in this report. A seventh issue this year as a Yearbook including the 1983 List of Members is being considered by the new publisher and *Dr Herd* who advised he wished to step down as Editor at the end of the year. It was resolved to update and reprint the information brochure about the Institute supplied to applicants for membership.

Student Travel Grants

It was resolved to allocate about \$500 to each Branch to subsidize to the extent of up to \$100 each the travel of student members to Conference or other meetings approved by the Branch. This programme is to be reviewed in a year's time. The cost of it will be approximately half of the \$5 increase in subscriptions for 1983/84.

President's Visits to Branches

Dr Wright advised he would speak to the Wellington Branch on 4th May, at Invercargill on 15th June, to the Otago Branch on 16th June, at New Plymouth on 21st June, at Hastings 27th June, to the Canterbury Branch on 11th July, the Auckland Branch on 13th July and the Waikato Branch on 20th July.

Congratulations

Council resolved to congratulate *Dr E.G. Bollard*, Hon. FNZIC. President of

the Royal Society of New Zealand, on the Queen's CBE award in the New Year's Honours List and the Honorary D.Sc. to be awarded him during the centenary celebrations of the University of Auckland in May.

Recruitment

Council has resolved to test a new procedure for processing applications for membership. Candidates will be asked to send all their required papers to the Secretary of their Branch who will arrange for interview reports and the Branch Committee recommendation to be added before forwarding the file to the Registrar. He will check and circulate this to the Membership Committee who will make a recommendation to Council. This method will be reviewed after 12 months operation.

The code of ethics and rules and commentary on rules of admission require reprinting. *Prof. Batt*, *Mr A.W. Mackney*, *Dr J. Rogers* and *Mr N.G. Thom* have been asked to prepare a paper on their revision for circulation to Branches and the Membership Committee for their comment.

Standing Committee Meeting

On Tuesday 2nd May *Dr Wright* chaired a telephone meeting in which *Mr Hogan*, *Drs Percival* and *Rogers* participated.

At a function arranged for graduates on April 19th by the Auckland Branch *Miss Celia M. Kahukura* was presented with the Institute's \$50 prize for the student gaining highest marks in the 1982 AAVA examinations for Chemistry V. *Dr Rogers* reported that for the third successive year one of the fair sex had won this award and for the second time in a row was one of the staff of the Auckland Branch of Chemistry Division, DSIR.

The Committee, on behalf of Council, accepted with regret *Mr Stan Brooker's* resignation as honorary Librarian after 30 years' service and appointed *Dr Laurence Eyres*, Chief Chemist at Abels Ltd, as his successor.

It was resolved to extend until 31st July the deadline for receiving entries, not longer than 5000 words, for the Chemical Essay Prize, \$50, open to anyone under 25 on 30.4.1983.

A sum of \$300 was allocated for a competition for a design suitable for an NZIC tie and scarf and possibly a letterhead logo by a Graphic Design class at the Auckland Technical Institute.

Nominations to Fellowships of the Royal Society of New Zealand are requested via Branches for consideration by Council at its meeting in Hamilton on 21/22 August.

The President, *Dr D.E. Wright*, will attend a meeting of the Program Planning Committee of the 16-21 December 1984 International Chemical Congress of Pacific Basin Societies in Tokyo 16-18 May and will spend about three weeks in Japan.

The Honorary General Secretary plans to visit Australia July 3-17. In Melbourne *Dr Rogers* will have discussions with the President and Secretariat of the RACI. He will participate in the Wark Symposium —

"Principles of Flotation 1938-83" in Adelaide 7-9 July and 10-15 July attend the Annual Conference of the Australasian Institute of Mining and Metallurgy at Broken Hill, which celebrates the centenary of its discovery this year.

The Royal Society of New Zealand has invited the NZIC and its other Member Bodies to nominate a suitable subject, an author competent to review it and a date by which an MS might be ready, for a review of a topic in pure or applied science which is currently of concern or interest to the scientific community in New Zealand. It is hoped to publish one review per quarter. The manuscripts will be refereed so that the review to be published in March 1984 must reach the Editor by August 1983. Guidelines for authors are available from the Editor, *Dr C.M. King*, P.O. Box 12-249, Wellington and Mrs Wignall, Box 13-545, Christchurch.

If members wish the Institute to nominate them as authors, please advise Mrs Wignall.

MEMBERSHIP

The Standing Committee, on May 2 1983, approved the following applications.

Fellowship:

Gibson, Milton George Charles, MSc (NZ), Auckland Technical Institute, (Senior Tutor)

Johnson, Cecil Barry, MSc PhD (NZ) MRSC, Applied Biochemistry Division DSIR, Palmerston North, (Scientist).

Headridge, Jame Baille, BSc (Hons) PhD DSc (Edin) FRSC, School of Natural Resources, University of the South Pacific, Fiji, (Professor of Chemistry).

Whittle, Kenneth Rodney, MSc PhD (Auck), Manawatu Polytechnic, Palmerston North, (Course Supervisor).

Re-admission as Members:

McCallum, Neil Keith, MSc (Auck) PhD (Oxon), Chemistry Division DSIR, Gracefield, (Scientist).

Robins, Malcolm Douglas Wakefeld, MSc (Well), Sprott Analytical Laboratories Ltd, Auckland, (General Manager).

Membership:

Cowie, Maureen Grace, BSc, Agnew Mining Co. Ltd, Western Australia, (Senior Chemist).

Graduate Membership:

Kingsley, Susan Margaret, BSc, Chemistry Dept., University of Canterbury, (Student).
Lundon, Yvonne Marie, BSc, 5 Plunket St Kelburn Wellington.

Mettananda, Lokusatu Hewa, BSc, Chemistry Dept, Victoria University, (Honours Student).

Wong, Lisa, BSc DipSci (Otago), Dental Research Unit MRC Wellington, (Technician).

Technician Membership:

Fowler, John Leonard, NZCS, Sprott Analytical Laboratories Ltd, Auckland, (Technician).

Huber, Rolf, Quickstik International, Auckland, (Assistant Chemist).

Deaths:

Radcliffe, C.B., (Canterbury).

Whitehead, H.R. (Manawatu).

BRANCH NEWS

AUCKLAND

Rex Lyndon has moved from the NZ Co-op Dairy Co, Central Laboratory in Hamilton to take up a position as Chemist with Gamlen Chemical Co Ltd, in Auckland.

Ron Smith, who will be well-known to northern members for his activities with Philips Electrical Industries of New Zealand Limited, has joined W Grayson & Associates Lt of Auckland. Ron is looking forward to his return to the bench as an analytical chemist, but he will also be continuing his association with Philips in a consulting capacity.

The March meeting of the branch was organised around a luncheon at the ATI training restaurant, followed by a short address by *Ray Osborne*, Senior Divisional Engineer with the NZ Post Office in Auckland, and currently Vice President of the Australasian Corrosion Association. An awareness film entitled "The Corrosion Problem" was also shown. This was prepared by the NZ Branch of the ACA for its Silver Jubilee, and features some local chemists in starring roles. Those at the meeting were impressed by the high quality of the film and felt that its wider distribution should be encouraged. Copies may be obtained on loan through the ACA.

The annual Graduand's Function was held in April with graduands from both ATI and the University attending. Certificates were presented to recent members, and *Dr John Rogers* gave a brief address on the activities of the Institute. A special presentation was also made to *Miss Celia Kahukura* of Chemistry Division, DSIR, as the student gaining the highest marks nationally in the 5th year chemistry exams for NZCS. This is the second year in succession that this distinction has been achieved by a member of the Chemistry Division staff.

The meeting concluded with an interesting address by *Dr Dave Christian*, Product Development Manager with the Coil Coating Division of NZ Steel Ltd. The operation of the new coil coating plant was described, followed by an indication of how the industrial chemist fitted into the range of activities of the division, including materials procurement, quality control, product research and development, and marketing of the final product.

WELLINGTON

The well-attended April meeting of the Branch was addressed by *Dr J.W. Cole*, Reader in the Geology Department at Victoria University of Wellington. In his fascinating and informative talk entitled

"Volcanoes of Taupo Volcanic Zone — their Chemistry and Genesis" he described the volcanism of TVZ, looked at the variation in chemistry of the lavas, and discussed current thinking on their genesis.

The May meeting was also very well attended when *Dr D. Wright* gave his Presidential Address entitled "Biomass and Energy". The importance of biomass related to energy production was examined in a global context, followed by a discussion of current and potential New Zealand research in this area.

MANAWATU

The New Plymouth section of the Branch organised a visit of members on 17 March to the Kapuni natural gas and ammonia — urea plants. A small group from Palmerston North was also present. In the ammonia plant, natural gas is desulphurised (zinc oxide) and "reformed" with steam and air to produce, after removal of carbon dioxide, a synthesis gas containing three parts hydrogen and one part nitrogen. These gases are converted to ammonia. In the urea plant ammonia and carbon dioxide are reacted under high pressure (3,000 lb/sq.in.) to produce ammonium carbamate and then urea. The urea is concentrated in an evaporator and sprayed into a fluidised bed granulator. Many of the processes in the plants are controlled by catalysts, the composition of which varies depending on the reaction that is taking place in the particular process.

On 11 April, the Branch presented an evening of information and entertainment, at Massey University, for pupils and teachers from Palmerston North High Schools. The audience was welcomed to the University by the Vice-Chancellor *Dr Neil Waters* and the programme was introduced by *Drs Ted Baker* and *Sylvia Rumball*. During the evening meal (saveloys and buns), staff of the Chemistry Department, D.S.I.R. Applied Biochemistry Division and Dairy Research Institute were present to describe displays of their research work as well as aspects of careers in chemistry and the university teaching of chemistry. A four team (two consisting of pupils, one of teachers and one of Institute members) quiz was held under the leadership of "Mastermind" contestant *Dr Trevor Kitson*. The seriousness of this part of the evening can be gauged by the answer given (by a prominent member of the Institute) to the question "What common household commodity contains diphenhydramine hydrochloride?" "Is it a toilet bowl cleaner?" The evening was completed by a "chemical magic show" presented by *Drs Eric Ainscough* and *Andrew Brodie*. A most enjoyable time was had by all and a further evening is being planned for pupils from regional schools later in the year.

Massey University Department of Chemistry, Biochemistry and Biophysics:

Recent Departmental Seminars have been presented by *Prof R. Lemieux* (University of Edmonton, Canada, on "The

Binding of Oligosaccharides by Antibodies and Lectins"), *D.G. Barnes* (on "Speckle Metrology"), *Dr W. Sharman* (Building Research Association, on "Chemistry and Buildings"), *Dr B. Anderson* (on "Protein-Nucleic Acid Interactions"), *Mr D. Knighton* (on "A study of Lipid Association Peptides using Reverse Phase High Performance Liquid Chromatography"), *Dr A. MacGibbon* (on "Role of the Active Site Metal Ion in the Alcohol Dehydrogenase") and *Dr G. Prichard* (on "Propanoic Acid Bacteria: Biochemical Oddities or Useful Models?").

CANTERBURY

As part of the "Chemistry in Action" lecture series aimed at sixth formers in the Canterbury region, Christchurch sixth formers were treated in March to a lively lecture by *Dr Peter Ingham* of Wool Research Organisation. In his lecture, Dr Ingham stressed the importance of the textile industry, in New Zealand and the role played by chemists in the industry. To illustrate his talk, he demonstrated the effectiveness of the water and oil repellent and flame resistant finishes which wool can acquire with suitable chemical treatment. Later in the year the "Chemistry in Action" programme will be taken to Blenheim and Timaru.

In a change from the usual format, the March meeting of the Canterbury Branch was held during the tea hour and preceded by snacks, wine and cheese. A good turnout of members heard *Mr R.G.M. Christie* of B.P. (N.Z.) Ltd. present a talk entitled "The Oil Industry-Dinosaur or Chameleon?" In his talk, he outlined the difficulties faced by the N.Z. oil industry in responding to imposed factors such as fluctuations in international oil prices. The meeting was held at Christchurch Polytechnic. In April, more than fifty members interested in chemical education attended a meeting held at Christchurch Boys High School addressed by *Dr Derek Smith* Chemistry Department, University of Waikato. In his talk entitled "Chemical Periodicity — A Personal View" he stressed the importance of not putting undue emphasis on the periodicity concept. In May branch members toured the Christchurch plant of Firestone (N.Z.) and viewed the tyre manufacturing process from raw material through to inspection of the final product. It is understood that members were to be found in not one but several local hostelrys afterwards.

OTAGO

Two speakers addressed the Branch and University Chemistry Department during March. These were *Prof M. Rubin* of the Technion Israel Institute of Technology, Haifa who talked on "The Photochemistry of β -Diketones", and *Prof R.U. Lemieux*, F.R.S., whose lecture was titled, "The Binding of Oligosaccharides by Antibodies and Lectins". In April, the Branch visited the Dunedin City Council Water Treatment Station at Mount Grand followed by the Waste Water Treatment Station and Analytical Laboratory at Tahuna.

John Henderson, the Dunedin City Engineer, conducted the party around the water treatment plant and *Bernie Smirk* talked about the work of the Analytical Laboratory.

On 6th April, the Otago science teachers held an in-service training day at the University. In the afternoon, they were addressed by *Dr Ross Grimmett* of the University Chemistry Department who gave a demonstration of chemical magic and discussed the chemistry behind the demonstrations.

Dr Linton Phelan of the Medical Research Council's Wellcome Institute will visit Italy, then Sweden during June where he will work at the University of Gothenburg. During his stay, he will chair a symposium session at a conference on Early Structural Changes in Hypertension to be held in Kiruna, Sweden.

On the industrial front, a new Wincanton continuous-pressing system for the manufacture of cheddar cheese has been installed at the Southland Dairy Co-op Ltd., Edendale. This has a capacity of 6000 kg per hour. An overnight cooling and chilling process has also been installed which includes a fully-automatic cool room. The carton-handling system was manufactured by Millers Mechanical of Dunedin. The cost of these parts of the manufacturing system was \$1.5 million. These additions complete the automation of cheese manufacture at the plant and give the Company the capacity to handle all the milk which is expected to derive from the resurgence of dairy farming in Southland.

UNIVERSITY NEWS

AUCKLAND

The Chemistry Department has commemorated the centenary of the university by publishing a 48 page illustrated history of the department entitled "A Century of Chemistry at the University of Auckland". Even a "dyed in the wool" Otago graduate can appreciate the careful research and lively style that the authors, Profs R.C. Cambie and B.R. Davis have brought to this excellent publication. The photographs of past students are a delight, the Marlon Brando look-alike on p29 for example, but surely someone can identify the gentleman labeled "not known" in the 1946 photograph.

The booklet has been distributed to Auckland Branch members and is available (gratis) to other readers of this journal by writing to the authors at the Chemistry Department, Auckland University, Private Bag, Auckland.

WAIKATO

Prof Ken Mackay will attend the 14th International Conference on Ge, Sn and Pb in Montreal from Aug 8-12 and the 2nd IUPAC Symposium on organometallic chemistry in Dijon from Aug 28 to Sep 1.

Dr Malcolm Carr will be spending a period of study leave in London from August. He will attend the International Chemical Education Meeting in Montpellier from 22-26 Aug and will represent Waikato at the Commonwealth vice-chancellors meeting in Birmingham in August.

Dr Neil Duffy who obtained his DPhil under *Ken Mackay* and *Brian Nicholson* in 1981 has returned to Waikato from a post-doctoral period with *Prof M.D. Curtis* at the University of Michigan.

Dr Tony Cartner has had his tenure confirmed, his position now is described as "continuing appointment" rather than the more precarious "limited term appointment".

Dr G. Marvel of the French National Institute of Applied Chemistry made a visit to the Thermophile Research Group in March to discuss high temperature microbial cellulose breakdown and ethanol production. The visit was sponsored by the NZ Energy Research and Development Committee.

Dr Chris Sissons, after two years with the Thermophile Research Group working on cellulytic bacteria, leaves to join the MRC Dental Research Unit in Wellington.

MASSEY

The University conferred a total of 1541 qualifications in the year ending May 1983, the majority of graduations taking place on 5 and 6 May. Within the Science Department, 104 students graduated B.Sc., 24 B.Sc. (Hons), 5 Dip. Sc., 19 M.Sc. and 8 Ph.D. From the Food Science and Biotechnology Departments, 77 students graduated with technical diplomas, 28 B. Tech., 29 B. Tech. (Hons.), 3 M. Tech and 5 Ph.D.

OTAGO

Dr R.D. Reeves of Massey University visited the Chemistry Department in April and lectured on "Transition Metal Uptake by Plants". He talked primarily about those plants which grow only on the basic, nickel-rich soils of New Caledonia, the fluids of which can be up to 1 molar in nickel.

In the Biochemistry Department, the 1983 Harold Chaffer Lecturer, *Prof Donald Steiner* from Chicago University, gave a series of lectures on insulin genes, insulin receptors, synthesis of the preproinsulin precursor, the processing mechanisms and how an understanding of the molecular events are leading to an understanding of causes of some types of diabetes.

Dr John Cutfield's work on primitive insulins and insulin aggregation properties received further support from the Medical Research Council. *Prof Robin Carrell* and *Dr Ian Bathurst* of Christchurch Clinical School also visited the Department. Prof Carrell revealed how a single change in β -antitrypsin, a protein involved in preserving elasticity in the lungs, converts the

Continued on page 68

D.S.I.R. AND RESEARCH INSTITUTIONS

N.Z. POTTERY AND CERAMICS RESEARCH ASSOCIATION (Inc.) — PACRA

Dr Mike Swain of the CSIRO Advanced Materials Laboratory, Melbourne, visited PACRA for two days and gave a seminar on the indentation cracking of brittle solids.

Mike Rose has joined the staff of PACRA from England. He will be in charge of the ceramics fracture research.

BUILDING RESEARCH ASSN of N.Z. (BRANZ)

Dr John Duncan has been appointed as Head of Materials Research Division. John has been a scientist in this Division for six years.

Dr Wayne Sharman recently presented seminars on "Chemistry and Building" to the Department of Chemistry, Biochemistry, and Biophysics at Massey University; and "Corrosion-resistant flooring" to the Australasian Corrosion Assn. in Wellington.

CHEMISTRY DIVISION (DSIR), Gracefield

Mr F. Hurst who retired from Chemistry Division in 1982, has been temporarily appointed to supervise the forensic services in the Auckland branch.

Mr S.J. Cordiner has joined the forensic section to work in forensic biology. Mr Cordiner recently completed PhD studies in the Biochemistry Department at Victoria University.

Mr G. Mills, a recent M.Sc graduate from Waikato University has been appointed to the water laboratory.

Dr C.D. Stevenson, Group Leader for the water laboratory, spent three weeks in the United States visiting water and analytical laboratories.

Dr D.M. Bibby, section head of the inorganic materials section, is visiting Australian and South African laboratories. In South Africa Dr Bibby will be working at the University of Witwatersrand for three months in a joint project with S.A.S.O.L. and C.S.I.R. examining the ab-

sorption of CO on pure iron crystals.

Mr J. Ruaya from the Philippines Natural Oil Corporation, is working with *Dr T. Seward*, head of the geochemistry section. This work, studying High Temperature Metal Complex Equilibria, is part of the requirements for an M.Sc degree.

SOIL BUREAU (DSIR)

Dr Harry Percival has recently commissioned a new Philips PW1710 Automatic Powder x-ray Diffractometer and has assembled several programmes to control the Diffractometer in a series of specific tasks. Visitors are welcome to see the PW1710 in operation.

Chief features of this machine are that it:

- incorporates an automatic sample changer, allowing up to 42 samples to be run in sequence without attention (e.g. overnight);
- provides diffractograms with d-spacings printed beside each peak;
- is programmable for operation in a wide variety of different modes;
- contains provision for output in a number of forms, varying from graphic recorder to VDU to hard-copy digital printout.

Dr Kevin Tate and colleagues have taken delivery on an LKB - Wallac measuring the ATP contents of soils, utilising a reaction in which the chemical energy of ATP is released as light, catalysed by the enzyme luciferase (found in fire-fly tails). The technique is expected to be very useful in providing an index of the size of the microbial biomass and/or activity of micro-organisms in a soil.

Dr Cyril Childs spent a week in Australia during April. He attended a meeting in Melbourne of the Editorial Advisory Committee of the Australian Journal of Soil Research. He also visited the Department of Soil Science, Waite Institute and the Division of Soils, CSIRO in Adelaide. At CSIRO, Dr Childs presented a seminar on the application of Mossbauer spectroscopy to soil studies.

CHEMISTRY DIVISION (DSIR) Christchurch

Dr Jeffery Plowman has been appointed to the Food and Water Section of Chemistry Division, Christchurch. He completed his Ph.D. at Massey on lactoferrin and iron binding protein in milk and subsequently worked with Prof Thomas L. Loehr at Oregon Graduate Centre, Portland, Oregon on a metal chelate in blue-green algae, and studies in raman resonance spectroscopy.

Richard Van Oort joined the staff in March after completing his Ph.D work on reduction of acetylene alcohols with lithium aluminium hydride. He is presently involved in measuring exposure to polycyclic aromatic hydrocarbons of certain occupational groups.

D.S.I.R. Scientific Information Division

Since 1980, the DSIR Scientific Information Division, with assistance from other DSIR Divisions, has produced a series of pamphlets called "Alpha" leaflets. These cover a wide range of topics written in non-specialist language. Recent issues include "Marine Minerals Around New Zealand" (No. 20), "Maku Lotus — a new legume for New Zealand's grasslands" (No. 21), "The Ironsands Industry" (No. 22), "Drink-Driving Crashes" (No. 23), "Food Composition 1. Carbohydrates" (No. 24), "2. Proteins" (No. 25), "3. Fats" (No. 26), "4. Minerals" (No. 27), "5. Vitamins" (No. 28) and "Cutting Geothermal Pollution" (No. 29). Further information on these pamphlets may be obtained from The Publications Officer, Scientific Information Publishing Centre, DSIR, P.O. Box 9741, Wellington.

University News Continued from page 67

protein into an anticlotting agent with devastating consequences for the patient.

Prof Marion Robinson from the Nutrition Department will be on leave until December, and will be working in the U.K. and at the U.S.D.A. Human Nutrition Centre in Beltsville, U.S.A. She will also be visiting Helsinki, Finland, another centre for research on human subjects with low selenium status, and will attend a trace-element meeting in Lund, Sweden.

Prof Khanna from Toronto University will visit the Departments of Pharmacology and Psychology as William Evans Visiting Fellow. He is interested particularly in alcohol dependence and abuse. Also from the Pharmacology Department, *Dr J.G. Blackman* will spend study leave shortly at University College, London. Several members of the Department will present papers at a meeting of the Australasian Society of Clinical and Experimental Pharmacologists in Auckland. *Dr Don Ferry* is now using a Waters WISP autosampler with his HPLC equipment for drug bio-availability studies.

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CONFERENCES

ANNUAL CONFERENCE

AUGUST 23-26 1983

This year's conference at Waikato University will be opened on the Tuesday morning by the Minister for Science and MP for Hamilton East, *Dr Ian Shearer*. A very full and interesting scientific programme in chemistry, biochemistry and soil chemistry has been organised as outlined in the 1st and 2nd circulars. Further details of the programme and conference organisation will appear in the August issue of 'Chemistry in New Zealand'.

A number of additions or changes in plenary and keynote speakers have been made. *Dr Robin Clark*, University College, London, will be attending the conference. The winner of the Chemical Society 1983 Tilden Lectureship, he will address the conference on his speciality of resonance Raman spectroscopy.

Dr Don Weiss, OBE, will attend the conference as the inaugural RACI/NZIC Exchange Fellow. Current President of the RACI, his address will cover CSIRO's innovative processing technology using magnetic particles.

Unfortunately, *Dr H. Freeman* is unable to come to the conference and *Dr Ted Baker*, Massey University, will now give the Inorganic plenary paper on his pioneering structural work with azurene. This lecture on the copper-protein complex from plants will also have biochemical interest.

Dr Frank Whitfield, CSIRO Food Research, Sydney, has been invited by the Chromatography Group. He will talk on his group's outstanding work in the chemistry of flavours and pheromones.

Dr Ralph Richardson from Syntex Laboratories, will provide a timely review of immunoassay techniques including EMIT and ELISA.

Dr Bill Hancock, Massey University, will discuss applications of affinity chromatography and HPLC to protein separations.

Dr Ian Miller, Chemistry Division, DSIR, will discuss uses for by-products from the Motanui methanol-hydrocarbon conversion process, including the possibilities for production of high value polyimide plastics.

Prof Peter Fensham, current Royal Society of Chemistry's Nyholm lecturer in chemical education will open a one-day symposium on chemical education on Friday 26. All matters pertinent to this chemical education symposium should be addressed to:

Mark Cosgrove,
Hamilton Teachers College,
Private Bag,
Hamilton.

OCCA

The 21st Annual Convention of the NZ Division of the Oil and Colour Chemists Association will be held at the International Hotel, Rotorua on July 29-31.

Contact:
OCCA, Auckland Section,
P.O. Box 5192,
AUCKLAND.

CHROMATOGRAPHY COURSE

The NZIC's Chromatography Group propose to run a course on capillary gc techniques this year at Waikato Technical Institute in November. This would replace the well established basic gc course that we have had running for the past few years. However, if individuals are prepared to write to Dr P. Judd, Waikato Technical Institute, Hamilton, expressing their interest or need to have a basic gc course, this will be considered as well. The feasibility will depend entirely on demand. Otherwise there will not be one until much later next year.

19th TECHNICAL FERTILISER CONFERENCE

The NZ Fertiliser Manufacturers' Research Association will hold its 19th Technical Fertiliser Conference in Auckland, November 30 to December 1, 1983.

Contact:
The Conference Secretary,
P.O. Box 23-637,
HUNTERS CORNER.

OVERTASMAN

Patents in Chemical Industry and Research, 13 July 1983, Melbourne.

Contact:
Dr G.B. Guise, RACI, P.O. Box 224,
Belmont Vic., 3216, AUSTRALIA.

14th Australian Polymer Symposium, 12-16 Feb 1984, Ballarat.

Contact:
Dr G.B. Guise, RACI, (Address above).

Sixth Australian Electrochemistry Conference, 19-24 February 1984, Geelong.

Contact:
Dr E.J. Frazer, CSIRO,
P.O. Box 124, Port Melbourne Vic., 3207,
AUSTRALIA.

OVERSEAS

Chemrawn III World Conference on chemical research applied to world needs. 25-29 June, 1984. The Hague.

Contact:
QLT Convention Services,
Keizersgracht 792,
1017 EC Amsterdam,
THE NETHERLANDS.

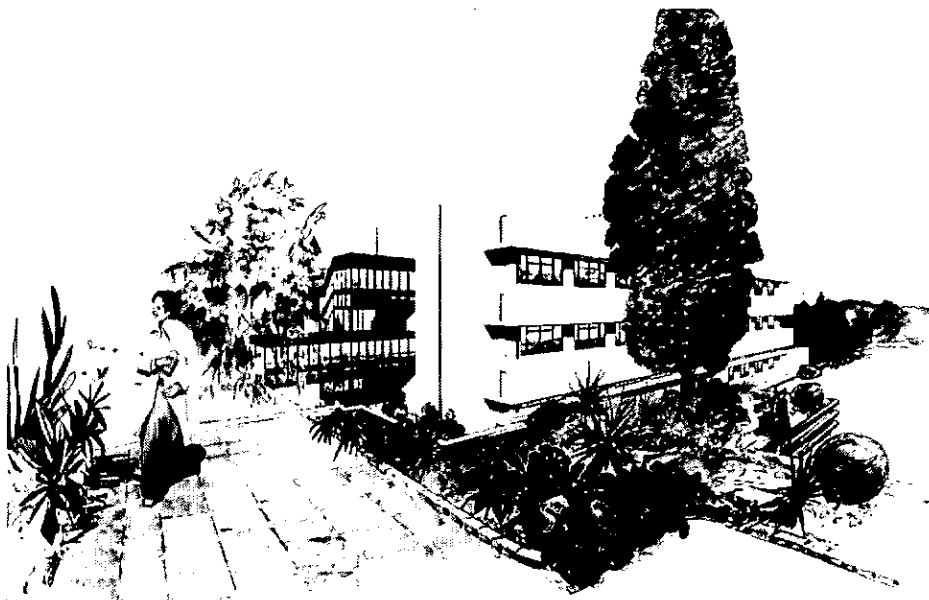
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GENERAL/PRODUCT NEWS



New D.S.I.R. Labs

NEW DSIR LABS

Tenders will shortly be called for a new \$6 million building to house laboratories for the Government Analyst in Auckland.

Planned for completion by 1986, the building will be located in the grounds of the Mount Albert Research Centre and will form part of the Chemistry Division of DSIR. It will house over 50 staff and have over 3,000 square metres of floor area.

At present, the Government Analyst assists the police with the scientific investigation of crime, post-mortem toxicology, checks on food quality for the Department of Health, certification of wines for export, problems of metal and plastics deterioration, general analytical chemistry and the provision of a technical advisory service.

The new laboratory will provide much needed extra working room for increased staff and modern equipment. Current staff total 32 and this number will rise to over 40 (when the laboratory opens) to cope with big increases in crime investigations, illicit drug cases and the need for a food monitoring programme for all the area north of Taupo which contains over half of New Zealand's population.

Announcing details of the new building, the present Auckland Government Analyst, Dr Kingsford said: "It is pleasing to see an end to the current unsatisfactory arrangement where part of my laboratory is at DSIR Mt Albert in an older building and the remainder is inadequately housed in Broadcasting House in Auckland.

AUTOMATIC HEAD SPACE SAMPLING

Automated Gas Chromatography

Dani S.p.A. of Italy has announced a new Head Space Automatic Sampler which can be coupled to any existing gas chromatograph without modification. The transfer of the head space gas from sealed vials to the gas chromatographic column is by a heated gas sampling valve and loop.

The sampling module includes a thermostatic bath where up to 24 vials of differing capacity can be located in the carousel. The sampling probe and sampling valves are also thermostatted. Connection between sampling valve and the gas chromatograph is made by a heated capillary tube, firmly connected to the gas chromatograph injection port through the injection septum. A separate module incorporates circuitry and electronics, as well as commands for programming the sampling sequence.

Each sampling sequence consists of: a pressurisation step where the vial is pressurised by means of the carrier gas; a sampling step where the head space gas

flows through the sampling loop; an equilibration step where the gas in the sample loop is equilibrated to atmospheric pressure; an injection step where the sample loop is put in series with the carrier gas line; and the final step where the whole sampling system from GC vaporiser up to the sample loop and the sampling valve are backflushed with the carrier gas a few seconds after sample injection.

The main features of this automatic sampler are:

- Coupling possibility to any GC (no modification required);
- The sampling principle allows the use of packed or capillary column of any diameter, operating at any back pressure;
- Facilities are provided for automatic repetitive sampling from the same cuvette and cuvette evacuation in between, allowing the multi-equilibration or multiple head space extraction;
- The backflush of the sampling system after the injection and when in stand-by minimizes any memory effect and improves the peak shape in capillary column operation.

For further information contact:
Advanced Electronics Ltd,
PO Box 32-076, Devonport,
Auckland, 9.

BENCHTOP LIQUID SCINTILLATION COUNTERS

A new series of liquid scintillation counters offers multi-user capability, versatility of sample handling and simplicity of operation.

The modularly designed benchtop systems in Beckman's LS5800 series are suitable for research labs in universities, industry, government and hospitals.

There are five models — the LS 1800, LS 2800, LS 3800, LS 4800 and LS 5800 in the series. The new Versa-Rack Sample changer provides racks, standard vials and miniature vials with a sample capacity of 336 to 648 depending on the mix of vials used.

Instrument features include CRT or MARQUEE displays, select format for data output, two-phase monitor, random coincidence monitor, interrupt, H# with automatic quench compensation factor, spectrum search and RS 232C output.

Accessories include a single photon monitor and special application PMTs. Beckman also offers a complete line of cocktails and vials for use with the instruments.

For more information, please contact Beckman Product Specialists at:
Alphatech Systems Ltd
P.O. Box 5565
Auckland.
Telephone 770-392.

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IKA-TRON DTM1 AND IKA-TRON DTM2 DIFFERENTIAL TEMPERATURE MEASURING INSTRUMENTS.

The following three measuring tasks can be distinguished in thermometry:

- measurement of the *absolute temperature* in °C
- measurement of *temperature variations in K* to determine variations with time of a given starting temperature at the same place (relative measurement)
- measurement of *temperature differences in K* to determine temperature differentials at a given time.

To deal with these measuring tasks IKA has developed a special temperature measuring instrument available in 2 versions: model DTM 1 for absolute and relative measurements (1 measuring sensor) and model DTM 2 for absolute and differential measurements (2 measuring sensors).

The fields of application for the accurate measurement of temperature variations or temperature differences are found mainly in biology, process technology and chemistry.

Examples are the determination of heat of reaction, heat of solution, heat of dilution, heat of crystallisation, heat of wetting, heat of mixing:

To measure the temperature differences of the above types, one measuring sensor is put into a reference medium, whereas the other sensor measures the variable temperature (DTM 2). If the medium to be examined and the reference medium are adjusted to the same initial temperature and thermal capacity, all environmental influences are automatically eliminated.

If these environmental influences are known or negligible it is often sufficient to measure the temperature difference with time compared to an electrically adjustable zero point (DTM 1).

A further application for accurate temperature differential measurements is found in the determination of the molecular mass by measuring the increase in boiling point or the lowering of the melting point. If it can be assumed that the atmospheric pressure will remain constant during the test period, the DTM 1 will be sufficient.

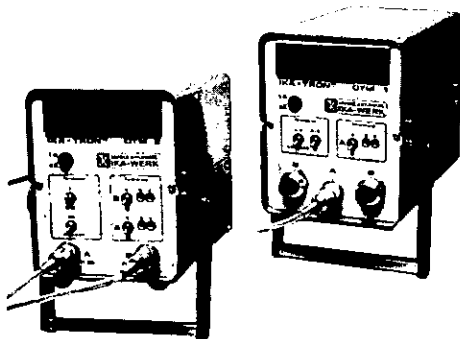
However, if errors of measurement due to atmospheric variations are to be excluded, the use of a reference medium and the DTM 2 is recommended.

The differential thermometer (DTM 2) enables calorimetric measurements to be carried out with great accuracy. In bomb calorimetry for instance two vessels filled with the same amount of water

and of the same initial temperature are used. One vessel contains the bomb, the other a 'pseudo-bomb' of the same mass and specific heat. In this way, variations in the ambient temperature are largely eliminated.

Full specifications and further technical details can be obtained from:-
Kempthorne Medical Supplies Limited,
P.O. Box 1234,
AUCKLAND.

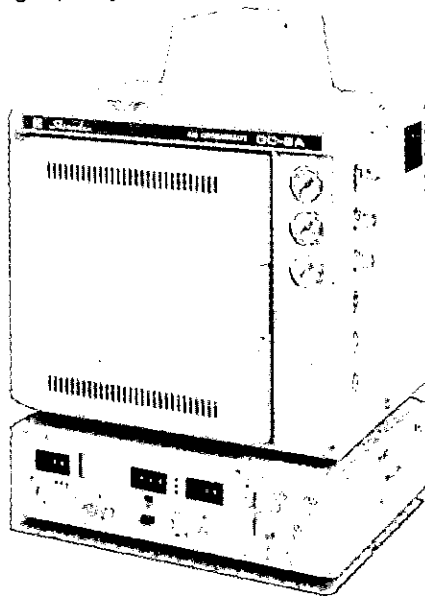
IKA-TRON DTM 1 digital temperature measuring instrument



IKA-TRON DTM 2 digital temperature measuring instrument

SHIMADZU GC - 8A SERIES GAS CHROMATOGRAPH

Simple rugged construction and low cost are key features of Shimadzu's new high quality G.C.



The GC-8A series offer digital temperature setting and digital temperature programming. Isothermal versions are also available. Dual on column, on detector configuration. Despite its small overall size and low bench space requirement the GC-8A incorporates a large oven.

A variety of detector options are available including Flame Ionisation, Thermal Conductivity, Flame Photometric and Electron Capture.

The complete range of Shimadzu accessories for GC are applicable to the GC-8A series, such as autosampler, integrator/data processors, gas sampling valves, capillary GC etc.

SHIMADZU MICROBORE HPLC SYSTEM LC - 5A

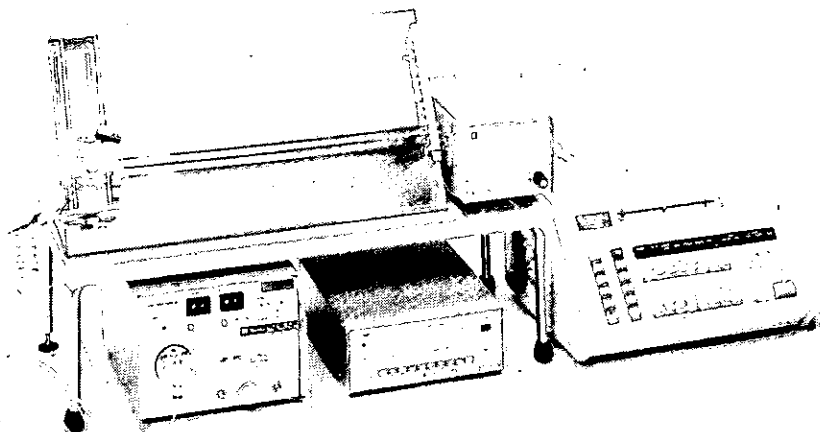
The new Shimadzu LC-5A is an HPLC solvent delivery system especially designed for the exacting demands of microbore and fast LC while still retaining the flexibility to meet the requirements of conventional HPLC applications.

The LC-5A features a very wide range of flow rates, from as low as 1 µl/minute up to 9.9ml/minute, with a maximum operating pressure of approximately 7000psi.

This capability of pumping accurately and precisely at very low flow rates makes it the ideal solvent delivery system for microbore HPLC, with its attendant advantages of higher resolution and sensitivity and greatly reduced solvent consumption. The LC-5A forms the heart of Shimadzu's microbore HPLC system which comprises the solvent delivery system, a specially constructed microbore column holder which allows series connection of up to 13 microbore columns with minimal dead volume, a microsample injector and a detector system with a micro flow through cell (0.5 µl).

Thus the system builds to become the world's first dedicated microbore HPLC system.

For further information contact:
SCI-MED (N.Z.) LTD,
P.O. Box 47-309,
AUCKLAND.



ALLTECH ASSOCIATES N.Z.

Mr Richard Dolan, president of Alltech/Applied Science has decided that effective August 1, 1983, Alltech Associates NZ will be the sole New Zealand distributors for Alltech/Applied Science products. With NZ stocks currently being cleared by customs, Alltech hope to hold the most comprehensive local stockholding of chromatography consumables, at competitive prices.

ALLTECH ASSOCIATES N.Z.,
P.O. Box 33-527, Takapuna,
Auckland, 9. N.Z.
Phone: (09) 459-057.
Telex NZ21025 STECO

AMENDMENTS TO AIR POLLUTION CONTROL LEGISLATION

Late last year Parliament enacted the Clean Air Amendment Act 1982, and it came into force on 1 April this year. The changes to the Clean Air Act are largely of a legal nature. In terms of the "day-to-day" administration of the legislation, the major change is replacing annual licensing of significant industrial sources of air pollution with a requirement for licences to be issued for whatever period specified by the licensing authority. However, this provision does not alter the right of the licensing authority to vary or otherwise change the conditions of a licence at any time, subject to the appeal rights available to the licensee.

The Schedules to the Clean Air Act have also been amended, by the Clean Air Act Schedules Order 1982 which came into force on 3 January 1983. The Order largely corrects anomalies that had arisen regarding those industrial processes of major air pollution potential (and as such should be subject to control by the Department of Health) and those of lesser significance (and handled by local authorities).

A third change has been made, to the licensing regulations. The Clean Air (Licensing) Regulations 1973, Amendment No. 1, which came into force on 25 March this year, alters the amounts of fees payable under the Clean Air Act. An important structural change, brought about by the removal of the necessity for annual licensing, is the replacing of the annual "licence fee" with an annual "scheduled process fee", which is paid quite separate from the licence and irrespective of the period of the licence. For those processes subject to control by the Department of Health (that is those considered to be potentially major sources of air pollution), the scheduled process fees are a sliding scale based on the current replacement

cost of buildings, plant, and equipment directly associated with the particular licenseable process. The fees payable with applications for approval to establish a process, or to substantially modify an existing process, have been changed in a similar manner.

A.C. HATRICK PLANT EXPANSION

A.C. Hatrick (New Zealand) Ltd. has commenced an expansion programme at its Avondale resin manufacturing plant to further strengthen its position as the leading synthetic resin producer in New Zealand.

Work on the installation of a multi-purpose high temperature kettle has already started and is expected to be complete by July. A large kettle suitable for the production of water based emulsion polymers will also be built and this is due for commissioning at the end of the year.

Both new kettles will significantly increase the manufacturing capability of the company and will enable A.C. Hatrick to efficiently produce a wide range of new and existing polymer products that have been developed in New Zealand and overseas.

Once the Avondale facilities are operational, A.C. Hatrick will progressively reduce the production of polyesters, hard resins and emulsions at the Otahuhu plant, part of which has already been sold to Lusteroid Holdings Ltd.

It is anticipated that A.C. Hatrick will cease resin production at Otahuhu by December.

A.C. Hatrick will continue to manufacture synthetic resins at its Tawa plant near Wellington.

QA SCHEME

New Zealand Manufacturers will be able to obtain independent assurance of their capability to produce to whatever requirements are demanded of them under a new scheme announced by the Government.

Mr Keith Allen, Associate Minister of Trade and Industry said that the voluntary scheme would give manufacturers the opportunity to demonstrate that their company's Quality Assurance procedures comply with internationally accepted standards.

Mr Allen, opening the annual conference of the New Zealand Organisation for Quality Assurance at Lincoln college said manufacturers joining the new programme will have their QA systems assessed by a team of independent assessors who are recognised experts in the field of quality assurance. If the company's QA system meets the required standards it will be accredited as a "registered supplier". This registration indicates to the company's customers and clients that its QA system has been independently as-

essed and will be subjected to regular surveillance by further teams of quality auditors.

Dr I. Shearer, Minister of Science and Technology has approved the new programme which is to be administered by the Testing Laboratory Registration Council (TELARC) which has already achieved international recognition for a similar programme that it operates for the accreditation of testing laboratories. In ten years of operations TELARC has developed procedures and skills in co-ordinating the independent assessment of testing laboratories, including industrial quality control laboratories. "These procedures and skills can be applied, with little modification, to the new Quality Assurance Accreditation Programme" said Dr Shearer.

ORIGIN OF LIFE

G.A. Rodley (Chemistry Department, University of Canterbury) would like to know of any who are interested in the Origin of Life — Chemical Evolution fields of study. He has information about the International Society for the Study of the Origin of Life which sponsors a variety of meetings and publications.

RESEARCH FUNDING VITAL

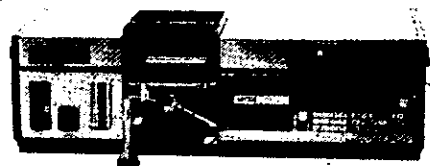
Alan Mackney, vice president of the NZIC, a former managing director of NZ Forest Products and new chairman of the National Research Advisory Council warned that NZ will suffer under CER unless research spending is increased.

Speaking at the inaugural conference of the NZ Institute of Physics, Mr Mackney claimed that research spending had fallen by 30 percent a year in real terms over the past three years. The advisory council recently proposed significant increases in the ceilings on support for research associations.

APRIL PUBLICATION OMISSION

Last issue we ran an editorial on a New Atomic Absorption Spectrophotometer. We omitted to mention that it is available from:

Advanced Electronics Ltd, P.O. Box 32-076, Auckland, 9. Telephone: 451-305. Telex: 60048.



**NEW FROM
FOXBORO**



977 INFRARED PROCESS GAS ANALYZER

Utilizing field-proven nondispersive infrared (NDIR) absorption technology, the 977 Infrared Process Gas Analyzer provides a wide selection of performance characteristics that can be used to meet the requirements of gas measurement applications involving carbon monoxide (CO), carbon dioxide (CO₂), and methane (CH₄).

The 977 Infrared Process Gas Analyzer is a precision gas analyzer, based on nondispersive infrared (NDIR) radiation absorption, for continuously determining the concentration of a given component in a gaseous stream. The analyzer is designed to effectively perform continuous monitoring and component analysis of gaseous process streams, ambient air, stack gases, and stationary source exhaust emissions.

The new Infrared Process Gas Analyzer eliminates detector gas leakage—a major source of drift in other NDIR analyzers. It does this by utilizing factory-sealed gas filled detectors that are charged at atmospheric pressure. Other drift eliminating features include infrared sources that are sealed in inert gases and optical benches that are mounted on heavy-duty temperature controlled support blocks.

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