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Levene DECORATIVE AND INDUSTRIAL

chemistry in new zealand

Vol 54 No. 2 April 1990

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Ph (04) 739-444,
Fax (04) 732-324
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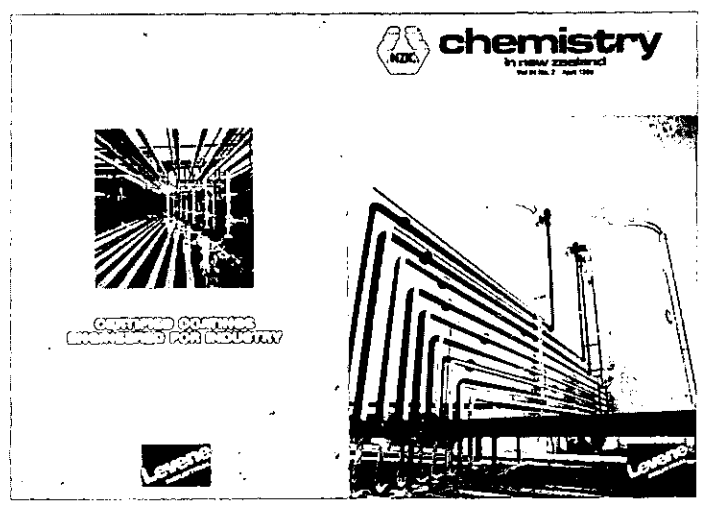

R-E-A-C-T-I-N-G E-D-I-T-O-R

This double entendre draws attention to the fact that *someone* is reactive to events around. Members of the Institute — well most members — continually surprise by their lack of response to the Journal.

The old philosophical question of 'how many angels can dance on the head of a pin?', could well be converted to 'how many pins must be stuck into the flesh of an angelic Institute member to evoke a response?'. Gentle cajoling, rank abuse, appeals for correspondence, have been tried — admittedly only for three issues of the journal - by the present incumbent, and the nett reaction has been — zilch!

The criticism may be overly harsh since as a former mere member, the now acting-editor was as silent as the rest of the bunch. The error, I presume, was to assume that others must have been active. Hence the reacting editor now appeals to all members of the Institute, since a lively and active association of chemists needs a little input from many, not just a large input from a few for a short time.

Members are urged to do just a little more e.g. if you haven't been to a branch meeting for some time - attend one this year; if you haven't been to an AGM for some time — go this year; if you haven't received a bill for membership - write to the executive officer; if you boil over chemical matters please write a letter to the editor; and how about the 1990 Conference?

Voluntary societies, such as ours, who find that paid staff are needed to sustain interest, run the danger of being taken over by those who should be paid servants and under firm control.

Re - editors, (the other half of the double), Dr. Tony Herd, together with Dr. Roger Whiting will now take over as editors, for a few issues, whilst the acting-editor escapes to the Northern Hemisphere to study its railway network, and the effect of Greenhouse gases on the culture of circa 1500 B.C.

B.E.S.

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WHAT THE INSTITUTE IS DOING FOR YOU

There are numerous activities in which the Institute is involved and Council is concerned that members are kept informed about these. What follows are some comments on these activities and some brief statements on membership and financial affairs.

Conferences

NZIC underwrites the annual Conference and smaller meetings of its specialist groups. A "seed loan" may be given to the organising committee, on request, to get the conference organisation started.

Official representatives have attended overseas conferences in 1989 as follows:

1. Meeting of Chemical Society Presidents - Sweden, August, Attended by Professor A. Campbell, a former President of NZIC.

2. PACIFICHEM89, Hawaii, December. Attended by Dr. B. Halton, NZIC's official representative on the PACIFICHEM organization, and by Dr. J. Waters, the current President of NZIC. A report on this latter conference will appear elsewhere.

(None of the representation was at any cost to the Institute).

Education

The Chemical Education Trust was set up by the Institute three years ago to sponsor educational activities throughout the country. It is administered by three Trustees, all of whom are ex-Presidents of the Institute as required by the terms of the Trust Deed. The current trustees are Mr T.R. Hitchings (Canterbury Branch), Professor G.N. Malcolm (Manawatu) and Professor G. Petersen (Otago). Dr A. Mackney (Auckland) was the founding chairman but has recently retired from the Trust.

In 1989 the Institute was responsible for organising the National competitions in conjunction with National Chemistry Day and prizes were offered to the winning entries. Branch members also organised a variety of local events. Specific activities for both national and local events have been reported in earlier issues of the Journal.

Other educational enterprises include the Chem13 examination successfully run by members of Wellington Branch for almost 2000 sixth and seventh formers throughout New Zealand and the production of a chemical kitset by Otago in collaboration with others. This latter enterprise has already been reported. Manawatu Branch established their own Education Trust some year ago with monies raised from the sale of examination booklets focussing on the old U.E. examinations. Small grants continue to be made to schools in their area.

Most, if not all Branches play an active part in Annual Science Fairs offering prizes to the best chemically (and biochemically) oriented entries. Some Branches also offer prizes and certificates to the top University student in Chemistry and biochemistry in their third year examinations. Subsidised travel to Conferences is offered to selected senior research students.

Finance

The Institute's expenses are presently under close scrutiny. However, because of rising costs Council has been forced to agree to a subscription rise for the next financial year. In order that members can see how their subscription has been spent in the 1989/90 year, a breakdown of expenditure is given in figure 1. The setting up of the permanent secretariat with a part-time executive officer and secretarial assistance has meant an increase in the salaries paid in comparison with previous years. The work, however, entails more than just routine duties since time has been spent on introducing systems which will be used in the future. The other major expenditure is the publication of the NZIC Journal "Chemistry in NZ". The travel and accommodation costs are associated with Presidential visits visits to the Branches, Council meetings (held twice-yearly) and overseas visitors. Administration costs include general office expenses such as stationery and postage etc. The chart shows that what might be considered minor items such as auditor's fees, ballots and salary surveys do have an appreciable impact on the finances. The education expenditure includes sponsorship of selected students to the annual conference as well as National Chemistry Day. The Chemical Education Trust is handled as a separate account by the trustees and is not included here. Rent and Establishment costs are charges from IPENZ for the setting up of the NZIC office with furniture etc. as well as the yearly rent. The sector labelled "IPENZ, Admin fees" refers to a per capita charge by IPENZ for keeping the NZIC records on the computer. Affiliation fees include a capitation to the Royal Society of New Zealand of which NZIC is a member body.

Membership

In August 1988 the rules of the Institute were changed to simplify the grades of membership. These are:

Non-corporate Members:
- Student
- Associate

Corporate Members:
- Member
- Fellow
- Honorary Fellow

A Member or Associate is presently eligible for life membership having retired and attained the age of 60 years and having paid subscriptions for at least 20 years immediately prior to retirement. Statistics showing the distribution of members over these grades are presented in figure 2. Figure 3 gives the distribution of the membership for those 25 years and older. The age cut-off of 25 was chosen because this is the minimum age at which a non-corporate member is eligible to apply for corporate membership. The chart shows the under-representation of younger members particularly those under the age of 35 and this should be of concern to all.

Overseas Activities

Currently the possibility of closer ties with the Royal Australian Chemical Institute (RACI) is being explored. At least two conferences in the near future under joint auspices are to held in NZ. In addition members attending RACI meetings in Australia have the non-member registration fee waived. An interchange of material suitable for publication in both "Chemistry in NZ" and "Chemistry in Australia" is planned.

NZIC is a member of the Federation of Asian Chemical Societies (FACS) which brings it into contact with Chemical Societies and Chemists in countries which stretch from Asia through to parts of the Middle East.

Links with the corresponding Australian and Canadian Societies are formally recognised by the Councils of these two bodies in their awarding Honorary Fellowship status to the current NZIC President. NZIC reciprocates.

Overseas Visitors

The Institute maintains a fund to sponsor distinguished overseas chemists to visit the NZIC Branches. The aim of the fund is to ensure that members throughout NZ have the opportunity to meet with overseas guests.

The NZIC-RACI Visiting Speaker Award is sponsored by NZIC and the RACI. In alternate years a chemist or biochemist from one country is chosen by the other as the recipient of the Award. The Awardee tours branches presenting a lecture and a further lecture is often included in the Conference programme.

Prizes

The Institute is responsible for the awarding of several Prizes

Easterfield Award: A medal in honour of the late Sir Thomas Hill Easterfeld is awarded every two years to a chemist under 35 in recognition of the quality and originality of their research.

ICI Prize: A medallion and prize of $1000 donated by ICI (NZ) Ltd is awarded on the basis of excellence in research work published during the previous 5 years.

Shell Prize: A certificate and prize of $500*, donated by Shell (NZ) Holding Company Ltd for meritorious achievement in the field of industrial or applied chemistry. * *See separate note.*

NZIC Chemical Essay: A prize of $100 for an essay of less than 2500 words on a chemical topic. In 1990 the topic chosen is "150 years of Chemistry in NZ":

A C Kennett Memorial Award: Certificate and prize of not less than $200 awarded in conjunction with the Australasian Corrosion Association for a paper presented at a technical meeting, seminar or conference run under the auspices of the Institute or the Association.

Chemical Education Award: Certificate and prize of $250 for an important contribution to Chemical Education in NZ.

Publications

NZIC publishes the bimonthly Journal "Chemistry in New Zealand" which is sent to all its members. The journal includes chemical articles, notice of new instrumentation, news of members and Institute business.

NZIC also publishes ChemNZ, a journal aimed at the teaching profession and distributed to secondary schools.

Representatives

NZIC has representatives on a number of official scientific and professional bodies giving members a voice on a variety of issues. These include:

i) IUPAC commission on the Nomenclature of Organic Chemistry

ii)Science Course Committee. Authority of Advanced Vocational Awards. The Government is to replace this committee in July 1990 by the National Education Qualification Authority and the Institute has written to the Minister requesting our continued involvement on the new body.

iii)SANZ (Standards Association of NZ)

iv)UNESCO

v) Member Bodies Committee of the Royal Society of NZ

vi)Polytechnic Councils - Some Branches nominate their representatives for local Polytechnic Councils. This representation may change after 1990 but the Institute has yet to be informed.

Specialist Groups

Specialist groups within the Institute are organised to promote contact between members with similar interests and to foster the interests of the discipline. The groups hold specialist meetings and also assist in the preparation of the NZIC conference programme.

At present the 11 different specialist groups are:
Analytical, Chemical Education,Chromatography, Electrochemical, Fats and Oils, Geochemistry, Inorganic and Organometallic, Organic, Polymer, Physical, X-ray Crystallography.

Submissions

An important function of the Institute is to provide a voice for its members on matters of concern. During 1989 the following comments and submissions were sent on your behalf to the appropriate authorities.

i) the health consequences of the ICI fire

ii)Pesticides: Issues and options for NZ

iii) nominations for the Foundation of Research, Science and Technology

Sub-committees

The Institute Council appoints a number of subcommittees to deal with particular issues. Some of these are currently under review. Normally members of each sub-committee come from the same branch so as to facilitate communication and to cut costs. The current subcommittees are

Chemical Education (under negotiation), Environmental Otago Branch, Hazardous Chemicals Canterbury, Membership Wellington/Auckland, Public Affairs and Science Policy, Manawatu.

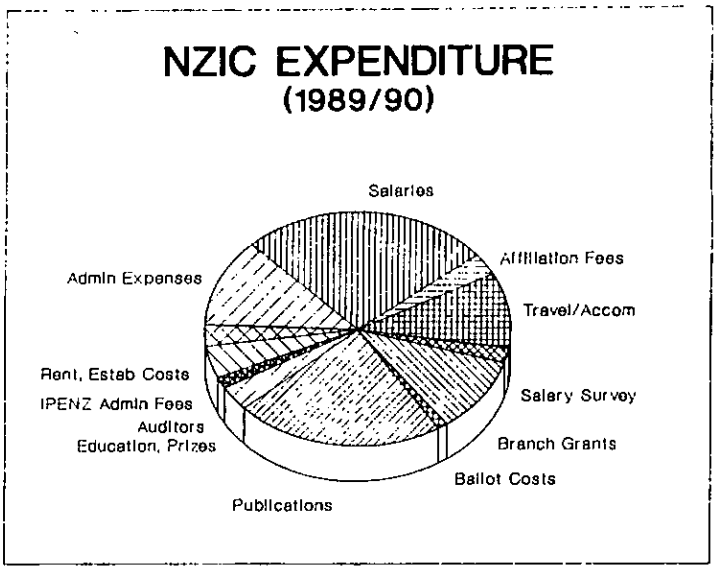
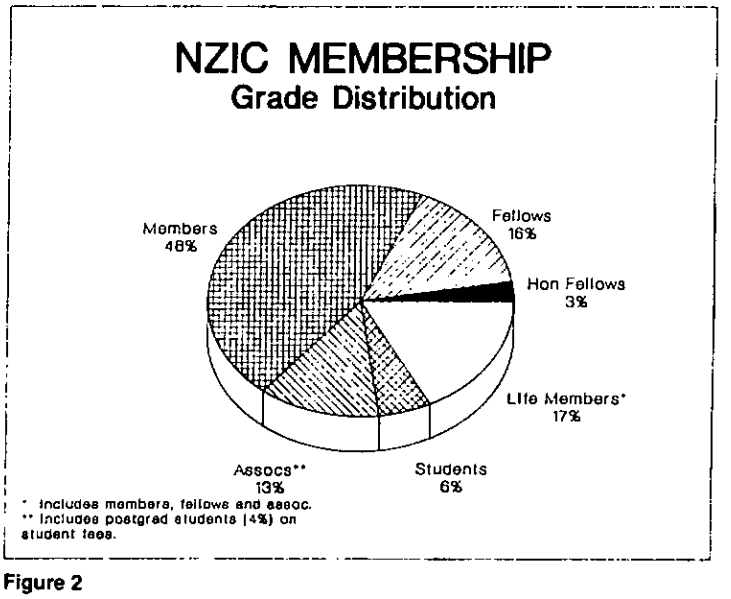


Figure 1



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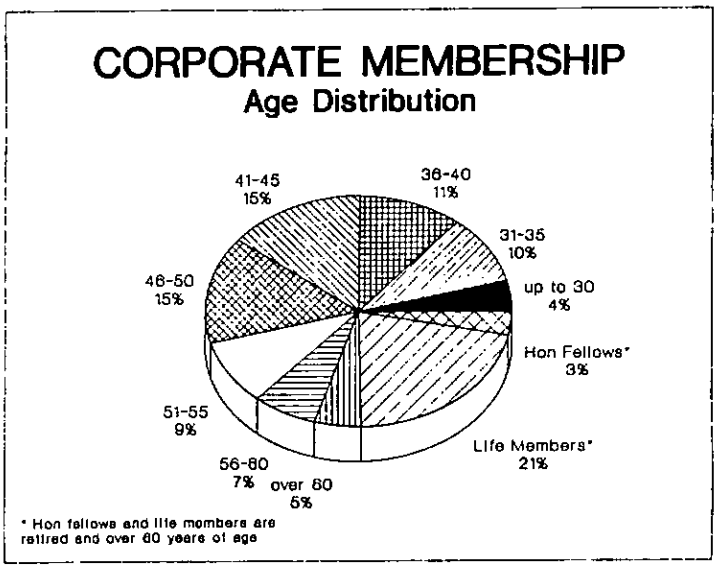

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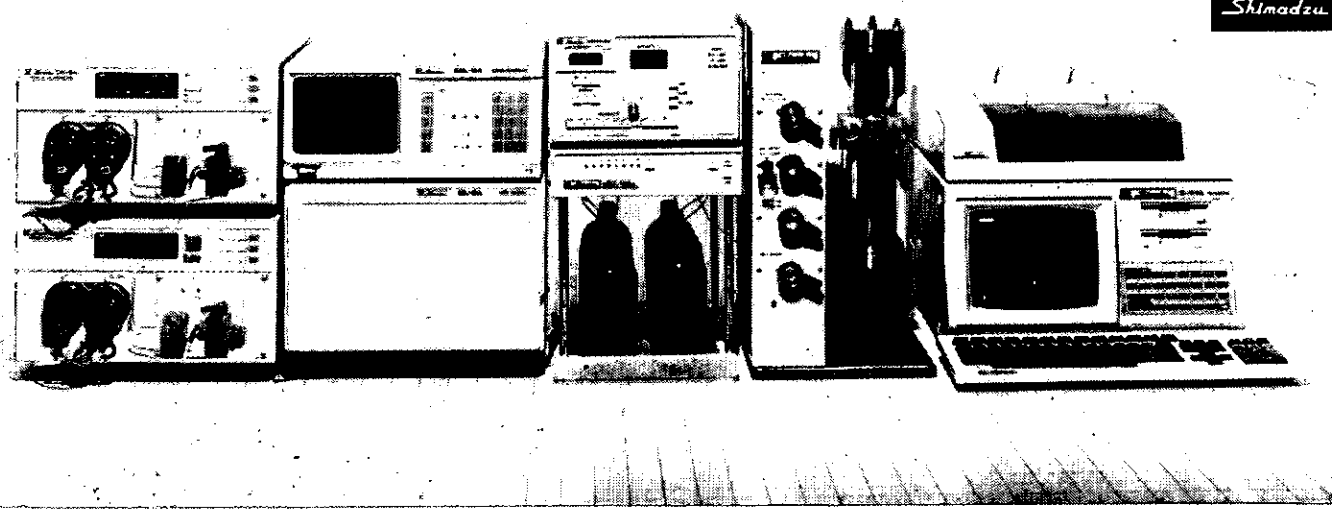

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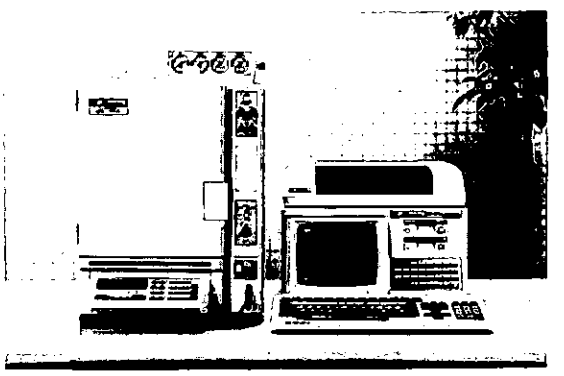

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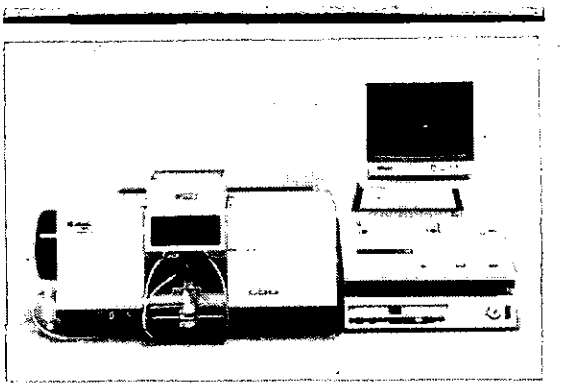

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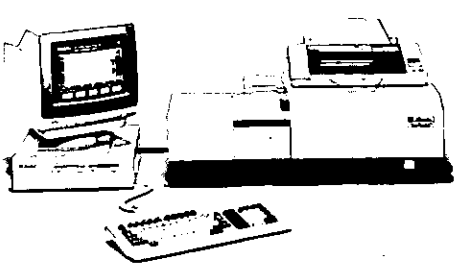

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THE NEW ZEALAND INSTITUTE OF CHEMISTRY THE NEW ZEALAND BIOCHEMICAL SOCIETY and THE NEW ZEALAND SOCIETY OF PLANT PHYSIOLOGISTS 1990 CONFERENCE

Victoria University of Wellington 20-23 August

The Conference Organising Committee has confirmed the participation of an unusually large number of quality plenary speakers both from within New Zealand and overseas. Below is listed general biographical information on each of these speakers, along with details of their proposed presentations.

Mr JOHN MADDOX, Editor of the prestigious journal "Nature" from 1966 to 1973 and again since 1980, began his career as a lecturer in theoretical physics at Manchester University. He then spent nine years as a science correspondent for the "Guardian" newspaper, followed by two periods with the Nuffield Foundation, as Coordinator of the Science Teaching Project and, later, as Director. He has also served as an affiliate of the

Rockefeller Institute, New York, and as a member of the Royal Commission on Environmental Pollution, The Genetic Manipulation Advisory Group, the British Library Advisory Council, the Council on International Development, and the Councils of the Queen Elizabeth College and Kings College, London. His published works include "The Spread of Nuclear Weapons", 1962; "Revolution in Biology", 1964; "The Doomsday Syndrome", 1972; and "Beyond the Energy Crisis", 1975. Mr Maddox's visit to New Zealand is assisted by a grant from the British Council.

In his opening address to the Conference, "Where is Science Heading?", Mr Maddox will provide an overview of current significant scientific issues. He will also be participating in the panel discussion on science policy, and will present the closing address on Thursday 23, entitled "Is Biology Now a Branch of Chemistry?".

Dr COLIN ADAM is Director of the newly-established CSIRO Institute of Industrial Technologies. He was most recently Chief of the CSIRO Division of Materials Science and Technology and has also held positions on several university, government and industry bodies. Following his graduation from and his post-doctoral experience at the University of Queensland, he was appointed Senior Lecturer in Materials Engineering at the University of Auckland, a post which he held from 1973 to 1978. Dr Adam then became an Associate Professor in Mechanical Engineering at the State University of New York, and later was Programme Manager in Advanced Alloy development for Pratt and Whitney Aircraft in Florida. Later he was appointed Manager of the Materials Laboratory for Allied Corporation in New Jersey and went on to become their Director of the Metals Ceramics Laboratory, a position he held until mid 1987.

In his talk, entitled "Industrial Research for the 21st Century', Dr Adam will draw upon

his experience as a materials scientist in the Aerospace Industry and with the Australian Government to illustrate the key issues facing industrial research in the future.

Dr GEOFF BELTON is Director, Central Research Laboratories, BHP Co Ltd as well as being Honorary Professor at the University of

Newcastle and adjunct professor at the University of Pennsylvania. He joined BHP in his current position in 1979 after spending about 19 years in the USA, mainly as Professor of Metallurgy and Materials Science at the University of Pennsylvania. He was born in Rotherham, England, and carried out his post-graduate research in the Nuffield Research Group at Imperial College. His talk, entitled, "The Role of Research & Development in a Resource-Based Industry" will be built around needs and opportunities, with particular reference to the steel and related minerals industries.

Dr JOHN P DEVLIN is the Research and Development Administrator for Boehringer Ingelheim Pharmaceuticals Inc, Ridgefield, Connecticut, USA. After graduating PhD in organic chemistry from Sheffield University, he conducted post-doctoral research in natural product synthesis and analysis with the National Research Council in Canada. On joining Boehringer in 1970, he directed a team working on the synthesis of anti-allergic and anti-inflammatory drugs, and also worked on the screening of marine organisms for substances of pharmacological utility. He has over 40 publications and patents in medicinal chemistry and is currently an External Associate Professor at the School of Pharmacy, University of Connecticut at Storrs.

In his talk, entitled "The Chemists' Guide to Drug Discovery in Immune Regulation", he will discuss the

opportunities available to the synthetic organic chemist for the design and discovery of new therapeutic drugs. Such opportunities have been created following the advances in the understanding of the cellular and biochemical matrices that regulate the immune response. An increasingly important method is high capacity screening of diverse chemical substances in receptor and enzyme assays. Examples will be provided of the processes employed in such screens and the selection and preparation of test substances, assay systems, computer matrices and data management procedures.

PROF ROBIN FERRIER obtained his PhD at Edinburgh University and was later awarded a DSC from the University of London. He attained the post of Reader in Chemistry at the University of London before taking up the Chair of Organic Chemistry at Victoria University of Wellington in 1970. Prof Ferrier is well known in his field of carbohydrate chemistry, teaching or conducting research visits to over 20 countries and giving invited lectures at several international conferences. He is currently on the editorial

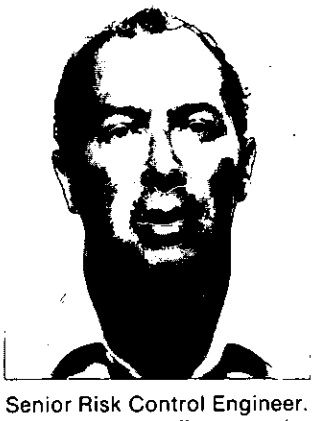
board of "Carbohydrate Research" and Senior Reporter of the Royal Society of Chemistry's specialist periodical report "Carbohydrate Chemistry". He was recently Executive Dean of Science at Victoria University, and is currently Chairman of the Chemistry Department. He was elected a Fellow of the Royal Society of New Zealand in 1977.

In his talk, Professor Ferrier will discuss how sugars, which used to be the outcasts from synthetic chemistry, can now be used as starting materials for the preparation of a wide range of biologically and medicinally active non-carbohydrate substances. This development will be discussed, and research in Wellington will be used by way of illustration.

Dr MIKE GRAVESTOCK is currently Manager of The ICI Corporate Carbohydrate Group, Jealott's Hill, UK. After graduating from Southampton University and spending two years with Shell Chemicals Research Laboratories, he graduated PhD from McMaster University, Ontario, Canada. He then spent two years in research at Stanford University and a year with Roche Products Ltd before joining ICI Pharmaceuticals. In 1981 he began looking at anti-infection targets such as triazole and polyoxin based antifungals, and the synthesis of carbapenem antibacterials. In 1987, Dr Gravestock was appointed Manager of the recently established ICI Corporate Carbohydrate Group. This Group's objective is to discover and develop new carbohydrate-based drugs and agrochemicals and to act as a knowledge-base within the Company for the many new developments in carbohydrate science.

His talk will be a review illustrating the new and exciting role for "small" carbohydrates as biologically active entities, by using examples from several areas of active research. These include aspects of the chemistry of plant cell walls, the synthesis of effective herbicides and plant growth regulators from carbohydrates, and the use of monosaccharides for the development of new pharmaceuticals such as antibacterials, anticancer drugs, immunostimulants, and anticonvulsants.

Mr ROBIN GUNSTON is a chartered chemical engineer, educated at Manchester University. He worked on the start up of Europe's first hydrocracker at BP's Grangemouth Refinery, then joined Foster Wheeler working on process design of oilfield and refinery projects in UK, Europe, South Africa and Saudi Arabia. In 1977, following a growing number of major disasters in the oil and petrochemical industry, he joined Sedgwick Group, insurance brokers as



Senior Risk Control Engineer. During the next five years he travelled to over 40 countries covering all aspects of oil insurance. In 1982, at the start of the Marsden Point refinery expansion project he assumed the new position of Safety Engineer being responsible for hazard and operability studies of all the new plant as well as all aspects of human safety and industrial hygiene. Since 1987 he has been the refinery Commercial Manager, piloting the refinery into its new deregulated environment.

His paper addresses the fact that as the oil and petrochemical industry enters the 1990's it has to face new demands. These arise mainly from environmental and economic pressures. Increasingly the help of the scientific community is needed in the areas such as molecular sieve technology, biodegradation of waste products, alternative uses for waste gases, and better understanding the mechanisms of catalysts. Such help facilitates a cleaner environment and ensures a more efficient use of each barrel of oil. Some of the current technical issues facing New Zealand's oil refinery will be presented.

Dr DEREK HODSON graduated PhD in Chemistry from the University of Manchester followed by post-graduate work in Education at the University of Exeter. After 10 years teaching chemistry and physics in secondary schools in England, Scotland and Wales, during which he held the posts of Head of Chemistry and Head of Science, and gained an MEd degree in Science Education, he spent a year in the University of Wales teaching curriculum studies. Thereafter, he moved to the University of Manchester, where he was responsible for initial teacher education (PGCE) in Chemistry, co-taught the University's MEd degrees in science education and in curriculum studies, and directed in-service courses for the Heads of Science Departments. In 1986 he moved to the Education Department in the University of Auckland, where he teaches a range of courses in science and education and curriculum studies, including a recently introduced MEd (Science Education) degree. He has published more than 50 papers and is the co-author of a book entitled "Science for All - Teaching Science in the Secondary School".

His paper, entitled "Science Fiction - The Misrepresentation of Science in the Curriculum", deals with the fact that despite the best efforts of science teachers, the current curriculum fails to address certain key issues relating to the role and status of scientific knowledge, trivialises the complex relationships between observation, experiment and theory, promotes a stereotyped and distorted view of scientists, and seriously misrepresents the nature of scientific enquiry. He proposes that if the current crisis in science education is to be solved, ways must be found to provide students with a philosophically valid and pedagogically sound curriculum.

Mrs HELEN HUGHES is Parliamentary Commissioner for the Environment. After graduating MSc with 1st Class Honours in Botany from the University of New Zealand, she completed a further degree in plant science at Vassar College, USA. Before becoming the DSIR Environmental Coordinator in 1974, Mrs Hughes was a scientist with Ecology Division, DSIR. In 1981 she was appointed an Assistant Commissioner with the Commission for the Environment, taking up her present position in 1987. She has been a past President of the Wellington

Branch of the Royal Society of New Zealand, a past Chairman of the New Zealand Committee for Water Pollution Research and Control, the UNESCO Committee on Man and the Biosphere, the National Committee on Problems of the Environment (SCOPE), and a member of the New Zealand Ecological Society, the New Zealand Limnological Society, the New Zealand Association of Scientists, the Cawthron Institute Trust Board and the New Zealand School of Forestry Advisory Committee.

In her talk, Mrs Hughes will be addressing the social costs of enviromental issues which have chemical implications and, in particular, the responsibility of public authorities for the management of such matters.

Dr GEORGE LORIMER, a Fellow of the Royal Society of London since 1986, leads a research team in the molecular biology division of du Pont's Research and Development Department. He comes originally from Edinburgh, gained his PhD at Michigan State and moved to du Pont after Fellowships in Germany and Canberra.

His presentation will cover his current research interests which centre on understanding the mechanism of one of the major photosynthetic enzymes (RubisCO). He is using protein engineering to investigate the features of the RubisCO structure which affect its function. The techniques of the structural study involve the use of assembly

enzymes similar to those active in plants responding to temperature stress.

Dr JIM PEACOCK is currently Chief of the Division of Plant Industry, CSIRO in Canberra. During his research career in CSIRO he has held a number of visiting professorships of biology, biochemistry and molecular biologies at universities including Stanford, San Diego, Los Angeles, and Oregon. He was also Visiting Investigator in the Oakridge National Laboratory and a consultant with Agrigenetics. He was elected a Fellow of the Australian Academy of Science in 1976, a Fellow of the Royal Society of London in 1982, and a Fellow of the Aus-

tralian Academy of Technological Sciences and Engineering in 1988. His other awards include the BHP Bicentennial Prize for the Pursuit of Excellence in Science and Technology, and the CSIRO Medal for his leadership of the division of plant industry. He has published approximately 160 research papers and edited a number of books. He is the editor of several scientific journals and participates regularly in international symposia.

His research laboratory has world prominence in the field of plant molecular biology and his presentation, entitled "Prospects with Transgenic Plants" discusses how recombinant DNA technology has transformed our capacity to understand how plants develop and function. This, in turn, is increasing the potential of plant breeding. Dr Peacock believes that, ultimately, gene replacement technologies may be developed where a gene sequence can be specifically removed and replaced with a desired alternative. The entry of such transgenic plants into agriculture will bring about significant changes to current processing and production technologies and lead to enhanced efficiencies in both agriculture and industry. Details of these trends will be discussed.

Dr HERB L ROTHBART is the Director of the North Atlantic Area, Agricultural Research Service, USDA, Philadelphia, USA. After graduating PhD in Chemistry from Rutgers University in 1963 he has worked on optimising the utilisation of agricultural commodities. Since 1984 he has been the Research Administrator in charge of the 13 USDA research centres in the North Atlantic states, employing 600

Federal and 300 contract staff with a US $50 million budget. He has responsibility for a broad programme of research in food and agricultural sciences, encompassing human nutrition and ageing, post harvest technology, animal health, plant production and protection, as well as soil and water sciences.

His talk will describe the USDA approach to long-range research planning — trying to guess the nature of agriculture in the 21st century, and what research agenda will be necessary to answer questions that will confront us by the year 2000.

Dr BASIL WALKER is the Chief Executive of the newly established Ministry of Research Science and Technology. He began his career in 1964 in Chemistry Division of the DSIR before going to Cambridge University to complete a Doctorate in Chemical Engineering. In 1970 he returned to Chemistry Division and four years later became Head of the Chemical Engineering Section of Industrial Processing Division. In 1978 he was seconded as the first Technical Director of the Liquid Fuels Trust Board, responsible for setting up the Board's technical organisation and management. He then joined the Ministry of Energy, first as Assistant Secretary (Planning), then as Deputy Secretary (Corporate Services) ultimately becoming Secretary of Energy. In this capacity he was responsible for the major restructuring of that department which resulted in two SOE's (Electricorp and Coal Corp). In

1988 he was appointed Chief Executive and Secretary of Defence in which capacity he implemented the major reforms arising from the review of defence resource management. He was appointed to his present position with the Ministry of Research Science & Technology in late 1989.

His talk will outline the role of the Ministry and the foundation for Research Science & Technology in matters of policy and funding, and their relationship to Government (the policy deciders) and the science providers such as the DSIR (the science operators). Key policy aspects of the new regime will be explained including the introduction of contestability in science funding, and funding by outputs rather than by institution. Following his talk there will be a panel discussion on science policy in New Zealand, featuring John Maddox, Basil Walker, Simon Upton (Opposition Spokesman on Science) and Rick Christie (Chief Executive Officer of Cable Price Downer).

LETTER FROM THE PRESIDENT

Dear Member,

It is now almost a year since the permanent secretariat was established and its effect on Institute affairs is now being felt. This is certainly obvious to those who serve on Council and those who are involved with Branch committees. The Executive Officer has asked various Government departments to add the secretariat to their mailing list so that we will be better informed on matters relevant to members. The Royal Society, of which we are a member body, has also been asked to bring to our attention matters on which we may wish to issue statements or prepare submissions. This is all part of the process of slowly trying to increase the professional profile of the Institute. Individual members could help here too by writing in when they learn of regulations on which submissions have been called if these are of relevance to the Institute.

Since I last wrote it has been announced that **Mr R. Arbuckle** will chair the Foundation of Research, Science and Technology. Four other appointments were announced just before Christmas, namely **Professor Patricia Bergquist** (University of Auckland), **Mr Brian Chamberlain** (President, Federated Farmers), **Mr Alan Kerr** (Forest Products Technology General Manager) and **Dr Ian Watson** (Massey University). It is pleasing to note that the only chemist to gain selection (Dr Watson) was one of our nominees.

The term "restructuring" has been very quickly assimilated into our vocabulary and, not to be outdone, the Institute has been undergoing a little restructuring of its own, although so far only in a modest way. At the February Council meeting we started to consider the role and function of some of our sub-committees and how these can best serve members interests. The position of specialist groups within the Institute is also under scrutiny and, as a first step in improving communications with them, the first Vice-President has been appointed to represent their interests at future Council meetings. Since his election the Second Vice-President has been considering a development plan for the Institute and he presented some ideas for consideration in February. In the months ahead some of these will be investigated further. One plan which we hope to put into effect as soon as possible is the setting up of a database of members skills and expertise which could be used to identify suitable candidates for particular jobs. Such a service should be of interest to our younger members in particular.

The February issue of "Chemistry in NZ" focused on recruitment and it is vital for the health of the Institute that we attract more members. I urge you all to encourage some new members to join. Elsewhere in this issue we have prepared some statistics to show the spread of members and associates and I refer you to this for details. Costs for the Institute continue to rise and one way in which we can avoid a subscription spiral is to increase the membership numbers. This is however a longer term goal. In the meantime Council has decided, albeit very reluctantly, that for this year we will need to raise the subscription. Last year it declined to do so but now the decision is forced upon us. To lessen the impact of the increase we will be offering members the choice of either paying the full subscription when it falls due or a month by month automatic salary deduction. Not only are we faced with increased costs due to inflation and a higher level of GST but also the 'user-pays' principle is affecting us. This is very apparent with for example the cost of posting the Journal where the 50% reduction for bulk postings of printed material, which has operated for a number of years, no longer applies. Council was concerned that the subscription increase was really necessary and we have been carefully pruning costs wherever possible. However, in spite of this an increase this year is unavoidable. The two largest items of expenditure are of course the Secretariat and the Journal. In my view the former is essential if we are to maintain the professional image required for the Institute in the 1990's. The Journal, too, is our means of communication with the membership, particularly those of you who do not live in one of the six Branch centres. We are thus concerned to retain the Journal although a less costly version may yet have to take its place. Elsewhere a breakdown of our expenses has been prepared for you so that you may see how your subscription is used. Alternative sources of funding (i.e. to subscriptions) have been considered and some ideas have been floated but these will take time to organise and any attempts so far have only brought in very modest sums. This another area which will continue to be under discussion as part of the development plan.

My letter in this issue is a long one but I was desirous of bringing to your attention some of the positive things the Institute has been doing for you as well as informing you of some of the problems it faces. I hope that you will refer to the further comments and statistics that are presented elsewhere and I look forward to your continued support.

Yours sincerely
Joyce Waters

HONOURS

Dr. A.J. Ellis was awarded an OBE in the New Years Honours List. He recently retired from the position of Director General of D.S.I.R., a post which he held for the last 5 years. His period as Director General coincided with major changes imposed by government in the science area, including reduced funding and greater self-sufficiency for DSIR through the user-pays policy; increased accountability requirements; and contestability for Government funds. This led to changes being made in DSIR management systems and structures; particularly the beginning of restructuring of DSIR Divisions into fewer entities.

Previously Dr. Ellis was Assistant Director General of the DSIR Head Office from 1979 to 1984; and the Director of Chemistry Division from 1971 to 1979. He has been on the Boards of many other organisations, including most of the Research Associations, Medical Research Council, Consumer Council, Technology Advancement Trust, and was recently Chairman of the Commonwealth Science Council, London. He is a Fellow of the Royal Society of New Zealand. He was President of the N.Z.I.C. in 1981, the Jubilee year.

Dr. Ellis' background in science is as a geochemist, establishing the physical chemistry and mineralogy of processes occurring within geothermal areas at high temperatures and pressures. He was actively involved in geothermal power developments in New Zealand and many other countries. During his period in Chemistry Division he established a major research group in hydrothermal geochemistry in the 1960's and 1970's, which still continues strongly. He is the author of many publications, which recently have been more related to managing science than science itself.

Marion F Robinson received a CBE in the Queen's New Year honours, but believes that the honour belongs to all those folk who worked with her over many years. Although she thinks that the following CV is 'stuffy' and should be edited - the editor disagrees and thinks that readers will be interested in her meritorious career.

Professor Marion F Robinson received her first degree of Bachelor of Home Science with a Science Specialization from the University of Otago, Dunedin, New Zealand in 1945;

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SPECTROSCOPIC STUDIES OF CATALYSTS OR UNRAVELLING THE MYSTERIES OF THE CATALYTIC FORCE

Russell Howe
Chemistry Department University of Auckland

The origins of catalysis can be traced back to the Philosopher's stone, although early experiments on the transmutation of elements into gold with the aid of this catalyst suffered from problems of reproducibility. The term catalyst was first coined by Berzelius in 1835; unfortunately, he also invented the concept of a catalytic force (1):

"Catalytic force actually means that substances are able to awaken affinities which are asleep at this temperature by their mere presence and not by their own affinity".

This concept, denying any chemical interaction between catalyst and substrate, undoubtedly contributed to the black magic reputation that surrounded catalysis through to the 20th century. Experimental work by names such as Langmuir, Ostwald, and Sabatier finally established firmly the chemical nature of catalysis, but the industrial development of catalytic processes such as ammonia synthesis, nitric acid synthesis, alkene hydrogenation and hydrocarbon cracking certainly preceded a clear understanding of reaction pathways and mechanisms.

The past 25 years has seen the introduction of many new spectroscopic techniques, and as in other areas of chemistry, these have allowed for the first time the possibility of building up a detailed molecular picture of events occurring in complex systems such as catalysts. In this article, I review briefly work being done in Auckland applying spectroscopic methods to problems in catalysis. Our objectives are to understand at the molecular level reactions occurring on catalyst surfaces, and to investigate and characterize potential new catalytic materials. We use the spectroscopic techniques of FTIR, NMR, EPR, XPS and EXAFS, together with other physical methods such as temperature programmed desorption, gravimetric and volumetric adsorption, X-ray diffraction, electron microscopy and gas chromatography.

FTIR Spectroscopy

Infrared spectroscopy has been used to observe molecules adsorbed on solid surfaces for more than 30 years. High surface area powdered solids pressed into thin self-supporting wafers present a sufficiently high number of adsorption sites that it is not difficult to measure spectra of adsorbed molecules in such samples, at least at room temperature, even with dispersive instruments. The advent of Fourier transform spectrometers (FTIR) in the past 10 years has however opened up several new opportunities in this field. It is now possible to measure spectra from pressed wafers of catalyst at high temperatures under reaction conditions, thus allowing in-situ monitoring of reaction intermediates. Alternative sampling methods such as diffuse reflectance or photoacoustic spectroscopy have been developed; it is now also possible to obtain spectra from single crystal surfaces, with the corresponding gain in structural definition.

We use the pressed wafer technique to study the ZSM-5 zeolite catalyst used to convert methanol to hydrocarbons in the Motunui synthetic petrol process (2). The active site in this catalyst is a Bronsted acid proton, shown in figure 1. The acid site has a characteristic v(OH) stretching vibration at about 3620 cm-1, and we have used an **in-situ** reaction cell to observe the interaction of this active site with methanol and dimethylether (the input to the ZSM-5 catalyst at Motunui is a mixture of methanol, dimethylether and water (3). The

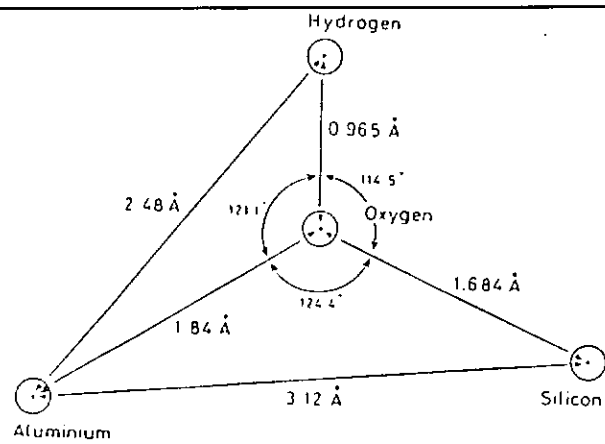
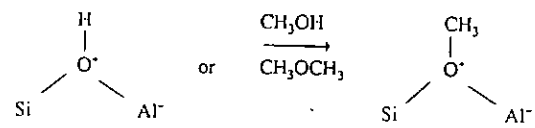


Figure 1. Structure of the Bronsted acid site in zeolite ZSM-5 (from reference (16)).

mechanism of the methanol to hydrocarbon conversion is the subject of considerable controversy; in particular, the route by which the first carbon-carbon bonds are formed has attracted much speculation.

We were able to show that under the conditions where the first carbon-carbon bonds are formed (ethene and propene) methanol and dimethylether react with the acid sites to form a reactive electrophilic methoxy group:



This methoxy group was shown to readily methylate added substrates such as ethene or benzene, providing clear evidence that such methylation is a major contributor to carbon chain growth. The subsequent chemistry of alkene polymerization and aromatization is complex, but the combination of FTIR and uv-visible spectroscopy has allowed at least the major ingredients in this reaction sequence to be identified (4).

A more practical aspect of the synthetic petrol process which can also be studied by FTIR is catalyst deactivation. After 1-2 months on stream at Motunui the ZSM-5 catalyst becomes deactivated and must be taken off stream for regeneration. In a joint project with Chemistry Division DSIR we have used the FTIR technique (along with other methods) to study this deactivation phenomenon. For example, the progressive loss of active sites during methanol conversion can be monitored either by observing them directly (as v(OH) bands) or by titrating the active sites with bases such as ammonia or pyridine, and measuring the concentrations of the resulting adducts from the intensities of their infrared spectra:

$$H^+ + C_5H_5N \longrightarrow C_5H_5NH^+$$

such measurements have shown that there is an initial rapid loss of acid sites due to formation of strongly adsorbed aromatic hydrocarbons within the zeolite pores, while methanol conversion continues over the remaining acid sites which are more gradually eliminated. Eventually, all acid

sites are lost, and hydrocarbon formation ceases (5). Catalyst regeneration by heating in an oxidizing atmosphere removes all adsorbed hydrocarbon residues and regenerates almost completely the acid sites. There is however a gradual deterioration in catalyst performance after repeated deactivation — regeneration cycles, and we are currently studying this irreversible deactivation by FTIR. We suspect that steam formed during regeneration may react with the zeolite to knock out acid sites, but that suggestion needs further study.

The sensitivity of the FTIR technique is such that it can be applied to the much lower concentrations of molecules present on single crystal surfaces. Many research groups are using the method to observe adsorbed molecules on single crystal metal surfaces, where the geometries of the surface atoms can be precisely defined and orientations of adsorbed molecules measured with polarized infrared radiation. No corresponding single crystal studies with zeolite catalysts have so far been reported. Zeolites such as ZSM-5 are normally prepared with crystal sizes of a few microns. Figure 2

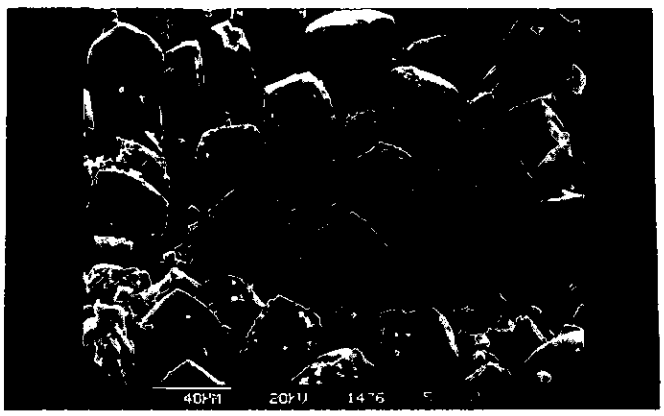


Figure 2. Single crystals of zeolite ZSM-5.

shows for example an electron micrograph of ZSM-5 prepared in Chemistry Division of DSIR consisting of cubic crystals about 30 microns on edge. We have recently demonstrated that FTIR spectra can be obtained from a single crystal of such ZSM-5 zeolites using an FTIR microscope. This instrument (not yet available in New Zealand) focuses the infrared beam from an FTIR spectrometer down to a spot size of about 20 microns (the lower limit of 15 microns is dictated by the wavelength of the light). Figure 3 shows the

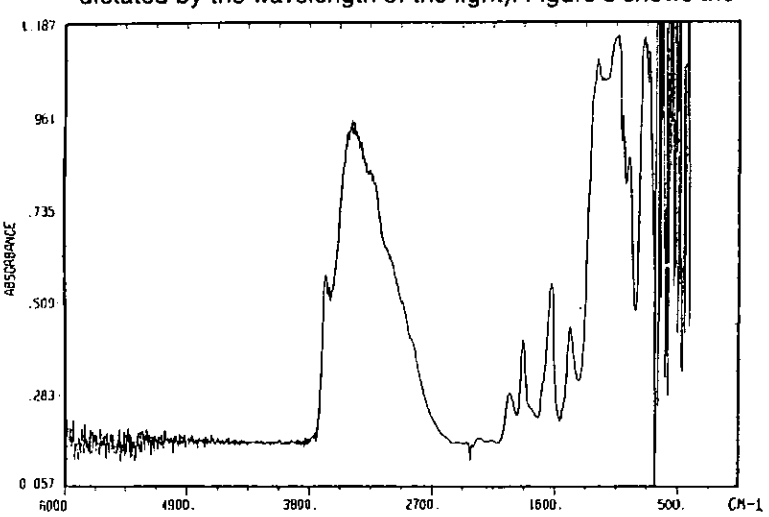


Figure 3. Infrared spectrum of one single crystal from Figure 2.

spectrum measured in this way from one of the zeolite crystals in Figure 2. The zeolite has been ammonium ion exchanged, the spectrum thus shows, in addition to characteristic bands of the zeolite lattice, bands due to NH_4^+ and adsorbed H_20. This demonstrates for the first time that spectra can be measured from zeolite single crystals; the exciting possibility now exists of determining orientations of adsorbed species in such well defined single crystals, and investigating active site geometries.

NMR Spectroscopy

The advent of solid state NMR spectroscopy as a routine analytical method has brought many applications in catalysis. Regretably, New Zealand has at present only one high resolution solid state NMR spectrometer, at Chemistry Division DSIR. Our use of solid state NMR for studying zeolite catalysts has been done in collaboration with Chemistry Division, and through access to instruments in Australia and the U.S. In the case of zeolites it is possible to observe directly the silicon and aluminium atoms in the aluminosilicate lattice, and with much greater difficulty (and expense) the oxygen atoms (if enriched in oxygen-17) and the protons of the Bronsted acid sites. For example, steam treatment of ZSM-5 has been shown by aluminium-27 and silicon-29 NMR spectroscopy to cause a gradual disappearance of tetrahedral aluminium atoms from the zeolite lattice. We believe this to be associated with the irreversible deactivation of the catalyst for methanol conversion referred to above, but this is again the subject of on-going study (6).

Carbon-13 solid state NMR spectroscopy can be used to observe hydrocarbons adsorbed on catalyst surfaces. **In-situ** studies under reaction conditions have not so far been feasible, but it is possible to at least characterize stable adsorbed species from spectra measured at room temperature. For example, Meinholdt **et al** at Chemistry Division DSIR have examined the hydrocarbon residues (coke deposits) formed in ZSM-5 during methanol conversion (7). In a collaborative study with Professors J. Haw and J.H. Lunsford at Texas A and M University we have attempted to observe the initial reaction products of methanol reaction with the active sites in ZSM-5, using carbon-13 enriched methanol to enhance signal intensities. The experiment in this case consisted of adding small amounts of methanol to the catalyst at various reaction temperatures, evacuating any weakly adsorbed molecules then cooling under vacuum and transferring the sample to the NMR spectrometer under an inert atmosphere. Figure 4 shows spectra obtained at two different reaction

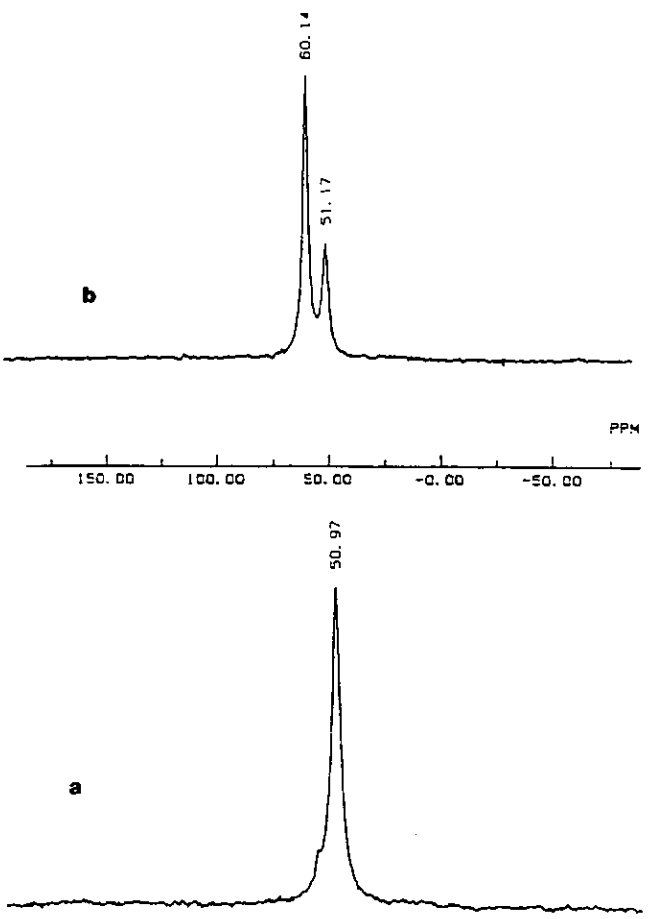


Figure 4. Carbon-13 NMR spectra of methanol introduced into ZSM-5 at (a):25°C, (b):250°C.

temperatures. Below the temperature at which methanol begins to react a single carbon-13 signal is obtained at the chemical shift of methanol (50 ppm relative to TMS). At temperatures where reaction occurs, a second signal at about 60 ppm is detected. This may be due to the reactive methoxy group detected by FTIR spectroscopy. Further experiments are needed to confirm that suggestion, in particular to correlate as closely as possible observations by the two quite different spectroscopic methods. If the catalyst is exposed to larger quantities of methanol for larger periods of time at elevated temperatures the NMR spectra show the presence of adsorbed aliphatic and aromatic hydrocarbons, as has been reported by others (7,8).

Another application of NMR spectroscopy specific to zeolites or zeolitic materials is xenon-129 spectroscopy of adsorbed xenon. This has the advantage that it does not require a solid state spectrometer, xenon gas is physically adsorbed and behaves like a liquid; its spectrum can thus be measured with a conventional liquids probe. As described elsewhere in this journal by my colleague Jan Coddington (9), the xenon chemical shift is sensitive to the pore volume occupied by the xenon and to other extra-framework species which may also be present in the pores. Xenon NMR can thus be used to monitor pore blockage and the distribution of added components throughout the zeolite pore structure. We are also exploring the possibility of using this technique to probe the pore structures in pillared clay catalysts, which have a range of pore sizes larger than those found in zeolites.

EPR Spectroscopy

Electron paramagnetic resonance spectroscopy is at least 6 orders of magnitude more sensitive than NMR spectroscopy, and thus should be ideally suited for studying low concentrations of reactive species on catalyst surfaces. In reality however, most such reactive species are not paramagnetic and do not therefore give EPR spectra. One notable exception are the methyl radicals believed to be the key intermediate in the high temperature oxidative coupling of methane:

$$2CH_4 + \tfrac{1}{2}O_2 \rightarrow C_2H_6 + H_2O$$

This reaction is under intensive study in many parts of the world as a potential direct route from natural gas to liquid fuels (ethane can be readily steam cracked to ethene, which can in turn be oligomerized to liquid hydrocarbons), and the research group of Lunsford et al at Texas A & M University has used EPR spectroscopy to show that an important role of catalysts in this reaction is to generate gas phase methyl radicals which can then react further (10).

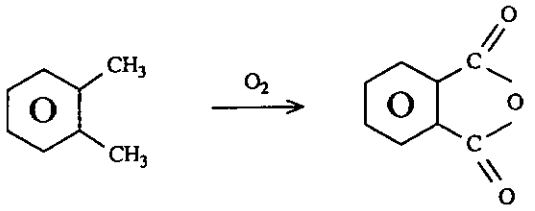
Another area of catalysis where EPR spectroscopy is potentially important is photocatalysis. Photocatalysts absorb light and transfer electrons to or from adsorbed reactants at low temperatures. These one-electron transfers must involve free radicals, and since they occur at low temperatures (unlike the 7-800°C needed for methane coupling), can readily be studied **in-situ** in an EPR spectrometer. In Auckland, we have used this technique to study photoeffects in porous titania glasses. Titanium dioxide is a popular choice as a photocatalyst, its band gap corresponds to photons in the near ultraviolet, and its reactivity in for example photooxidation of organic molecules is well documented. Porous titania glasses (PTG) offer the advantage over conventional titanium oxide powders of not scattering incident light and thus allowing much more efficient photocatalysis. We have observed by EPR spectroscopy the formation of trapped electrons when PTG is irradiated in the presence of hole scavengers such as methanol at room temperature. Band-gap irradiation of the PTG produces positive holes and electrons; the holes react with adsorbed methanol (an oxidative reaction, the details of which we have yet to work out), and the electrons are trapped at surface Ti^{4+} sites to form paramagnetic Ti^{3+}.

$$TiO_2 + h\nu \rightarrow Ti^{3+} + h^+$$

The reactivity of the PTG can be modified by doping with transition metal ions; if these are paramagnetic (such as Fe^{3+},V^{4+} or Mn^{2+}) their interaction with electrons or holes produced in the semiconductor can also be monitored by EPR spectroscopy (11).

In the absence of reactive molecules or impurity trap sites, the holes and electrons produced on irradiation of TiO_2 at room temperature immediately recombine. They may however be observed at very low temperatures. In a collaborative study with Professor M. Gratzel at the Ecole Polytechnique in Lausane, Switzerland, we have carried out in-situ EPR experiments with TiO_2 photocatalysts irradiated in vacuum at 4K (liquid helium). At this temperature it is possible to observe a steady state concentration of holes and electrons during irradiation. The electrons are associated with interstitial Ti^{4+}sites (as Ti^{3+}), and the holes with sub-surface oxide ions (as O^-); when the light is turned off recombination occurs in a few seconds at this temperature (12). The potential of low temperature EPR spectroscopy for studying mechanism of photocatalystic reactions is thus clearly demonstrated. This work needs now to be extended to modified TiO_2 catalysts, and to study the catalysts in the presence of reactant molecules.

A more mundane but nevertheless important use of EPR spectroscopy in Auckland is to assist in the characterization of catalysts containing transition metal cations. paramagnetic cations such as Mo^{5+},V^{4+} and Cu^{2+} give EPR spectra which are sensitive to the exact coordination geometry and environment around the cation. We have used this to characterize adsorption sites on for example alumina or silica supported MoO_3 and RuO_2 catalysts, zeolites cation exchanged with paramagnetic cations, and V_2O_5 supported on porous titania glass, which turns out to be a particularly interesting catalyst for the oxidation of ortho-xylene.



X-Ray Photoelectron Spectroscopy

X-ray photoelectron spectroscopy (XPS) is one of the so-called surface analytical methods which provides quantitative analysis and chemical information for the outermost atomic layers of a solid surface. The technique has been reviewed recently in this Journal (13). In the case of heterogeneous catalysts, XPS can identify the components present on a catalyst surface and detect any catalyst poisons present. Establishment of the Research Centre for Surface and Materials Science at Auckland University has given us the opportunity to carry out XPS measurements in-house, using the Kratos XSAM800 instrument installed during 1988. Prior to that time, instruments in Australia and Sweden were utilized.

We use XPS routinely to characterize all catalysts studied. The XSAM800 instrument was recently fitted with an **in-situ** reaction chamber which will allow catalysts to be prepared, treated in various ways and then analyzed without removal from the spectrometer. As an example of such **in-situ** XPS measurements I cite some earlier experiments conducted on a spectrometer at the University of Lund, in Sweden. We are interested in the catalytic properties of small metal clusters contained within the 12 Angstrom diameter pores of zeolite molecular sieves. Such metal clusters are expected to have different reactivity from larger metal particles, and may be

also influenced by interaction with the zeolite lattice and any exchangeable cations present. One method for preparing intrazeolitic clusters is via adsorption and decomposition of volatile transition metal carbonyl complexes. Thermal decomposition of such zerovalent complexes under non-oxidative conditions should produce zerovalent metal.

$$\text{e.g. } Mo(CO)_6 \rightarrow Mo + 6CO$$

We showed by in-situ XPS measurements that $Mo(CO)_6$ initially adsorbed into the pores of zeolite Y at room temperature decomposed on heating in vacuum to 200°C leaving zerovalent molybdenum dispersed through the zeolite pores. Similar chemistry occurred with $Fe(CO)_5$, except the zerovalent iron produced in this case tends to migrate out of the zeolite pores to the external surface (enhancing dramatically the XPS iron signal). This migration could however be inhibited by exchanging the zeolite with divalent cations such as Co_2). The complex $Co_2(CO)_8$ was found to decompose largely on the external surface of the zeolite rather than in the pores, but high dispersions of intrazeolitic cobalt could be formed from the precursor $Co(CO)_3NO$(14).

Further studies on these novel metal loaded zeolite catalysts will be carried out with the XSAM800 facility in Auckland. As catalysts, they show high activity for the synthesis of light hydrocarbons from CO and H_2 (the Fischer-Tropsch reaction). A particularly intriguing possibility in these systems is the formation of bimetallic or multimetallic alloy clusters within the zeolite pores which should certainly have interesting catalytic properties.

EXAFS

The technique of EXAFS (Extended X-ray Absorbtion Fine Structure) allows structural information to be obtained from solid materials which have insufficient long-range order for traditional X-ray or neutron diffraction methods to be useful. Most zeolite catalysts, for example, have crystal sizes too small for single crystal diffraction experiments, and powder diffraction methods give useful structural information only about the zeolite lattice, and not additional components introduced into the zeolite pores (which are generally disordered).

EXAFS involves measuring oscillations in the X-ray absorbtion spectrum of the solid near to the absorbtion edge. These oscillations arise from back scattering of photoelectrons ejected from the absorbing atom off neighbouring atoms. The EXAFS spectrum thus contains information about the number of neighbouring atoms, their chemical identity and their distances from the absorbing atom (but no information about bond angles). The effect is however extremely weak, and requires a very intense flux of X-rays to give reliable data. Although EXAFS can in principle be done with a laboratory X-ray generator, most researchers prefer to use the much more intense X-ray beams generated by synchroton electron storage rings (electrons accelerated to near the speed of light give off a complete electromagnetic spectrum which can be used for all kinds of spectroscopic experiments.

We have recently begun a collaborative project with the group of Professor Y. Iwasawa at the University of Tokyo, which gives us access to an EXAFS facility at the Tsukuba synchroton in Japan. EXAFS is proving to be extremely useful for further characterizing the intrazeolitic metal cluster catalysts referred to above. For example, EXAFS has shown that the initial product of decomposition of $Mo(CO)_6$ adsorbed in zeolite Y is a dinuclear Mo_2 cluster weakly bonded to oxide ions of the zeolite framework. Heating to higher temperatures causes some sintering of the clusters, producing an average cluster size of Mo_3 (xenon-129 NMR studies on these systems support this interpretation (15).

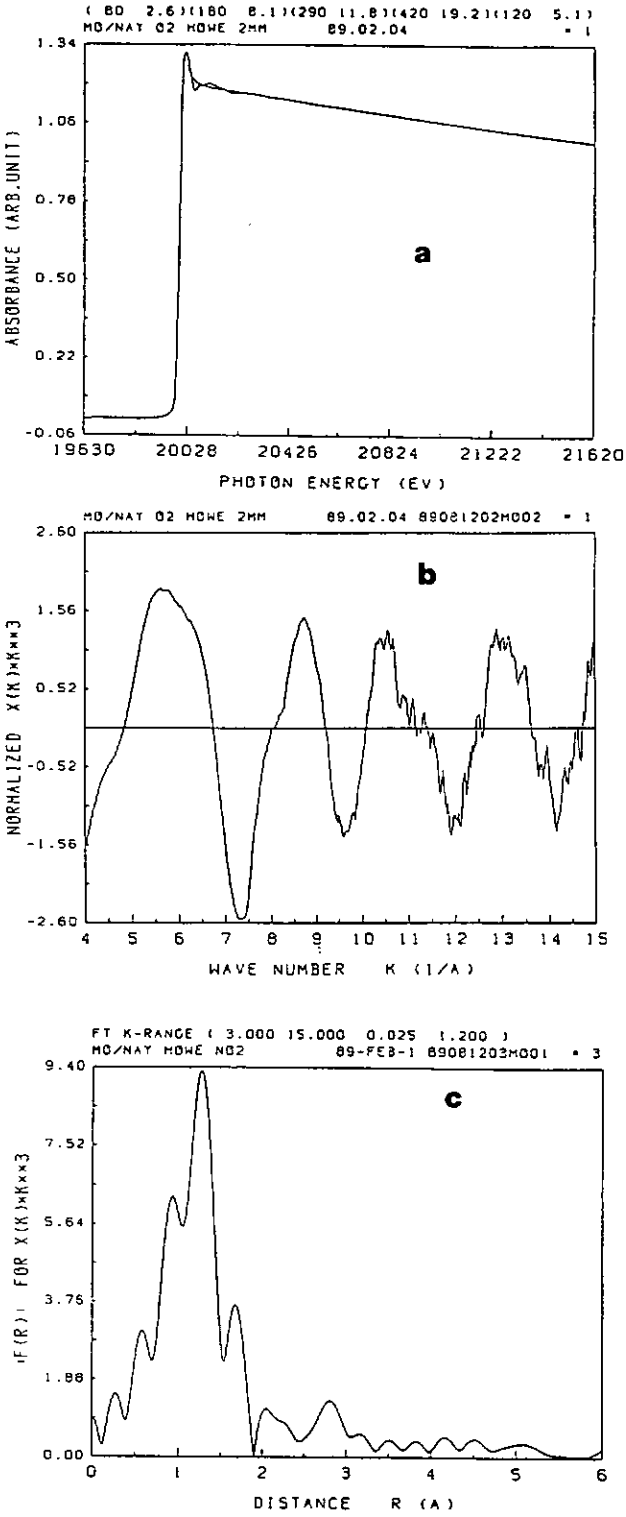


Figure 5. EXAFS data from oxidized molybdenum clusters in zeolite Y. (a): X-ray absorbtion edge; (b), after background subtraction and k^3 weighting; (c), Fourier transform of (b).

Figure 5 shows EXAFS data for an oxidized molybdenum loaded zeolite Y. The EXAFS molulation in the absorbtion edge is amplified by subtracting away the absorbtion edge baseline, then Fourier transformed to produce the radial distribution function in Figure 5 (c). This shows a single peak due to Mo-O bonds (1.7 angstroms, after phase correction) with a coordination number of approximately 3 i.e. oxidation has destroyed the Mo-Mo bonds and formed highly dispersed molybdenum oxide clusters.

Further EXAFS measurements are in progress at the moment; catalyst samples are prepared in Auckland, sealed in glass tubes under vacuum, and mailed to Tokyo where they are opened and loaded into the EXAFS cell under inert atmosphere. We are seeking evidence for interactions (bonding?) between metal clusters (Mo,Fe or Co) and zeolite cations such as Co^{2+},Cu^{2+} or Ni^{2+} within the zeolite pores; such interactions may inhibit sintering of the clusters and

modify their catalytic behavious.

The major drawback of the EXAFS technique is the distance of the measurement from New Zealand. Other synchroton facilities are available in the U.S. and in Europe, and will shortly become available in the People's Republic of China, but access to these is no easier than to Japan. Nevertheless the information available from EXAFS measurements on catalysts cannot be obtained by any other method, and we will be continuing to use the technique as far as is financially and logistically possible.

Concluding Remarks

This article has attempted to illustrate, by means of selected examples, how we apply spectroscopic methods to study catalysts. In an area of chemistry as complex as catalysis, no single technique will ever be enough to fully solve any particular problem, and the area is a most fertile one for the spectroscopist with imagination to work in.

The work described here has involved a number of able and enthusiastic students: in alphabetical order, **Sharelle Alexander, Chee Yee-Hong, Tim Forester, Huang Min-ming, Sheralyn Hume, Jiang Ming, Jeff Johns, Michael Logan, Gavin McLellan, Paul Van der Heide, Suhendra Widjaja, Wong She-Tin, Yong You-Sing, Les Young** and **Zhu Jianhua. Catherine Hobbis** has provided excellent technical assistance, and my colleagues **Jan Coddington, Ralph Cooney, Jim Metson** and **Michael Taylor** have been major sources of advice and assistance. I acknowledge also DSIR Chemistry Division, particularly **David Bibby** and **Neil Milestone** for many fruitful discussions and access to facilities not available in Auckland. We have also fortunate to have access to instruments at CSIRO Division of Materials Science, Australia, Texas A and M University, USA, University of Lund, Sweden, Ecole Polytechnique Federale de Lausanne, Switzerland, and Bomem Inc., USA.

Financial support has come at various times from the Auckland University Research Committee, the University Grants Committee, DSIR Chemistry Division, the New Zealand Energy Research and Development Committee, the New Zealand Ministry of Energy, the Petroleum Research Fund of the American Chemical Society, and the Swedish Board for Technical Development.

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SPECIAL FEATURE ON QUALITY ASSURANCE

QUALITY ACCREDITATION

by Malcolm R. Bell
Deputy Director, TELARC New Zealand

Most companies would claim to have a commitment to quality in the goods or services they supply. Why then, do we have endless complaints about poor quality products and inadequate services? When quality failure occurs it is rarely because of out and out negligence or a deliberate lack of care or a lack of concern for customer satisfaction. Few people want to make poor quality goods — so why does it happen?

There is an old saying that quality doesn't happen by accident. Unfortunately in a lot of companies quality in fact only occurs by accident! However, consistent quality only occurs through Quality Management. Just as a company with a commitment to profitability manages its finances properly so should a company with a commitment to quality manages its quality systems properly.

Before discussing quality management it is necessary to define quality. Through the media quality has come to mean a variety of things but the definition used in quality management is FITNESS FOR PURPOSE. A quality product or service is fit for the purpose for which it is intended, it meets the customer requirements, it complies with the specification. Quality then is not an absolute. There are no high or low quality products per se. A product's quality can only be determined in relation to the customers requirements.

So how does one manage this thing called quality when its definition is so vague. Everyone knows what a profit is so financial management has an obvious goal. But how do you manage for customer satisfaction and fitness for purpose?

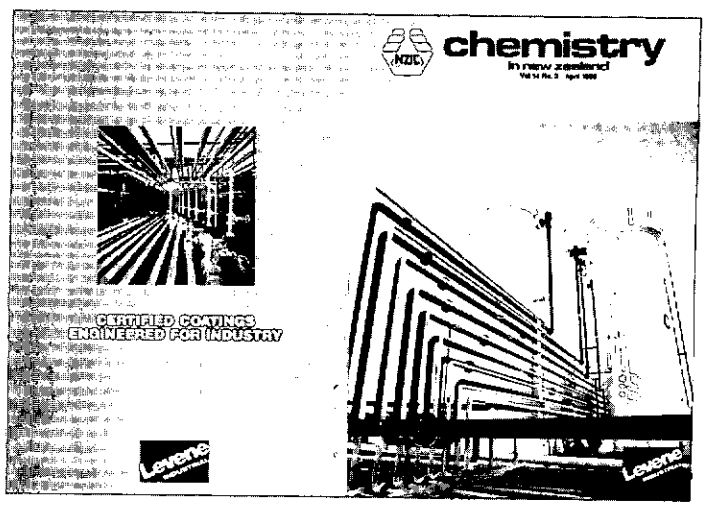
There are two parallel but complementary streams of quality management practice. These two streams are often referred to as Quality Systems Management and Quality Improvement Management. Quality Systems Management relates to a few basic disciplines, all of them straight forward common sense procedures which must be implemented throughout the company from marketing to billing. If properly implemented throughout the company, these disciplines will usually solve the majority of a companies quality problems. This in turn will lead to improved customer satisfaction and pay for themselves many times over through reduced scrap, rework, warranty claims etc.

Quality Improvement Management uses more sophisticated techniques to build upon the basic quality systems to achieve better standards of quality control. For the rest of this paper I will refer to Quality Systems management as this is the level that most New Zealand companies are working towards. Some have moved on to Quality Improvement Management but most will be happy to achieve good Quality Systems Management.

If the basic principles of Quality Systems Management are only common sense then why are they not in use already? The answer is that quality management is applied common sense. Everyone knows what should be done but the common sense is applied in an ad hoc manner. It must be systematised. It has to be written down and built in to the standard operating procedures of the company. To make it simpler the New Zealand Standards Association has published a set of standards defining the basic requirements for a quality management system under series NZS 5600. There is a series

ABOUT OUR COVER

The Shell Wynyard Installation Auckland, where LEVENE INDUSTRIAL COATINGS have recently been extensively used.



QUALITY ACCREDITATION

because quality management must be appropriate to the type of product being produced. That for making nuclear containment vessels will be more stringent than that for plastic clothes peg manufacture.

NZS 5603 defines a very basic quality system suitable for use when a product's quality can be ascertained by final inspection.

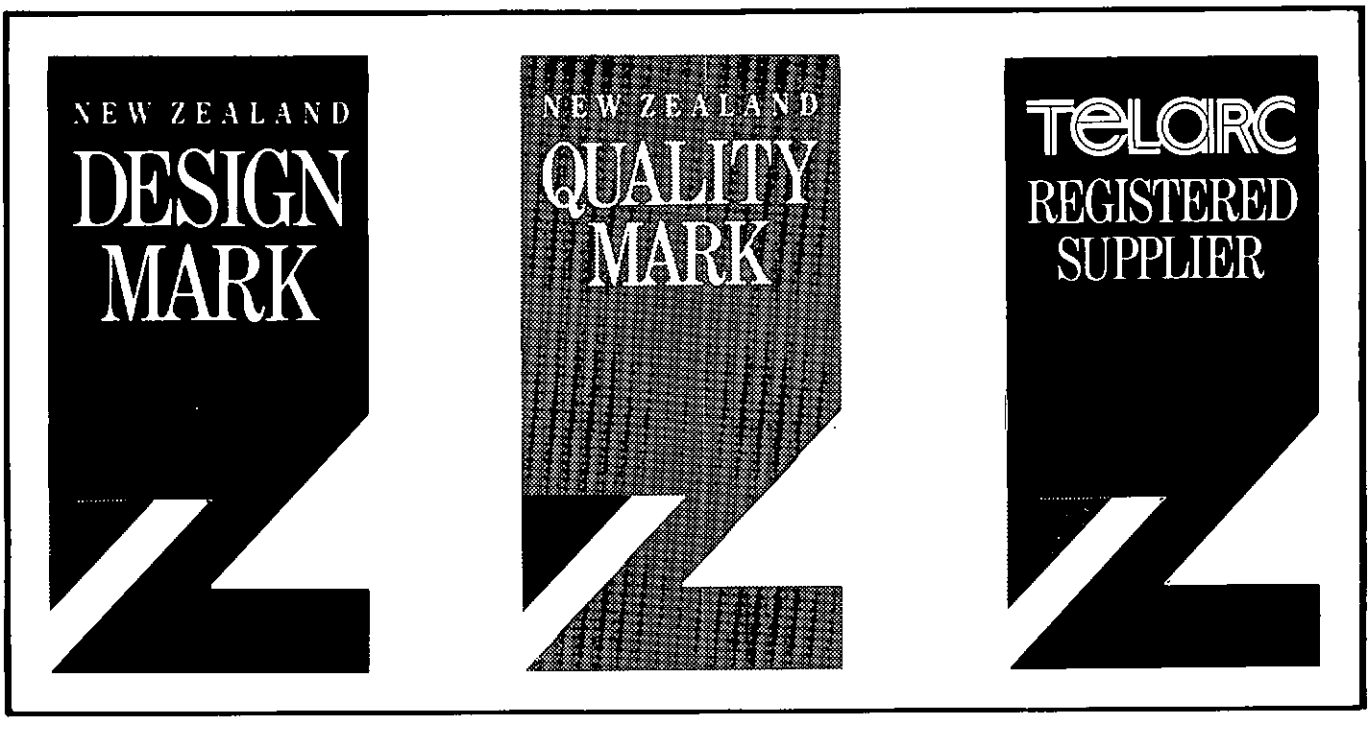
NZS 5603 defines a very basic quality system suitable for use when a product's quality can be ascertained by final inspection.

NZS 5602 builds on NZS 5603 and introduces additional requirements to ensure that defects are caught before they pass too far through the system. It also helps the manufacturer to do it right first time and to learn from mistakes that are made.

NZS 5601 builds upon NZS 5602 by extending the quality management systems into the design process. The intention is to ensure the product is correctly designed in the first place.

Most people would agree that all these quality system elements represent plain common sense. All that is required is a commitment from management to actually implement such procedures and some time and effort in developing the details and documenting them in a company quality manual. Once the company has developed and implemented its quality system it should start to gain considerable economic payback. Partly from reductions in scrap and rework etc but also from increased business from satisfied customers who bring their business back to the company. From that point of view quality systems represent one of the most powerful marketing tools.

But how does a company ensure that its current and potential customers know about the effectiveness of its new Quality management system? And more importantly, how do customers find out which suppliers of goods and services have installed quality systems? This is where TELARC New Zealand, the national quality system accreditation authority, enters the picture.



Most New Zealand companies will be comfortable operating their quality systems at the level NZS 5602. This standard sets requirements for:

- Management Responsibility
- Management Review
- Contract Review
- Document Control
- Purchasing
- Product Identification
- Process Control
- Inspection and Tasting
- Inspection and Test Equipment
- Inspection Status
- Control of Non-conforming Product
- Corrective Action
- Handling, Storage
- Packing and delivery
- Quality Audits
- Training
- Statistical Techniques

TELARC has a statutory role to independently audit companies quality management systems for compliance with standards such as the NZS 5600 series. A company can employ TELARC to independently audit its quality system. If the audit reveals problems then TELARC provides advice and help with any amendments that might be necessary. Once the company's quality system fully complies with the requirements of the the standard it is formally accredited by TELARC as a REGISTERED SUPPLIER. It is widely predicted that companies will not be able to do business unless they hold quality system accreditation. Customers will demand quality accreditation of their suppliers just as they now demand a credit rating of their customers.

For full details about the TELARC Registered Supplier programme contact:
The Manager, Quality Programmes,
TELARC New Zealand, Private Bag, Remuera, Auckland 5,
Phone (09)524-0962.

Condensed with permission from an article first published in DEMM magazine July 1989.

WHY QUALITY?

A definition of quality is complex. The aims of adopting a quality philosophy a multi-faceted. But the end results of such a commitment are obvious to both the company and its customers: consistently improving services and products.

Rohm & Haas Company, a leading supplier to the paint and coating industry for more than half a century, has adopted the philosophy of Dr. W. Edwards Deming and strongly believes that a quality initiative throughout all service levels of the organization will improve productivity and result in lower costs thereby providing greater value to the customer.

The philosophy of quality provides only a theoretical umbrella. The abstract must be transformed into measurable action. Quality teams have been established in each business segment and are being trained to analyse the many processes that lead from the purchase of raw material to the delivery of the final product.

The basic steps involved in such a study can be summarized as follows:

1. Select a process to be studied that needs attention.
2. Create a flow chart that details each step in the process.
3. Identify customer needs to ascertain what to study.
4. Study the problems that occur in the process.
5. Identify the causes of those problems.
6. Create a new process.
7. Implement and monitor this new process.

A scientific method involving statistical techniques is employed as the chief tool for measuring improvement. By reducing variation and waste in each process, progress is achieved toward fulfilling customer needs and expectations.

Quality improvement is a never-ending, always-evolving process in itself. Rohm and Haas will not be content with reaching an "acceptable" plateau.

Consistent quality in products and services demands adaptation to changing needs. One of the keys to the survival of business in today's global economy is remaining cost-effective in an environment that breeds an accelerated pace of change.

Remaining open to new ideas and changing requirements is a necessary ingredient to not only staying even with that pace, but anticipating coming events and reacting appropriately. New smaller business teams at Rohm & Haas are working more closely with customers to improve our knowledge of the marketplace.

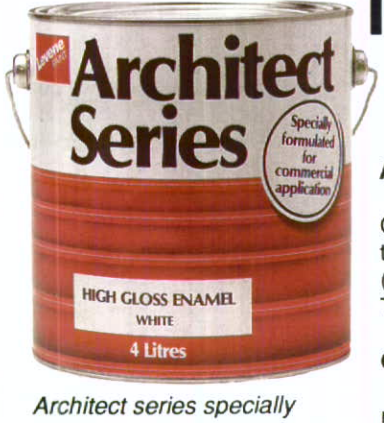
In the past, quality was characterized by a product's strict adherence to specifications. Now, it is an integral part of every process in our company.

Understanding quality means understanding and meeting customer requirements. This results in providing value to customers in the form of product performance and consistency, delivery reliability, technical service, leading edge process technology and price.

We are dedicating ourselves to provide an environment where each employee is encouraged to pursue quality improvement in every aspect of their work. Rohm & Haas is confident that this formidable challenge will produce a more responsive and innovative company, and congratulate LEVENE PAINTS on achieving "registered supplier status."

Elegance in exterior design.

ISO 9002 TO LEVENE PAINT



Architect series specially formulated for commercial application.

A diversity of products for a variety of surfaces.

Accreditation

LEVENES Auckland based paint manufacturing company Oregon Paint Co Ltd has gained registration to the International Standard for Quality Management Systems NZS 5602 (ISO 9002) for the production of their LEVENE DECORATIVE and LEVENE INDUSTRIAL paints.

Company Policy

The achievement of the accreditation by TELARC is the result of a commitment to quality in all aspects of the company's operations. This is best summed up in the company's policy statement:

It is the policy of this company to conduct quality control programmes in order to meet the requirements of the market place,

All quality assurance programmes shall be designed to enhance and perpetuate the name of the company within the industry as a supplier of reliable quality products,

All programmes shall stress defect prevention aspects of quality, with the emphasis on formulating quality into the products rather than inspecting the defects out,

Quality control programmes shall provide for product control through all stages of manufacture and supply.

Starting in the Laboratory,

The company's involvement with TELARC registration began in 1983 when the company achieved registration of its laboratory according to AS 1580 Test Methods (Standard methods of testing for paints and related materials). This represented a first for the paint industry in New Zealand and this was the first New Zealand paint company laboratory to achieve TELARC registration. Following this the company obtained recognition by the then PSPC (Public Sector Paints Committee) now administered by TELARC as PASS, (Paint ApprovalS Scheme).

TELARC REGISTERED SUPPLIER

N.Z.'s largest colour range. Goldline paint - the designers choice.

The years after 1983 represented a period of rapid growth for the company. Along with the growth came the problems normally associated with companies suddenly finding themselves supplying product all over the country. The solution to many of these growth problems came from a commitment to quality.

The formal commitment to quality started at the beginning of 1989 and in order to give focus to that commitment SANZ were approached to see if there was any New Zealand equivalent to BS 5770 (ISO 9002) which was being written about in the paint journals of the time. Thus LEVENES were one of the first companies to receive copies of NZS 5601, 5602, 5603 and 5604. The company decided that the quality systems embodied in NZS 5602 (ISO 9002) were what it needed to express its (then) new commitment to quality, ensuring defects do not occur during manufacture. (Refer also M. Bell on Quality accreditation).

The company registered its immediate interest in obtaining registration under NZS 5602. Personnel were engaged to assist in the task of developing the company policy and systems to achieve the target. This has culminated in the company obtaining registration in February 1990.

Another First for LEVENES

LEVENE paint is the first consumer product in New Zealand with national distribution of its products to obtain registration to NZS 5602 and obtain TELARC registered supplier status. Although overseas numerous companies are obtaining similar registrations under the appropriate national or international standards, it is believed that LEVENE paint is the first paint company in Australasia to attain this registration. The company believes that to be market leaders they must be prepared to break new ground. This is what they did in 1983 with their laboratory accreditation and what they have done again with their registration for Quality System Management under NZS 5602.

Levene industrial paints - performance and innovation.

The N.Z. INSTITUTE OF CHEMISTRY
The N.Z. BIOCHEMICAL SOCIETY
And The N.Z. SOCIETY OF PLANT PHYSIOLOGISTS

1990 CONFERENCE

Victoria University of Wellington
20-23 August

Chemistry - Resources and the Future

Mr JOHN MADDOX (editor of "Nature") will ensure a fascinating start to the Conference programme when he presents a general public lecture at 7.30 pm on Monday 20 August. Mr Maddox's position with the Science and Media communities puts him in a unique position to describe past, future and current scientific issues such as the spread of nuclear weapons, the energy crisis, global warming, the revolution in biology, superconductivity and room-temperature fusion.

The Organising Committee expects a large audience at this lecture, so be early to guarantee a seat.

Mr Maddox will also be participating in the panel discussion on Science Policy, and will present the closing address on Thursday 23 August entitled "Is Biology now a branch of Chemistry?"

PLENARY SPEAKERS

The Organising Committee has secured an unusually large number of exceptional Plenary Speakers, eminent in their own fields, whose contributions will be provocative and stimulating. The titles of their proposed talks are listed below:

TUESDAY 21 AUGUST

Dr G C Belton — Director, Central Research Laboratories, BHP, and Professor of extractive metallurgy, University of Newcastle, Australia
"The role of Research & Development in a Resource-based Industry"

Dr C Adam — Director, Institute of Industrial Technologies, CSIRO, Melbourne, Australia
"Industrial Research for the 21st Century"

Dr J P Devlin — Research Director, Boehringer Ingleheim Pharmaceuticals Inc, Ridgefield, USA
"The Chemist's Guide to Drug Discovery in Immune Regulation"

Mr R Gunston — Commercial Manager, New Zealand Refining Company, Whangarei, New Zealand
"Taking the New Zealand's Oil Refinery into the 1990's"

Dr B Walker — Chief Executive Officer, Ministry of Research Science & Technology, New Zealand

"The Role of the Ministry of Science & Technology in Science in New Zealand"

WEDNESDAY 22 AUGUST

Dr G Lorimer — Central Research & Development Department, EI du Pont de Nemours, Willmington, USA

"RubisCO - Protein for all Seasons"

Dr J Peacock — Chief, Division of Plant Industry, CSIRO, Canberra, Australia

"Prospects with Transgenic Plants"

Prof R J Ferrier — Professor of Organic Chemistry, Victoria University of Wellington, New Zealand

"Sweet Dreams and the Re-awakening of Sugar Chemistry"

Dr M Gravestock — Research Director, ICI Carbohydrate Group, UK

"Biological Effects of Small Carbohydrates"

THURSDAY 23 AUGUST

Mrs Helen Hughes — Parliamentary Commissioner for the Environment, Wellington, New Zealand

"Management of Environmental Issues"

Dr H L Rothbart — Director, North Atlantic Area, Agricultural Research Service, USDA, USA

"Long-range Planning for Agricultural Research in the USA"

Dr D Hodson — Senior Lecturer, Education Department, University of Auckland, New Zealand

"Science Fiction: - The Misrepresentation of Science in the Curriculum"

SPECIALIST SESSIONS

Mass Spectroscopy Workshop - Monday 20 August, 12.30 pm

A VG users' workshop will be held at Chemistry Division, DSIR. This will be a technical session discussing aspects of the Gracefield mass spectroscopy facility. New VG users are welcome to attend and an opportunity will be available for general discussions. This will be an informal workshop at no charge to participants. Details available from Dr L Porter, telephone 04 690-580.

Science Policy - Tuesday 21 August, 7.00 - 9.30 pm

By August, it will be timely to discuss and examine the effects of the recent dramatic changes to Science Administration in New Zealand, following the formation of the Ministry of Research, Science and Technology and the New Zealand Science Foundation.

Following an introductory talk by Dr Basil Walker, there will be a panel discussion on science policy in New Zealand, featuring John Maddox, Basil Walker, Simon Upton (Opposition Spokesman on Science) and Rick Christie (Chief Executive Officer of Cable Price Downer) representing international, Government, opposition and industrial viewpoints respectively. Written questions for the panel should be submitted in advance to the Conference Secretary.

Science Education Symposium - All day Thursday, 23 August

The model of science held by science educators and its significance for teaching practice will be discussed by plenary lecturer, Dr Derek Hodson, Auckland University. This all-day symposium will include specialist sessions on the new form 1-5 science syllabus, equity issues, recent developments in first-year tertiary chemistry, chemistry and industry cooperation and the use of computers in chemistry.

Specialist Sessions:

Analytical Chemistry and Chromatography

Analytical and Chromatography sessions will include the broad spectrum of work in these disciplines. Particular emphasis will be given to practical techniques, presented in the usual specialist sessions or as posters. Papers and posters should, in general, be of value to the practising chromatographer or analyst, although discussions on novel techniques, applications or instrumentation are welcome. Work which discusses industrial situations is particularly encouraged.

Biochemistry and Plant Physiology

Biochemistry and Plant Physiology Programmes will feature the usual programme of submitted papers from a wide range of research programmes and these will be presented either orally, during the specialist sessions, or as posters. In addition, a joint symposium is to follow the Biochemistry/Plant Physiology plenary session. A major focus in the symposium will be on the use of molecular biology in solving physiological and biochemical problems related to plant production. Included in one of these sessions will be the annual Watson Victor Lecture, presented by this year's winner of the Watson Victor Award for Biochemistry.

Carbohydrate and Organic Chemistry

The Carbohydrate Symposium will highlight both bioactive compounds derived from or related to monosaccharides, and commercially relevant polysaccharides.

Health and Environmental Chemistry

The specialist symposium on chemistry related to Health and Environment welcomes any relevant contributions but is particularly seeking contributions on the following topics:

* Analytical chemistry in chemical toxicology and occupational hygiene
* Hazardous chemicals, waste materials and their management
* Trace contamination in natural systems
* Chemistry of the Antarctic environment

These topics are of importance to the protection of people in their workplace, monitoring and protection of the environment, and the analytical armoury of the environmental chemists. Several 'keynote' speakers will be arranged for the symposium.

Inorganic and Physical Chemistry:

Following on from the successful inorganic seminar which was held in Wellington in February 1990, a specialist session will be organised for any contributors in the inorganic/physical field if such contributions are received.

Mass spectroscopy and NMR spectroscopy:

The mass spectroscopy specialist session is entitled "Current Developments in Mass Spectroscopy in New Zealand", and will include invited papers from the major mass spectroscopy facilities in DSIR, MAF, FRI and the Universities. A concurrent mini-symposium entitled "New Dimensions in NMR" will feature guest speakers from DSIR and the Universities, and may include a demonstration of remote interaction between the VUW terminal and Chemistry Division, Gracefield. Both sessions are scheduled for Tuesday 21 August.

Geochemistry and Industrial Chemistry:

A symposium on geochemistry and industrial chemistry will be held, which will include keynote speakers. Papers are invited on all aspects of these disciplines, including those relating to the characterization and the current and potential utilization of New Zealand's chemical/geochemical resources. Other topics which will be covered include current and potential industrial processes, research and development, quality control and financial and business management in the chemical/geochemical industry.

Women in Chemical Sciences:

This will be an opportunity for women Conference participants to meet and to hear from Dr Irene Irvine, CSIRO about the Women in Chemistry Network, Victoria, Australia. Comment will be sought on topics including the encouragement of women into chemistry and other sciences, the visibility of women working in these fields and factors affecting career advancement.

REGISTRATION FORM
NZIC-NZBS-NZSPP
1990 CONFERENCE

Victoria University of Wellington

20-23 AUGUST 1990

Complete this form and return to:
Dr Neville Tapp
1990 Conference Secretary
C/- Chemistry Division, DSIR
Private Bag, PETONE

REGISTRATION DETAILS

Title (Dr, Prof, etc)_____

SURNAME:_____

First Name:_____

Address:_____

_____

_____

_____

Telephone:_____

I am/am not presenting a paper

Oral ☐ Poster ☐

Deadline for Abstracts is now 1 JUNE

I am/am not attending the Monday Evening Programme (no charge)

I am/am not attending the Monday Mass Spectroscopy Workshop
(delete as applicable)

OFFICE USE ONLY
Official Receipt

Tax Invoice
GST No. 51 861 957

Fees Received
Conference $_____
Conference Dinner $_____
Accommodation $_____
(all GST inclusive)
Total $_____

*With Thanks*_____

Date Received:_____

Reg. No. _____

Abstract Received:_____

FULL REGISTRATION FEES (all GST inclusive)

NZIC/NZBS/NZSPP	Before 1 June	After 1 June
Member	$180	$230
Non-Member	$220	$270
Student	$50	$50

Full Registration Fee $_____

DAILY REGISTRATION FEES

		Before 1 June	After 1 June
TUES ☐	Member	$90	$115
WED ☐	Non-Member	$110	$135
THURS ☐	Student	$25	$25

Daily Registration Fee $_____

SCIENCE EDUCATION SYMPOSIUM
No charge for full registrants
Other registrants: $25 (GST inclusive)

Science Education Symposium Fee $_____

CONFERENCE DINNER *(must be pre-paid)*

Indicate number of tickets required (GST inclusive)

☐ @ $45 (includes transport, admission to Southward's Car Museum, all drinks & entertainment)

Fees $_____

HOSTEL ACCOMMODATION

Number of Persons ☐

I am prepared to share a room ☐ with_____

Cost per head per night (GST inclusive)

	B & B	Full Board
Single Room	$35	$45
Share Room	$25	$35

	B & B	Full Board
MON		
TUES		
WED		
THURS		

Total accommodation fees $_____

I will be arranging my own accommodation ☐

TOTAL FEES REMITTED $_____

Enclose payment, make cheques payable to:
"NZIC 1990 CONFERENCE"

Signed_____

Student Paper Competition:

The customary Student Oral Paper Competition will be held for the Institute Prize, which will be presented by John Maddox at the closing ceremony on Thursday 23rd. The student papers will be of 15 minutes duration with 5 minutes for questions.
The Conference Committee will also award a prize of $50 for the best poster presented by a student. No special entries are needed for the poster competition - all posters where the presenting author is identified as a student registered for any degree will be considered.

SOCIAL PROGRAMME
Monday evening 8.30 pm Trades Mixer with a light supper (no charge).

Wednesday evening - Conference Dinner
This is the major social event of the Conference and an evening of unique entertainment has been organised to complement the banquet. Coaches will be provided to transport guests to the Southward Motor Museum, 60 km north of Wellington. The Museum houses the most extensive collection of antique vehicles in the southern hemisphere, and time will be taken for a stroll around before pre-dinner drinks. After-dinner entertainment has been arranged in the Museum's Concert Hall. The ticket price of $45 includes transport, entrance to the Car Museum, all drinks, entertainment and GST.

GENERAL INFORMATION

Registration: Substantial discounts will apply to all registrations received before 1 June 1990. Single day and student registrations are also offered. The registration desk will be open from 2 pm on Monday 20 August in the foyer, McLauren Lecture Block, Victoria University, (signposted from Kelburn Parade). The registration desk will remain open at all times during the week. Pre-Conference enquiries should be made to the Conference Secretary, Dr N J Tapp, c/- Chemistry Division, DSIR, Private Bag, Petone.

NZIC Annual General Meeting

The NZIC AGM will be held at 6.30 - 7.00 pm on Monday 20 August. A full attendance is requested, to receive and discuss the Annual Report. As Officers have already been elected, there should be no concern about being 'roped' on to the Committee.

Trades Display: The Trades Display will be, as always, an extremely important feature of the Conference. This will be an excellent opportunity for you to view the latest in instrumentation, computers, equipment, and the chemical literature. Coffee and tea (kindly sponsored by Cafe Bar) will be available at all times in the Trades Display area.

Accommodation: Excellent single and shared room accommodation has been reserved in the Student Hostels, Victoria House and Weir House, a short walk from the lecture theatres. The accommodation will be filled on a first-come basis and is available as full board (3 meals daily) or bed and breakfast only. Accommodation charges are calculated from the first to last item (meal or bed) required. Please indicate on the registration form the first and last days of accommodation required. It is essential that accommodation numbers be known two weeks before the start of the Conference. Delegates registering after that time cannot be guaranteed accommodation in the Halls of Residence. Late cancellations notified after Wednesday 15 August will not be refundable. Would those

delegates choosing to share a room, please advise on the registration form the name of the person you wish to share with, if you have a preference.

For those preferring to arrange their own accommodation, a list of motels is available on request to the Conference Secretary.

Casual Meals: Casual Meals will be available at the University Staff Club or the Gymnasium Cafeteria adjacent to the Lecture Halls for registrants not accommodated on full board. Those on full board will take all their meals in the Halls of Residence dining rooms.

CONTRIBUTED PAPERS

Note the new deadline for Abstracts is 1 June 1990. A book of Abstracts will be produced and supplied to all participants upon registration. Most NZIC NZBS and NZSPP specialist groups have arranged programmes including invited keynote lectures. As a result, there will be only a limited number of time slots left for oral presentations. The Committee, therefore, encourage you to submit a paper for poster presentation. The final decision about oral or poster presentation will be made by the Section Organiser. However, all attempts will be made to schedule oral presentations where these are preferred. Again, early registration gives more degrees of freedom. Oral presentations will be of 15 minutes with 5 minutes for questions. Overhead and slide projectors will be provided. For posters, the board area is 80 cm wide by 120 cm high. The name of the presenter should be asterisked on the poster; photographs of authors are very helpful.

INSTRUCTIONS FOR ABSTRACTS

The ORIGINAL and ONE copy are required.

1. Abstracts must be typed in camera-ready form within an area of maximum width 160 mm and depth 180 mm on A4 paper. Please ensure that the Abstract is free of typographical and grammatical errors and of good quality for reproduction. Dot matrix imaging is not suitable.
2. Title - to be in upper case.
3. Authors - lower case except for first letters and initials. Place an asterisk after the author who will present the paper or poster.
4. Affiliation - lower case starting with the affiliation of the presenting author followed by the other authors.
5. Text - this should be as informative as possible and should contain relevant information or methods and results. Conclusions drawn should be clearly outlined. Statements such "as the results will be discussed" should be avoided. **DO NOT** indent. Leave one line space between paragraphs.
6. Acknowledgements - if necessary, to appear one space below the text.
7. References - in the text the citation should be numerical in order of use. References to be listed, no heading, one space below the text (or Acknowledgements) and given in numerical order, citing the authors, the year of publication, the title of the journal, volume number and the first page number. References to books should also contain the year and place of publication, and the publishers.

8. The Conference Committee reserves the right to make the final selection of papers in accordance with the requirements of the Programme. Unless asked to the contrary, any oral presentation that cannot be given a time slot will be slotted into the poster session and the authors notified as soon as possible.

Do not fold Abstract - mail it flat.

Send Abstracts by 1 June to:

Dr Neville Tapp
NZIC/NZBS/NZSPP Conference Secretary
C/- Chemistry Division
DSIR
Private Bag
PETONE

for professional advice, research, investigations and consulting services

discuss your project with

Industrial Processing

Our team of highly qualified chemists, professional engineers and scientists can answer your problems - solve your headaches - confidentially and efficiently - in the fields of

* chemical manufacturing and process engineering
* biochemical processes and food technology
* selection and evaluation of materials for performance and corrosion resistance
* waste management and utilisation
* chemical process development and process audits

Call our receptionist on (04) 690-788
or fax (04) 690-132

DSIR Industrial Processing are pleased to support the 1990 Conference and invite participants to visit their display in the Trade Exhibition.

David R. Levene Chairman of Levene and company and a Director of Oregon Paints Ltd

Customer Confidence

The advantage to the customer of TELARC registration is an endorsement of a product such as LEVENE PAINT.

This is very important to large organisations such as the Government Supply Brokerage Corporation of New Zealand (GSB) and City Councils where large amounts of material are purchased annually and they need to be sure that the product they are getting is consistent. Thus with TELARC registration LEVENES are able to offer greater confidence to their customers and this has meant immediate success in obtaining supply contracts for supply of paint to such organisations as the GSB and Housing Corporation. Clearly the confidence given to large users of paint will also come through to the individual consumer. Both will be able to have confidence that the LEVENE Paint they buy is as good and as consistent as any available.

An Onward Trend

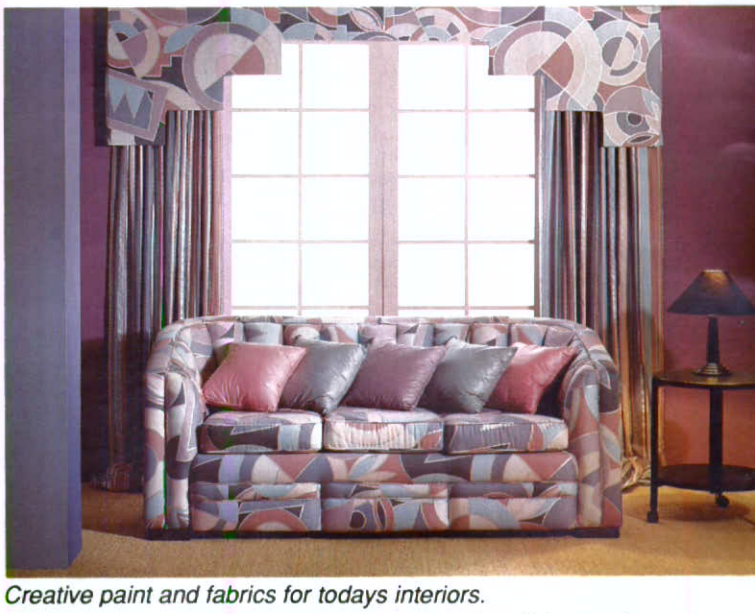
This demand for confidence is part of an ongoing trend world wide. To quote from an article in JOCCA 1988 (Journal of Colour Chemists Association) "It will soon become necessary for every supplier to be registered and it will ultimately be more or less obligatory to upgrade manufacturers' quality systems to ISO 9002." Clearly this is starting to happen in New Zealand.

Selection made easy - colour co-ordinated wallpaper and paint panels.

Team Effort

Discussions with Mr Kevin Blitz Managing Director of Oregon Paints indicated the total involvement of the company in the commitment to Quality Systems Management. There has to be a team effort. The commitment must be there from top to bottom of the company.

The management of the company must commit themselves to the concept of quality systems management but that commitment must be taken up by staff at all levels.



Creative paint and fabrics for todays interiors.

Kevin is very quick to point to the way all staff have taken on the challenge to implement the quality systems management approach and to stress that they have all played their part.

The discipline needed to operate the quality systems management shows itself in all parts of the company's operations in a variety of ways. Tidy workplace, clear signage, clearly defined operating procedures and areas of responsibility. These factors make for a happier and healthier work place even though the effort needed to implement them at first make them seem difficult to achieve.

The Levene Image

1. To install a Quality Management System Capable of meeting NZS 5602 (ISO 9002) and to obtain Registered Supplier Status.
2. To gain recognition as market leader with respect to quality.
3. To be identified by the Surface coatings industry in New Zealand as the leader in respect of quality standards and manufacturing disciplines.
4. To be perceived by all Do-It-Yourselfer's, Commercial Applicators and Industrial users of surface coatings, as suppliers and producers of quality and reliable products and services.
5. To provide to the market, a range of consumer products that fully conform to the requirements of an internationally recognised Quality Standard.
6. To enhance the LEVENE image.

The company has maintained a high level of professional involvement as a part of the commitment to the industry. The company is a member of:

Paint Approvals Scheme (PASS)
Coating Research Group Inc, Ohio (CRGI)
NZ Chemical Industry Council (NZCIC)
Paint Manufacturers Federation
Building Owners Management Association (BOMA)
Standards Association of New Zealand (SANZ)
Building Research Association of New Zealand (BRANZ)

Its staff are members of various organisations:
Oil and Colour Chemists Assoc.
NZ Organisation for Quality Assurance.
Australasian Corrosion Assoc.
NZ Institute of Chemistry
Royal Society of Chemistry

LEVENE EXTREME Wairau Park.
Group Stores, top branch award for 1989.

The procedures used to achieve the objectives sound deceptively simple.

1. To assign the responsibility and authority for the investigation, installation and maintenance of the project.
2. To collate all available information and to compile the company Quality Manual.
3. To simultaneously undertake an in-depth work methods study and improvement programme on all the operations within the company.
4. To implement systems that meet the requirements of the Quality Standard.
5. To have the company Quality Management System assessed by an independent body, (in this case TELARC).
6. To maintain its Quality Management Systems and subject them to continuous internal and external audit.

Confidence

The implementation of the systems has had a major impact on the confidence that the customers are able to place in the products. The LEVENES retail division has already noted the improved quality and the message has started to reach the shop counter where now LEVENES manufactured paints are offered to the customer as a preferred product. This has also been noted not only in LEVENES chain of 42 stores but also by independent stockists of LEVENE PAINT.

The company is now able to embark on a programme to market and sell both quality service and quality products. It will allow the company to search for an increased market share and new market opportunities with the confidence that it will be able to deliver. This will be greatly enhanced by the company's status as a Registered Supplier.

Registered Supplier status is also becoming a tender prerequisite or condition of more and more contracts. Thus LEVENES PAINT will be in "the best position" to tender and take advantages of the expected increase in the opportunities on offer.

Participation of the products in the PASS scheme has been optimised to the point where LEVENES has products approved in each available category.

Global Identity

Emphasis is being placed on the ISO 9000 series of standards in all parts of the world giving LEVENES a global identity. NZS 5602 is equivalent to ISO 9002. TELARC registration has given LEVENES the opportunity to expand its base of licensing agreements for a wider range of products with principals in other parts of the world.

Pay back

Implementation of the NZS 5602 Quality Systems Management scheme and the TELARC registration have required considerable direct and indirect costs during the implementation period. The advantage of this type of investment is that the benefits start almost immediately. Direct investment in the Quality Systems Management scheme started in early 1989 and by early 1990 significant improvements in the companies operations have been apparent. Financial savings and productivity are improving.

The first but hardest improvement to quantify is the improvement in morale of the work force. The increased levels of confidence in their product and the clear definitions of work methods and responsibilities has meant a work force who are more satisfied in their jobs. Staff morale has improved despite a New Zealand market that is confused and declining.

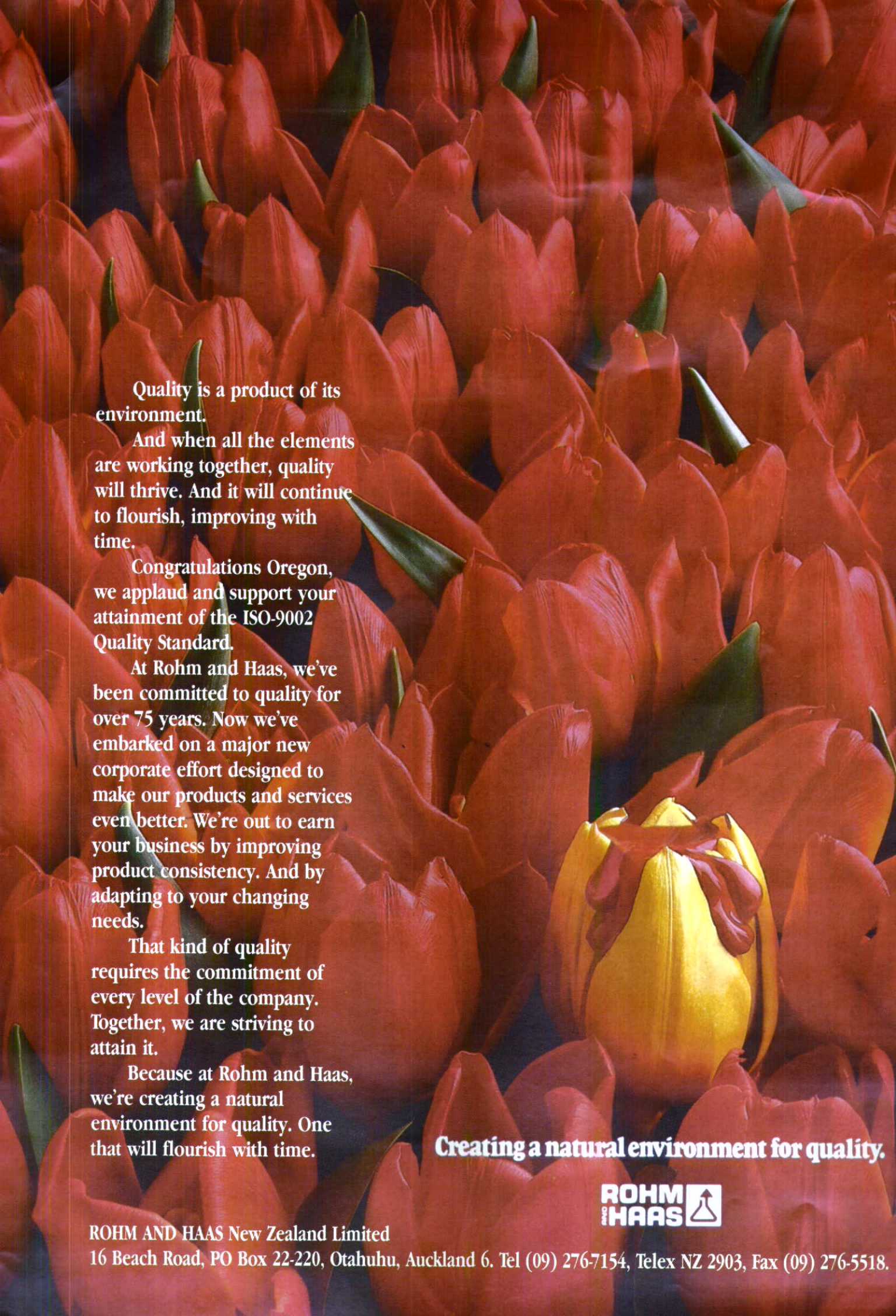
Retail and Trade Customers,

Since the introduction of the Quality Management Systems scheme, the Technical Department and LEVENE RETAIL stores have been able to report a noticeable reduction in the need for after sales service.

The improvement in efficiency has allowed a serious development programme to be contemplated which should place the company in a good strategic position with respect to future changes in technology.

Clearly all these can be covered by one word and that is productivity. The Commitment to Quality Systems Management has resulted not only in improvements to the customer but also in improved productivity in the factory and BETTER PAINT. In these difficult times and with so many New Zealand companies finding themselves under severe pressure from overseas products increased productivity is the only way to survive. What at first may have sounded like a publicity gimmick is in fact a vital step in developing LEVENES, a New Zealand company, to a position from which it can compete successfully in terms of productivity, quality and reliability.

Futuristic exploitation of interiors.



Quality is a product of its environment.

And when all the elements are working together, quality will thrive. And it will continue to flourish, improving with time.

Congratulations Oregon, we applaud and support your attainment of the ISO-9002 Quality Standard.

At Rohm and Haas, we've been committed to quality for over 75 years. Now we've embarked on a major new corporate effort designed to make our products and services even better. We're out to earn your business by improving product consistency. And by adapting to your changing needs.

That kind of quality requires the commitment of every level of the company. Together, we are striving to attain it.

Because at Rohm and Haas, we're creating a natural environment for quality. One that will flourish with time.

Creating a natural environment for quality.

ROHM AND HAAS

ROHM AND HAAS New Zealand Limited
16 Beach Road, PO Box 22-220, Otahuhu, Auckland 6. Tel (09) 276-7154, Telex NZ 2903, Fax (09) 276-5518.

SANZ Quality Assured Supplier Scheme

The Standards Association of New Zealand's mark of quality achievement is reserved for those companies that can demonstrate professional standards in their quality management systems.

These are the models for success — the New Zealand Standards for Quality Assurance.

— NZS 5601 Quality systems — Model for quality assurance in design/development, production, installation, and servicing.

— NZS 5602 Quality systems — Model for quality assurance in production and installation.

— NZS 5603 Quality systems — Model for quality assurance in final inspection and test.

This series of Standards forms systems based upon the experience and consensus views of internationally successful companies and organizations. The Standards create models for systems, suitable for matching and tailoring to practically every supplier situation — a quality for any occasion.

The benefits of being a quality assured supplier include:-

— International acceptance of quality performance.

— Recognition enhances market image.

— Effective quality management systems help to maximize profits by reducing wasted effort and materials.

— Credibility — the company will be better accepted by national and international buyers as one with a commitment to produce to quality standards — backed up by NZS national Standards organization, SANZ.

— Reduction in the incidence of failure and the potential for legal liability.

— Ongoing practical working relationship with the QAS team, working to make sure the quality stays right!

— Listing in the SANZ Buyer's Guide available for reference to major purchasers in New Zealand, Australia and other overseas countries.

In the Quality Assured Supplier scheme, SANZ looks for:-

1. That the supplier's system for the control of product, process and service is designed and implemented so that the achievement of quality objectives can be demonstrated — the applicable New Zealand Standards for quality systems are used as a basis for approval:

Other acceptable and equivalent Standards may be used by arrangement.

2. That the supplier recognizes the need for compliance with applicable statutory codes and regulations, and has adopted professional Standards applicable to products, processes, and services. These Standards may for example be acceptable international or national Standards, other authoritative specifications or company specifications.

SANZ will assign a qualified quality management systems assessor to examine the supplier's documented quality system and to make a pre-assessment visit to the supplier. If the supplier's systems are considered sufficiently developed then arrangements for the audit are made.

A team, normally of at least two assessors, will visit and audit the quality situation and, depending upon the findings, will advise the need for improvement or corrective action.

An efficient quality system should pay back initial costs and more through increased profitability. SANZ fees are applied at logical stages during the evaluation. Following approval, an annual fee will cover its maintenance.

Through a continuous visit programme the QAS team ensures that the Quality Assured Supplier receives at least 3 routine audits per year.

The 'S' Mark for a specific product may be obtained as either an alternative or supplement to the SANZ Quality Assured Supplier approval.

For further information contact the Standards Association of New Zealand, 6th Floor, Wellington Trade Centre, 181-187 Victoria St, Wellington 1. (Private Bag, Wellington) Telex NZ3850, Telephone (04) 842-108, Fax (04) 843-938.

QUALITY, QUALITY...

We hear about Quality here, Quality there, Quality this, Quality that, about "Quality products", "Quality processes". Referring to quality has become popular, confusing, and hense meaningless — or perhaps not?

Quality only takes on a meaning, if it is defined. There is no such thing as absolute "quality", nor do the attributes "high" or "low" illuminate us. Satisfactory quality exists only with regard to the user, the consumer, or the client. No chemist would, e.g., use an ultrapure solvent, if one of "General Purpose" grade were satisfactory, but would consider the quality of the same solvent as inappropriate for chromatography.

The same need for precise definition applies to the terms describing the *dealing* with quality. Often Quality Control, Quality Assurance, or even Quality Management are interchanged wrongly. I could spell out some definitions, but an evolutionary account is probably eliminated.

Only about two decades ago the emphasis was on QUALITY CONTROL. The basic idea was to control quality by checking the results of operations. Products not up to "specification" were eliminated.

Soon it was realised that reliance on Quality Control alone was a wasteful way of achieving desired quality. It became clear that, rather than checking quality at the end of a process, it was preferable to devise measures ensuring the desired outcome. These measures, coordinated in an appropriate system, became the basis for QUALITY ASSURANCE. Quality Control operations still had their place, but became less important.

While in the early stages Management believed it could abdicate the role of looking after quality to so-called Quality Controllers (they still appear in recruiting ads!), some involvement by Management in building Quality Systems for Quality Assurance became essential. The appointment of Quality Assurance Managers, as an isolated measure, soon turned out to be inadequate, because of the proverbial chain being only as strong as its weakest link. It was realised that the management of quality, to be effective, had to pervade the entire organisation. Quality professionals increasingly talked about QUALITY MANAGEMENT.

The Japanese led the way to the next stage, QUALITY IMPROVEMENT. They rightly argued that we are not living in a stable world. Science and technology are progressing, customer demands are rising, and the competitors are not asleep. There is not such thing as a perfect Quality System. Continuous improvement is essential.

No wider concept invalidates the narrower ones. There is only an increasing shift of emphasis towards top management, and rightly so, because the management of quality is easiest from the top. It is very gratifying to see a whole issue of CHEMISTRY IN NEW ZEALAND devoted to quality and to the variety of ways of dealing with it.

Wolfgang Passl
Ph.D., M.Pharm., NZOQA, NZIC,
Quality Management Coordinator Chemistry Division, DSIR.

MARIHUANA COMES TO THE SOUTH PACIFIC

SUBRAMANIAM SOTHEESWARAN, SCHOOL OF PURE AND APPLIED SCIENCES, UNIVERSITY OF THE SOUTH PACIFIC, SUVA, FIJI.

The names, Marijuana, Marihuana, Ganja and Indian Hemp, all refer to the same plant, **Cannabis sativa,** belonging to the family Cannabinaceae. Hashish and cannabis are Hemp preparations. To date the major marihuana growing areas in the world have been Africa, South America, Pakistan and Thailand. In Thailand marihuana is grown legally and is classified as a medicinal plant[1]. Traditional use in Thailand is reported to be as a sedative. Marihuana is also claimed[1] to be useful in the treatment of dyspepsia with painful symptoms, cancers, ulcers, migraine, neuralgia and rheumatism[2].

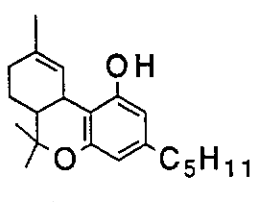
Marihuana is classified as an illegal drug in many western countries. People taking marihuana become addicted to it and invariably take to crime. The marihuana addicts in the U.S.A. alone number currently over 20 million. One in four of the users consume marihuana on a daily or near daily basis. The South Pacific was generally thought to be free from marihuana addiction. The situation has dramatically changed within the last seven years. Several marihuana cultivations have been discovered. During the period 1980-1987, 291 persons have been charged[3] and convicted of either growing or being in possession of marihuana in Fiji. 2571 marihuana plants and about 5 kg of dried marihuana leaves have been seized by the Fiji police[3]. As in many cases only a few of those involved in marihuana growing and trafficking have been caught. The buyers are mostly tourists, visiting yachtsmen and sailors of foreign vessels. Unless steps are taken to stop the cultivation and trafficking of marihuana the South Pacific will be turned into a nation of addicts.

A decade ago street samples of marihuana rarely contained one percent Δ^9 tetrahydrocannabinal (THC) which was thought to be the psychoactive substance in the marihuana extract. Today's potent new varieties average above four percent THC with some exceeding ten percent. THC is just one of the many organic compounds found in the marihuana extracts. The biological activity and the ill effects of marihuana are due to these many organic compounds.

CHEMISTRY OF MARIHUANA EXTRACTS:

Several compounds containing a new backbone were isolated from the extracts of marihuana. A new class of organic compound emerged and was called cannabinoid after the botanical name for the plant. These compounds have been referred to as cannabinoids and they could be classified as follows:

1. **Tetrahydrocannabinol type:** e.g. Δ^9 Tetrahydrocanabinol[4] (THC) (1) and **[8]THC(2)5.**
2. **Cannabinol type:** e.g. cannabinol[5] **(3),** cannabinolic acid[6]**(4),** cannabivarin[7]**(5).**



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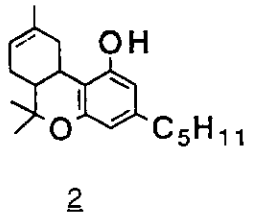

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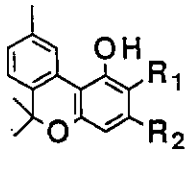
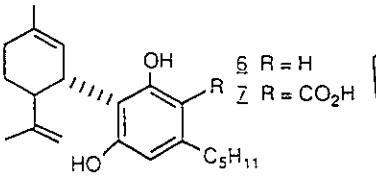


3 R_1= H, R_2= C_5H_{11}

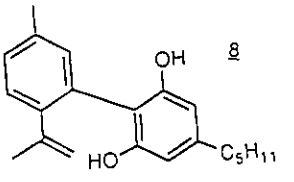
4 R_1= CO_2H, R_2 = C_5H_{11}

5 R_1= H, R_2= C_3H_7

3. **Cannabidiol type:** e.g. cannabidiol[6]**(6),** cannabidiolic acid[6]**(7).**
4. **Cannabinodiol type:** e.g. cannabinodiol [8]**(8).**



6 R = H
7 R = CO_2H



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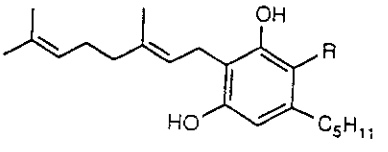
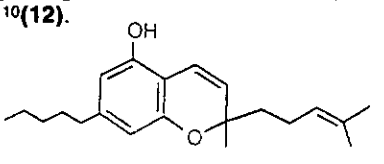
5. **Cannabigerol type:** e.g. cannabigerol[6]**(9)** and cannabigerolic acid[6]**(10).**



9 R = H
10 R = CO_2H

6. **Cannabichromene type:** e.g. cannabichromene[9]**(11)** and cannabichromenic acid [10]**(12).**



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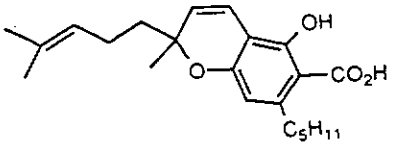

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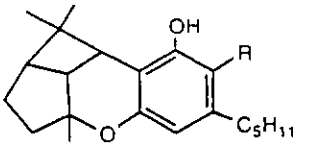
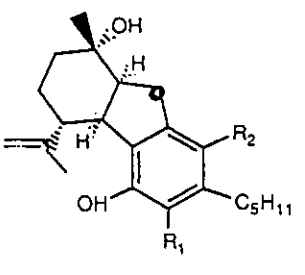
7. **Cannabicyclol type:** e.g. cannabicyclol[11]**(13)** and cannabicyclolic acid[12]**(14).**
8. **Cannabielsoin type:** e.g. cannabielsoic acids **A** and **B**[13] **(15 & 16).**



13 R = H

14 R=CO_2H

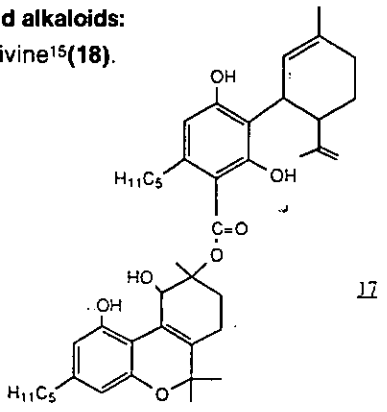


15 R_1 = CO_2H, R_2 = H

16 R_1=H, R_2=CO_2H

9. **Cannabinoid ester:** e.g. ester of cannabidiolic acid and tetrahydrocannabitriol [14]**(17).**

10. **Cannabinoid alkaloids:**
e.g. cannabisativine[15] **(18)**.



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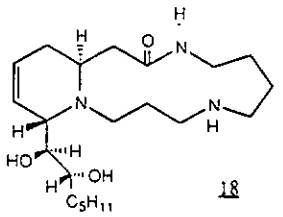

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Apart from the cannabinoids, several common natural products such as: hordenine, muscarin, trigonelline, neurine, choline, betaine have been characterised[1] in the extracts of marihuana. Marihuana extracts also contained amino acids, proteins, enzymes, sugars, steroids, terpenoids, phenols, flavonoid glycosides and vitamins.

PHARMACOLOGICAL ACTIVITY

Ancient Asian traditional medicines included cannabis preparations. Reports indicate that Cannabis extracts have been used for the treatment of several problems, including insomnia, pain, anxiety and tension. Recent research [16,17] shows that cannabis extracts could aid individuals with glaucoma, asthma, nausea and vomiting from cancer therapy and those with epileptic seizures. It has also been established that administration of cannabis results in mild degrees of dependence, both psychological and physical. Marihuana ingestion results in a temporary increase in heart rate and blood pressure. Marihuana addicts with hypertension or cerebrovascular disease should consider continued ingestion of the drug as a definite threat to their lives. Marihuana smokers usually have red eyes which results from the vasodilation of blood vessels.

Marihuana use decreases hand steadiness and increases body sway while standing erect. Marihuana intoxication, therefore, impairs driving skills[18]. Experiments showed that marihuana users had slow glare recovery time after driving into headlights at night. Marihuana smoke has many harmful effects on the respiratory system. The Δ^9THC present in the marihuana smoke has the ability to localise in the body fat, particularly in the brain, liver and the lung. These tissues are likely to undergo damage[19] with prolonged marihuana smoking. The residuals of marihuana smoke also contains carcinogenic substances which are related to malignant cellular changes of the lung tissue.

Administration of large doses of Δ^9THC to experimental animals has revealed that Δ^9THC can cause birth defects. Marihuana intake is known to alter the perception of sight, sound and touch. Palsson et al[21] has reported that heavy users of marihuana enter into a schizophrenic like state and become aggressive and confused. Heavy marihuana use, in contrast to the claims of some marihuana smokers, is also associated[20] with poor academic performance and motivation. In one experiment human volunteers were given sizeable doses of Δ^9THC or marihuana extracts. A transient rise in epinephrine excretion was observed and the volunteers[22] experienced a pronounced euphoriant and sedative effect. In another experiment[23] high oral doses of marihuana extracts showed significant impairment of the serial coordination of cognitive operations and resulted in disintegration of sequential thoughts which may be due to the impairment of immediate memory.

Most of the pharmacological studies have been on Δ^9THC and/or the marihuana extracts. The cumulative effect of marihuana smoking on humans is still not clear. In many countries the people most affected are the young ones. The cumulative effect of ingesting marihuana will only be known in ten or twenty years time.

The countries of the South Pacific, more notably Fiji, have taken the proper stand against marihuana growers and traffickers. It is absolutely essential that the youngsters of today are educated about the ill effects of marihuana ingestion.

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About the Author

Professor Sotheeswaran obtained his Ph. D (1967) and D.Sc (1987) degrees from the University of Hull, England. He is currently attached to the University of the South Pacific, Fiji where he holds a personal chair in Organic Chemistry. Professor Sotheeswaran's current research interests include the Chemistry and Biochemistry of Organic Natural Products.

OBITUARY

PETER BERNARD DAVID de la MARE

Peter de la Mare was born in Hamilton and was educated at Hamilton High School (1932-37) and thereafter, as a holder of a University Junior Scholarship, at Victoria University College where he graduated B.Sc. in 1940 and M.Sc. with First Class Honours in 1941. While at Victoria he won a Senior Scholarship in Chemistry and a Shirtcliffe Fellowship. During World War II he worked for 4 years as an agricultural chemist with F.B. Shorland at the Fats Research Laboratory of the N.Z. Department of Agriculture.

In 1946 with the resumption of peace he joined C.K. Ingold's group at University College, London, where he received his Ph.D. and was awarded the Ramsay Memorial Medal and Prize in 1948. In the same year he was appinted to the academic staff of University College where he held successive posts as Assistant Lecturer, lecturer, and Reader, and gained his D.Sc. in 1955, before moving to Bedford College in 1960 as Professor of Chemistry and Head of Department. In 1967 he was appointed professor of Chemistry and Head of Department at the University of Auckland. He arrived at a time when there had been a considerable expansion of staff and the Department was about to move into a spacious new building. Already recognised internationally as an expert in the general field of organic reaction mechanisms, he provided an academic stimulus and leadership in this fertile setting not hitherto experienced by the Department. During his Headship which lasted until 1980 when he stood down, international recognition of the Department continued to grow not only as a result of his own work but also of that of his academic colleagues whom he never ceased to support.

As one who sought recognisable and ordered patterns in his research he made inportant contributions to the administration of the Department setting up an organisational system which has stood the test of time. He was Chairman of the Auckland Branch of the N.Z.I.C. in 1969. The price of his departure from the UK was probably an FRS but he was not a seeker of awards and his international standing was quickly recognised by the Royal Society of New Zealand by his election to Fellowship in 1970 and the award of its premier research prize, the Hector Medal, in 1985.

He took early retirement in 1981 but remained active within the Department as Emeritus Professor and Chairman of the organising committee of the 7th IUPAC symposium on physical organic chemistry held at Auckland in 1984. He retired to a beach house at Kutarere and then to Opotiki where he died suddenly of a heart attack on 13th December, 1989.

In the area of physical organic chemistry Peter de la Mare made important contributions to studies on electrophilic aromatic substitution, additions to unsaturated compounds, elimination reactions, nucleophilic replacements, and anionotropic and prototropoic rearrangements. He published 189 scientific papers and review articles. In 1950, 1953, and 1957 he contributed sections of the Annual Reports of the Chemical Society, a section on the mechanisms of chemical reactions to Encyclopaedia Britannica (15th ed., 1974), and was co-editor of two volumes of "Progress in Stereochemistry" (1958 and 1963). He was the author of three books, viz. "Aromatic Substitution - Nitration and Halogenation" (with J.H. Ridd, 1958), "Electrophilic Additions to Unsaturated Systems" (with R. Bolton, 1966, 2nd ed. 1982), and "Electrophilic halogenation" (1976).

His interest in reaction mechanisms was sparked by his work for the M.Sc. with P.W. Robertson to whom he acknowledged his indebtedness in an obituary of the latter (**Chem. in Brit.**, 1969, 5, 525). In early work with Robertson (**J.C.S.**, 1943,279) on the effect of substituents on halogenation, he showed that the reactivity of the benzene ring was in the order Me > Et > i-Pr > t-Bu, from which it was deduced that the rate of the reaction of toluene was facilitated by hyperconjugation. In later work (**J.C.S.**, 1957,131) he firmly established this order for aromatic replacements **para** to alkyl substituents. His work with Robertson also established that in the halogenation of aromatic compounds ionisation of the halogen-halogen bond occurred during, rather than before, association with the aromatic nucleus (**J.C.S.**, 1943, 276; 279; 1948, 100) and that substituents affected the rates of reaction in a very powerful fashion (**J.C.S.**, 1953, 782). Work on the kinetic and structural features of bromide-catalysed brominations showed that bromide ion provided the nucleophilic partner in the addition as part of the rate-determining step, either synchronously or after a pre-association of the unsaturated compound and bromine (**J.C.S.**, 1945, 509; 1948, 48; 1950, 2838).

With Ingold at London he provided evidence that allyl rearrangements could proceed by a bimolecular nucleophilic substitution with anionotropic rearrangement (S_N2^1) (**J. Chim. phys.**, 1948, 45, 236). This research provided the groundwork for a modernisation of the theory relating to prototropic and anionotropic rearrangements of 3-carbon systems wherein he used the concepts of conjugation and hyperconjugation (**J.C.S.**, 1948, 17). He also showed that it was possible to introduce substituents into the allyl system, as for example in 3,3-dichloroprop-1-ene (**J.C.S.**, 1952, 3325, 3331, 3628; 1953, 3555), which inhibited the S_N2 and favoured the S_N2^1 process. Later he was to vigorously refute a critique of his ideas on the S_N2^1 mechanism (**J.C.S.(B)**, 1971, 1699).

Much of his work at University College was spent in formulating and providing evidence for general mechanistic schemes for all electrophilic halogenating agents. For example, he demonstrated experimentally the intervention of free halogen cations in only one instance, namely for the chlorination of olefinic substances by acidified hypochlorous acid in the absence of chloride ions (**Research**, 1980, **3**, 192, 242), showing that under these conditions hypochlorous acid and a proton reacted by two mechanisms analogous to S_N1 and S_N2. He also studied the reactions of acidified hypochlorous acid wth aromatic compounds and showed that with unreactive substrates the kinetic form was consistent wth the intervention of $ClOH_2^+$ or Cl^+. With more reactive substrates the kinetic form was more complex and the reaction involved the slow heterolysis of ClOH and $ClOH_2^+$ to Cl^+.

With very reactive compounds the kinetic form was even more complicated (**J.C.S.**, 1954, 4450). From this work he established the relative reactivity sequence for electrophilic chlorinating species as $ClOH_2^+ > ClOAc > Cl_2O > ClOH$. By using isotopic chlorine he was able to show that in the addition of hypochlorous acid to allyl chloride the entering chlorine substituent was more favourable situated for interaction with the developing carbocationic centre than was the chlorine substituent already present in the molecule (**J.C.S.**, 1954, 3910, 3990). Rearrangements (**Chem. & Ind.**, 1959, 1020) and neighbouring group participation in the presence of perchloric acid (**J.C.S.**, 1962, 443; **J.C.S.**, 1963, 410) were also shown to be possible for such reactions.

He also studied other isotopic exchange reactions, e.g. the isotopic exchanges of simple alkyl halides (**J.C.S.**, 1955, 3169, 3180, 3196) in a comprehensive treatment of the mechanism of nucleophilic substitution at a saturated carbon atom (**J.C.S.**, 1955, 3200). This work led to a quantitative assessment of the role of steric effects in S_N2 reactions, and was one of the earliest examples (pre-computer) of the use of molecular mechanics. Isotopic dilution was used to determine orientation and relative reactivities of substituted benzenes for reation with hypobromous acid in dioxan (**J.C.S.**, 1956, 36; 1957, 131, 3004) to give partial rate factors which resembled those for nitration. The dual electronic character of the phenyl substituent was shown by the reduction in rate of **meta**-bromination, and increase in rate of para-bromination. Isotopic exchange was also used to draw an analogy between bimolecular attack at sulfur and at carbon (**J.C.S.**, 1955, 3200).

His work provided kinetic evidence for the existence and electrophilic behaviour of chlorine acetate (**Research**, 1953, 6, 55) and he showed that in 0.5% water it hydrolysed almost completely to hypochlorous and acetic acids (**J.C.S.**, 1960, 4039). He established that in acetic acid chlorine acetate added to unsaturated compounds to give a carbocationic intermediate which was essentially free from the influence of the anionic fragment. This intermediate then partitioned to give a product in accordance with the properties and nature of the medium. This behaviour was attributed to a form of intramolecular acid-catalysis in which H-bonding to the carbonyl oxygen facilitated heterolysis of

the Cl-O bond. In contrast, chlorine gave a series of intermediates in which the chloride counterion remained closely associated with the carbocation and affected the pathways involved in further reactions (**J.C.S.**, 1960, 4044). Chlorine acetate was also found to be less sterospecific than chlorine in its additions to alkenes (**Chem. Comm.**, 1970, 731).

He showed that the mode of hydrolysis of cyclic sulfates in acid or alkali was by S-O bond fission (**J.C.S.** 1958, 4751, 4761) and that halogen acids were very effective because the halide ion attacked the sulfur atom of the conjugate acid to form a readily hydrolysable chlorosulfite (**J.C.S.**, 1958, 4754). The acid hydrolysis of dialkyl sulfites was also shown to be by S-O fission (**J.C.S.**, 1959, 1766). Cyclic aromatic sulfites were hydrolysed much faster than the corresponding aliphatic sulfites as a result of steric strain at the sulfur atom on formation of the transition state (**Chem. & Ind.**, 1961, 1533).

He went to some pains to dispel the idea that substitution in halogenation was confined to aromatic compounds and that addition was confined to olefinic compounds, promoting the concept that substitution and addition should be regarded as complementary. For example, he showed that the same kinetic form was found for aromatic compounds which reached with chlorine exclusively by substitution and for compounds such as phenanthrene which give addition and substitution in similar proportions (**J.C.S.(B)**, 1969, 717). He studied the halogenation of a number of aromatic compounds (e.g. **J.C.S.**, 1962, 988; 1963, 5973; 1964, 5327; **Rec. Trav. Chim.**, 1965, 84, 109; **Bull. Soc. Chim. Fr.**, 1966, 1157; JCS (B) 1966, 827) and showed inter alia that dienones were formed in many reactions (**Chem. Comm.**, 1971, 1324; **J.C.S.(B)**, 1971, 1122; Tet. Lett., 1976, 4835; 1980, 21, 411) and that ipso-attack occurred (**J.C.S. Perk. 2**, 1976, 1389) for example in the bromination of 3,4-dimethylphenol (**J.C.S. Perk. 2**, 1979, 933). His study of the molecular chlorination of acetoxybenzenes led to the first σ^+ values for the acetoxy substituent and to the finding that chlorination of 4-substituted acetanilides give a much lower p value than the corresponding acetanilides, a fact explained in terms of the effect of the 4-substituent on conjugative electron release by the acetamido group (**J.C.S. Perk. 2**, 1976, 784). He was one of the first to put forward the idea that nitration of aromatic hydrocarbons could involve an addition-elimination mechanism (**J.C.S.**, 1964, 5327) and the first to show that hyperconjugation could stabilize the charge on oxygen in the bromination of phenol (**J.C.S.**, 1964, 5306). In other work he showed that the position of bromination of quinoline depended on the reaction conditions (**J.C.S.**, 1958, 361; **Chem. & Ind.**, 1959, 737), bromination in the 5- and 8-positions in strong acid occurring via the conjugate acid (**J.C.S.**, 1960, 561; **Chem. & Ind.**, 1960, 1505).

His work with the halogenation of polycyclic aromatics led to studies of the dehydrochlorination of napthalene adducts (**J.C.S.(C)**, 1968, 648; **J.C.S.(B)**, 1966, 834). In an examination of the dehydrohalogenation of the dihalides derived from 1,4-benzoquinone he showed that the mechanism was well toward the ElcB end of the spectrum of transition states available for elimination (**J.C.S. Perk. 2**, 1983,271). He also showed that both carbocationic and ElcB pathways were implicated in the solvolysis of ring-substituted p-dibromomethylphenols giving quinone methides as transient intermediates (**J.C.S.**, 1984, 231, 1797).

PBD as he was affectionately called by his colleagues had an incisive mind and the ability to analyse his own results and those of others in great detail. Many of these papers of which the above are but a selection, were in the form of reviews or chapters in books which covered a broad range of topics, e.g. elimination (**Ann. Repts**, 1950,**75**, 4521), stereochemistry of nucleophilic substitution at an olefinic carbon atom (**Progress in Stereochemistry**, 1958, Vol. 2, p.65), a theoretical treatment of activation energies in the racemisation of biphenyls (**Progress in Sterochemistry**, Pt.1, 1954, p.122), and hyperconjugation (**Pure and Appl. Chem.**, 1984, 56, 1755).

As a person he was somewhat reserved and it took time for friendships to develop and ripen but the wait was well worthwhile. He stood out for his probity and for his concern for his staff and his Department. When he spoke people listened because they knew that what he had to say had usually been given long and serious consideration. On those rare occasions when his views or interpretations were questioned, either in print or at symposia, he responded with amiable vigour and clearly relished such challenges.

He is survived by his daughters Susan and Penelope, since his wife Gwyneth has subsequently died.

HONOURS continued from page 25

this was followed by MHSc in 1946 after work supported by the New Zealand Medical Research Council with Dr Muriel Bell on the metabolism of fluorine in human subjects. She went to England in 1948 on a University of New Zealand Postgraduate Scholarship in Science to work with Professor R.A. McCance, FRS, in the Department of Experimental Medicine, University of Cambridge, on the accumulation of trace minerals in the liver, and effects of starvation on the composition of liver cells of rats. She held the Alice Hamilton International Fellowship of the International Federation of University Women in 1950, and completed the Cambridge degree of PhD in 1952.

After returning to New Zealand, she joined the School of Home Science as Lecturer in Nutrition in 1958, and soon commenced metabolic researches on human subjects. In 1976 she was Chairman of the Otago Branch of N.Z.I.C. and the same year was elected a Fellow of the New Zealand Institute of Chemistry. She was elected a Fellow of the Royal Society of New Zealand in 1978 and a council member (1982-85). She was appointed to a Personal Chair in Human Nutrition in 1980, and was Chairman of the Department of Nutrition (1985-1988).

Professor Robinson was Honorary Director (1969-1988) of a Programme on Trace Elements in Human Nutrition funded by the Medical Research Council of New Zealand, with a special interest in selenium in human nutrition in New Zealand. Their aim was to see whether New Zealand residents were even marginally deficient in selenium. She has published about 90 papers, and has reported on her work at many international meetings in Australia and New Zealand, at TEMA-3 in Munich (1977), at TEMA-6 in Asilomar California USA (1987) and at the International Symposia on Selenium in Biology and Medicine in Lubbock, Texax, USA (1980), in Beijing, Chinese People's Republic (1984) and in Tubingen FDR (1988).

She has been President of the Nutrition Society of New Zealand and of the Trace Elements Group of New Zealand. She became an Hon. member of the Nutrition Society (1987) and a Fellow of the American Institute of Nutrition (1990). She is a member of the Nutrition Taskforce set up by the Department of Health to formulate a food and nutrition policy for New Zealand.

CANTERBURY BRANCH CHAIRMAN'S REPORT FOR 1989

The Canterbury Branch of the Institute has enjoyed, on the whole, a very successful year. This year's programme included a wide variety of events in an attempt to entice branch members to meetings which they may not have otherwise attended. The main programme was augmented with seminars and lectures of a purely scientific nature held in the Chemistry Department of the University of Canterbury. The Branch has had a noticeable drop off in membership this year. This drop has been almost solely attributable to the increase in membership fees from $80 to $110 and the fact that fees are no longer tax deductible. Members are asking themselves if they are getting value for money and at least some have decided that they are not. This year another increase in fees was proposed but was not supported at the last Council meeting. I believe that any increase in membership fees at this time would have a major detrimental effect on the membership.

This year no formal dinner was held. The decision not to do so was made because of the poor response to the last two annual dinners and the debt incurred to the branch because of this lack of support. Likewise, we decided to attach the AGM to a meeting to which we hoped a good attendance could be expected. In past years we have noticed a reluctance for Branch members to become involved in the committee and again this year we have found very few people willing to come forward to serve the Branch.

The meetings held this year included the popular BBQ and talk by Neil Cherry on the greenhouse effect and other matters meteorological. Good attendances were also recorded for the wine tasting and lecture by Dave Moore at the Polytech, the Spencer L. Ayries' shampoo and beauty product manufacturers, and the joint NZIC/NZIFST meeting at Uncle Lim's with Dr Dennis Dutton speaking about the fire walking event recently organised by the Skeptics Society. The final meeting for the year was on the topic of DNA profiling and its application to forensic science.

One notable exception to an otherwise successful programme was the proposed visit to SIDD. This meeting had to cancelled at short notice because of reasons beyond our control.

The financial position of the Branch is sound with an excess of payments over receipts of some $338 for the operating year. The student travel funds have been allocated to as many students as possible to allow travel to attend conferences both in New Zealand and overseas. A number of prizes were also awarded this year to the various winners of High Schools competitions run by the Branch during the year. A grant of $100 was made to the Chemical Road Show.

I would like to thank the members of the committee for their efforts toward the completion of another successful year for the Branch.

I would particularly like to thank Andrew Abell for his efforts as Secretary and his attention to the details and the paperwork. My thanks also go to Rob Lake as Treasurer and Bryce Williamson as Deputy Chairman and Branch Delegate for their efforts and support and jobs well done. The rest of the committee have all contributed towards the programme for the year and most have had responsibility for the organisation of at least one meeting and assisted in the success of others. My thanks go to all of you. Finally, I would like to acknowledge the time and effort given freely to the Institute by all those people who were prepared to speak at the meetings of the Branch.

R.J. Martyn

BRANCH NEWS — CANTERBURY

Branch Chairman Bryce Williamson was born in Hamilton in 1958. He studied at Victoria University of Wellington, from where he graduated with a B.Sc. (Hons.) in 1980, and at the Australian National University, from where he obtained a Ph.D in physical chemistry in 1984. He spent two years as a postdoctoral research associate at the University of Virginia before being appointed to the staff of the University of Canterbury, where he is currently a lecturer in the Department of Chemistry.

His research interests are in the field of optical spectroscopy and he is currently in the process of establishing a programme for the study of magneto-optical properties of matrix isolated species.

Branch Committee for 1990

Dr. Bryce E. Williamson (University of Canterbury) Chairman/Delegate; Dr. Andrew D. Abell (University of Canterbury) Secretary/Deputy Chairman; Dr. Robin J. Lake (D.S.I.R.) Treasurer; Dr. Robert . Martyn (D.S.I.R.) Branch Editor; Dr. Nigel B. Perry (University of Canterbury) Membership; Mr. John O. Trent (University of Canterbury) Student Representative; Dr. Peter E. Ingham (W.R.O.N.Z.); Ms. Loanne Metcalfe Villa Maria College; Dr. Andrew A. Watson(W.R.O.N.Z.).

CHEMISTRY DIVISION DSIR CHRISTCHURCH

Dr Richard Vannoort returned to the branch after a 14 month study leave period in Holland. He spent most of his time at the Free University, Amsterdam and studied applications of supercritical fluid chromatography and extraction, to analytical chemistry.

Dr Rob Lake attended the Pacifichem '89 conference in Hawaii in December in order to attain knowledge into the application of immunoassay techniques in food analysis.

Dr John Bathurst has transferred to the Gracefield laboratory from the Christchurch Branch. He is working on trace analysis of water for chlorinated hydrocarbons, pesticides and other hydrocarbons.

ANNOUNCEMENT

The Institute of Chemistry gives thanks to Shell New Zealand Holding Co. Ltd., who have advised that the Shell Prize for Industrial and Applied Chemistry has been raised in value to $1000. Annual entries close on April 30, and the Public Affairs Manager is looking forward to the Company's presentation in 1990.

GONE NO ADDRESS

We appear to have lost the addresses of some of our members from the records. If you know of anyone who has not been receiving the Journal recently please send their name and current address to the Executive Officer, NZIC, Box 12-347, Wellington. Please remember to advise all address changes promptly.

BRANCH CHAIRMAN Otago.

Richard Tapper is Head of the Science Department at Bayfield High School, Dunedin. He joined the Institute in 1976 and has been a committee member of the Otago Branch since returning to Dunedin in 1983. Prior to this he was Head of the Science Department at Mackenzie College, Fairlie, with responsibility for teaching both senior biology and chemistry. His biology classes led to a one year Visiting Teaching Fellowship at Lincoln College in 1979 under the guidance of Professor Bernard Howard and allowed Richard the opportunity of following up original school biology research projects he had started with his students. These studies included assimilation of wood by Huhu grubs, a topic that was presented in a paper he delivered to the 1982 NZIC Conference. He has a long and continuing association with Science Teacher Associations and Science Fairs, both nationally and locally and has an ongoing priority to foster communication between school science teachers and other scientists. He has recently been awarded a Woolf Fisher Fellowship to study science teaching developments in Australia.

Richard is an MSc graduate in chemistry from Otago University with commitments to his family and a vintage home as well as other interests that include flying, surf lifesaving, skiing and studying the transient mineral and water holding capacity of his sea side garden.

UNIVERSITY OF CANTERBURY, CHEMISTRY DEPARTMENT

Dr John Blunt is on Study Leave until August 1990 at the National Cancer Institute, Frederick, Maryland. He is working on the isolation and structure identification of natural products with antitumor and anti-AIDS properties. He is also asisting with setting up a 500 MHz NMR instrument, and is planning to carry our some molecular mechanics calculations on a Cray supercomputer. **Dr Jim Coxon** has returned from a semester at the University of Florida, Gainesville and another at the University of California, Berkeley, with an interlude lecturing in Europe. His time was spent largely on molecular modelling experiments, an area that he has been specializing in at Canterbury for the past few years. At Berkeley he collaborated with **Professor Clayton Heathcock** on modelling studies directed to the design for the synthesis of Petrosin, a marine natural product, which offers new synthetic challenges due to the large macrocyclic ring and symmetry of the molecule. **Dr Rod Claridge** is on Study Leave until January 1991. He is currently working with **Professor Hans Bock** at the Institut fur Anorganische Chemie der Universitat Frankfurt, and in April he moves to Japan where he will be working on an assessment of the value of industrial chemistry courses for undergraduate chemistry students at the University of Osaka. **Dr Kip Powell** returned in February from 12 months sabbatical leave spent in Sydney, Umea (Sweden) and Seattle. In Sydney he worked with **Mark Florence** (plenary lecturer 1988 NZIC Conference) on an electrochemical method for determination of lead in biological fluids. He was shocked at the low morale in a department (CSIRO, Division of Fuel Technology) which was being shredded and dismantled as a result of the government's 30% cost recovery policy. In Sweden he worked on silicate-tannin interactions, and enjoyed the stimulus of working with an outstanding group of solution chemists which attracts many international visitors. **Jaromir Ruzieka**, who developed the technique of flow injection analysis, was his host in Seattle, and here he worked on the application of electrochemical detectors in FIA measurements on fermentation broths.

OTAGO UNIVERSITY CHEMISTRY DEPARTMENT

Dr Jim McQuillan has returned from sabbatical leave at the University of York working with Professor R.H. Hester on spectroelectrochemistry at TiO_2 surfaces, and at the University of Utah with Professor S. Pons working on FTIR spectroelectrochemistry.

Dr Robert Gayhart from Bradley University, Illinois is visiting the department from February through May. His particular interest is in chemical education including computer assisted teaching and the role of classical quantitative analysis in modern courses.

BIOCHEMISTRY DEPARTMENT

Dr Michael Denton has arrived from the Department of Clinical Chemistry, Prince of Wales Hospital, Sydney as a Senior Research Fellow in Molecular Genetics. His special interest is in retinitis pigmentosa.

Professor George Petersen attended an interactive meeting on the Human Genome (sponsored jointly by UNESCO and COGENE) in Paris, January 29-31 and followed this by two weeks visiting laboratories in the U.K. While in the U.K. he made a videotaped interview of Professor Kenneth Burton (recently retired from the Chair of Biochemistry at Newcastle) for the archives of the Biochemical Society, London.

Dr Warren Tate is on sabbatical leave at the Max-Planck Institute for Molecular Genetics in Berlin.

Drs Bernard and Moira Cohen from the Department of Genetics, University of Glasgow are visiting the department for the first half of this year. They are studying mitochondrial and nuclear genome divergence in brachiopods.

The MAFTech unit has recently attracted two ex Biochemistry Students into its ranks. **Eric Lord** returns after completing a Ph.D. in Canberra and **Sue Galloway** returns after a Post Doc stint in the United States. The unit is full of enthusiasm and optimism reflecting the talent which director **Diana Hill** has managed to assemble.

ACOL (ANALYTICAL CHEMISTRY BY OPEN LEARNING) ANALYTICAL INSTRUMENT WORKSHOPS TO BE HELD AT ATI IN 1990

1) Intermediate Gas Chromatography: Transition from packed column to Open Tubular column GC using wide bore capillaries.

Date of course: Tues 1 May -Thurs 3 May

2) Atomic Absorption/Flame Emission Spectroscopy: A three day practical workshop.

Date of course: To be advised. (around mid August)

This course is intended as an introductory to intermediate level course in modern AAS and FES theory and practice. Participants will be sent the ACOL self teaching text 4-6 weeks prior to the beginning of the workshop with the intention that they will study the theory of the technique in their own time. The student's attention will be drawn to those sections of the text that will be covered in the practical sessions during the workshop.

Topics to be covered will include: Theoretical aspects of atomic absorption and flame emission spectroscopy, the components of a modern AAS/FES system, sample preparation and matrix problems, AAS from sample to flame, atomic absorption vs flame emission - and when best to use each, Background correction in AAS.

The course time will be largely spent on practical work, with only a short time spent on a review of each theory section in the self teaching text that has been covered by the students themselves prior to the beginning of the course.

WRONZ NEWS

WRONZ hosted the 8th quinquennial International Wool Textile Research Conference in Christchurch from 7-14 February. Over 300 enrolments (mainly overseas) were received for the Conference which covered wool chemistry, physics and technology. NZIC members, **Stan Simpson, John McLaughlin, Campbell Page, Andrew Watson, Steven McNeill, Doug Rankin** and **Margaret Leonard presented papers.**

Dr Campbell Page left WRONZ at the end of February to join Ciba Geigy Ltd, Basel, Switzerland as a research scientist in the leather area. Campbell joined WRONZ in 1977.

Dr Peter Ingham and **Dr Campbell Page** attended the 12th International Symposium of the Society of Dyers and Colourists in Melbourne. Dr Ingham presented a paper on the chemistry of stain-resistant treatments on wool carpets.

It is noted with pleasure that local Fellow of the Institute, **Mr Rex Stewart,** formerly head of the Chemistry & Engineering Division at WRONZ received the OBE in the New Year Honours for his service to the wool-scouring industry.

FEATURE:

WATER TREATMENT AND ANALYSIS

HAZARDOUS/LIQUID WASTE — TREATMENT AND DISPOSAL

"SERVICE FIRST — SAFETY ALWAYS"

This slogan as used by Chemical Waste Management Inc of North America is the basis of the operations of Waste Management NZ Ltd's, Hazardous/Liquid Waste Treatment facility in Wiri, Manukau.

The Wiri operation comprises New Zealand's only comprehensive Hazardous Liquid Waste Treatment Facility, offering a diverse range of treatment capabilities and other services to industry.

In maintaining its position as New Zealand's leader in environmental and pollution control services, the company is fully backed by the technical expertise and experience of its major shareholder — Waste Management Inc, North America.

Being at the receiving end of others unwanted waste materials, including extremely hazardous substances, requires a high degree of safety consciousness and the company has developed documentationary and operational procedures designed to minimise risks. Comprehensive staff training and customer education play a major part in maintaining a safe operation.

With the specific exclusion of radioactive substances, polychlorinated biphenyls and chlorofluorocarbons, the Treatment Facility is capable of effectively treating hazardous/liquid wastes to environmentally acceptable standards. Present day treatment methods include.

Chemical oxidation **Flocculation**
Hydrolysis **Neutralization**
Precipitation **Reduction**
Sedimentation **Stabilization/solidification**

Waste types commonly dealt with include:
Plating wastes **Timber treatment preservatives**
Oils/Solvent/Paint/Resin/Ink/Dye/Adhesives
Photo chemicals **Laboratory chemicals**
Agricultural chemicals

Operating its own vacuum,-tanker fleet, the company also regularly provides grease trap, septic tank, and stormwater cess-pit/soakhole cleaning services.

Other specialist services include:
Aerosol degassing **Spillage clean-up**
Hazardous/confined-space cleaning
Sample retrieval and analysis **Consultancy**
Recycling

The problem most commonly experienced when dealing with a customer enquiry is the lack of available information on the waste. It can be a costly exercise to identify what substances are contained in a waste, if accurate records are not maintained by the customer. In an instance involving a variety of waste types stored in 200 litre drums, the identification process can be more costly than the actual treatment and disposal.

At the very least a Material Safety Data Sheet should be available for each waste type and/or its constituents.

The company welcomes visitors to the Wiri Treatment Facility. To discuss how Waste Management NZ Ltd can be of service to you, or if you just wish to know more about the industry contact the Manager — **Mike Williams, Ph: 278-3644**

One thing we should be thankful for is the existence of hydrogen bonds — without them water would boil at around -100°C which would cause a change in our lifestyle to say the least. It is not only as biological organisms that we find water of immense importance to us, it also impinges on our professional lives as chemists. Chemical industry runs on water, as part of the product or in boilers or cooling towers. Water quality is important.

The topics of water treatment and analysis are vast and the following paragraphs attempt only to draw the faintest outline of where water and chemistry come together.

Sources of Water

The ultimate source of fresh water is rain but even in unpolluted areas this will contain gases absorbed from the atmosphere in accordance with Henry's Law and rainwater will have a pH of 5.7 because of dissolved CO_2. pH's considerably lower than this have resulted from SO_2 and NO_x emissions mainly from fossil fuel burning and these have had global environmental repercussions.

NZ is proud of its rivers though hydroelectric schemes have reduced the glory of many. Surface waters in NZ tend to be soft with low levels of Ca^{2+} and Mg^{2+}, not so good for home brewers but reducing the need for phosphate builders in detergents.

Unlike the United States, NZ draws little municipal water from underground supplies but many farms and small communities rely on bore water. Underground water tends to be low in dissolved oxygen, and reducing conditions can arise so that iron and manganese dissolve in their +2 oxidation states.

Similar reducing conditions can occur at the bottom of lakes and reservoirs during summer stratification (lack of vertical mixing due to density difference) and species such as NH_4^+ and S^{2-} accumulate near the bottom. These reduced species are mixed through the body of water when colder temperatures destabilise the strata in the autumn turnover.

Municipal Treatment

Softening is rarely required in NZ although DSIR publication CD2332 cites the Ardmore Services Correction Camp supply with 180ppm $CaCO_3$ and using softening. In fact where lime is used as a pH adjustment, municipal treatment often increases the hardness of NZ waters.

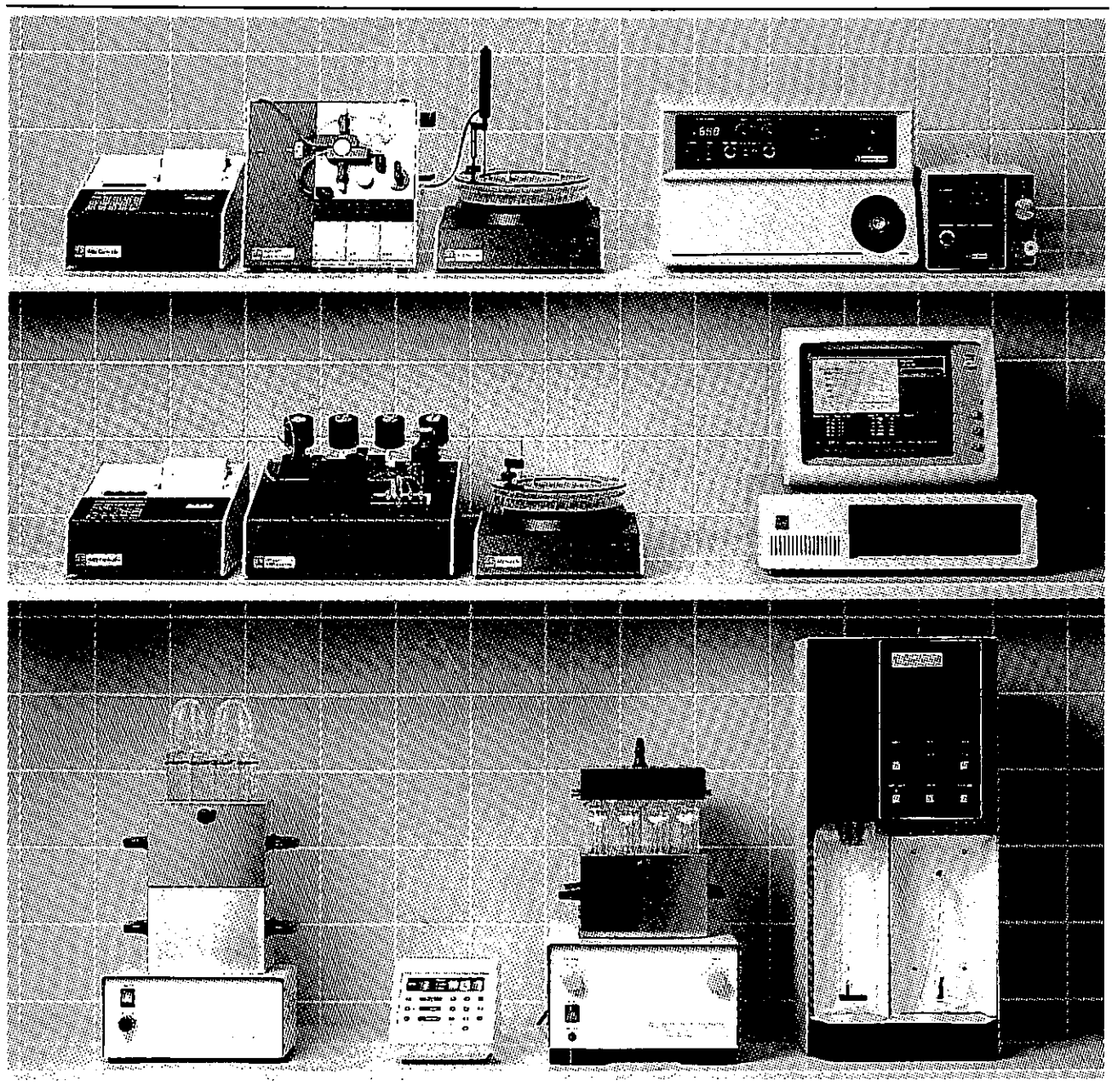
Colloidal suspensions of clays, and $Fe(OH)_3$ and MnO_2 that may have precipitated on aeration are agglomerated by the addition of $Al_2(SO_4)_3$ in which the Al^{3+} causes flocculation (the Schutz-Hardy rule says the higher the charge the more effective as a flocculant) and a blanket of $Al(OH)_3$ is used to coagulate the flocculated particles. Aluminium has been implicated in Altzheimer's disease and residual Al^{3+} has been of concern to kidney patients on dialysis. Final polishing is usually performed by sand filtration.

Water disinfection has been traditionally performed by the use of chlorine in a +1 oxidation state although concern about the production of harmful chlorinated compounds has meant that ozone is increasingly considered as an alternative. New Zealand waters typically have fluoride levels around 0.1ppm and in some areas this has been raised to 1ppm by contentious addition of H_2SiF_6, a byproduct of superphosphate manufacture.

Industrial Treatment

For many industries on municipal supply, the water is of a perfectly adequate standard to be added to the product. Even low levels of Ca^{2+} and Mg^{2+} can upset some products, however, and small scale ion exchange plants are used to remove these ions. Food industries must be particularly careful about bacterial contamination and often have disinfection processes of their own using either chlorine or UV radiation.

Boiler water treatment is directed towards corrosion control and in low pressure boilers consists of keeping the alkalinity high and removing dissolved oxygen (for example by sulphite addition). The ultimate in boiler water treatment is aimed for in high pressure boilers for power stations where the water is completely demineralised and even minute traces of O_2, Si and Cl^- cannot be tolerated. In cooling towers, microbiological fouling and deposit control are key areas of treatment and recent reports of



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Legionaires disease have underlined the importance of the maintenance of air-conditioning systems.

Laboratory water systems have become increasingly sophisticated as techniques such as HPLC demand higher standards of water quality. Although the laboratory still continues to provide much of the water for general laboratory use deionisers coupled to carbon filters are becoming more common.

Waste water

Increasing environmental awareness has meant that chemists have been required to monitor more closely any water that is discharged. Treatment of waste water is becoming more sophisticated in order to comply with tightening legislation.

Traditionally municipal water treatment has consisted of primary treatment consisting of physical processes such as sedimentation and secondary treatment using biological treatment such as oxidation ponds or fixed bed reactors. Although these processes reduce the oxygen demand and total solids content of a sewage to 5% of their raw values, nutrient and bacterial levels remain high. Tertiary or chemical treatment costs are high but there is pressure to reduce nitrogen and phosphorus levels in effluents discharged in places like Lake Rotorua. Authorities are incorporating effluent disinfection stages in treatment plants and ultraviolet sterilisation is establishing itself as a viable alternative to chlorine or ozone addition.

Water Analysis

Because of its long history, water analysis still utilises some traditional methods that are slow to change, but increasingly sophisticated methods are continually added as the demand increases for lower detection limits of more species. Simple parameters such as total dissolved solids, hardness and alkalinity may still be measured by time-honoured methods, though few chemists would still measure hardness by shaking with a standard soap solution and EDTA titrations are often replaced with AAS. Unweildy methods such as the traditional 5-day BOD resist displacement by automated TOC methods, partly because of cost but mainly because BOD results are established standards and have a history of interpretation. Trace metal analysis in waters can be done by a range of modern techniques, AAS, ICP, polarography and anodic stripping as well as the relatively recent potentiometric stripping. Ion chromatography has become increasingly important for anion analysis, sometimes at extremely low levels, Huntly Power Station monitors chloride in its boiler water to better than 1ppb. The development of chromatographic methods for trace organics in water has been driven by EPA requirements and purge and trap methods can now quantify halocarbons and aromatics in water down to ppb levels. Kitset water testing methods are available and these have extended to microbial test kits.

Water treatment and analysis extends into almost all fields of chemistry and volumes have been written on the many aspects that are covered under the general heading. Some of the new technologies are listed in the following pages.

NEW CHEMICAL OXYGEN DEMAND (COD) REAGENT VIALS FROM HACH

The testing range for COD using Hach's popular closed reflux micro method has been extended with the new High Range Plus and Ultra Low Range COD Reagent Vials. Now analysts can measure very high or very low concentrations of organic matter using two new ready-to-use COD reagents.

High Range Plus COD reagent vials, measuring 0-15000 mg/L without sample dilution, are USEPA-approved for NPDES reporting. Ultra Low Range COD reagent vials measure 0.40mg/L. Using the new reagent vials, analysts can monitor and calculate COD on any spectrophotometer (must have 350nm capability) or more conveniently, read results directly in two hours with a Hach DR/3000 Spectrophotometer.

These two new reagent formulations join the most widely used COD monitoring system in the world — Hach's closed reflux micro method COD system. A complete system includes vials, reactor and spectrophotometer or colorimeter. Characterized by convenience, speed and accuracy, this system features a two hour digestion, accurate results and reduced chemical waste disposal. In a cost comparison with the dichromate reflux method, users of Hach's semi-micro method realized considerable savings in time and materials.

Also available are High Range (0-1500 mg/L) and Low Range (0-150mg/L) reagent vials which are USEPA-approved for NPDES reporting. Like all Hach COD vials, they require no flame sealing, and when used with a Hach colorimeter or spectrophotometer, provide direct-reading results in two hours.

For further information contact Wilton Instruments, PO Box 31-044 Lower Hutt, Phone (04) 697-099, Fax (04) 697-240.

DETECTION OF POLLUTANTS AT PPM CONCENTRATIONS OR LOWER

Ever increasing emphasis is being placed on the detection and control of heavy metals in trade waste effluents. In order to meet the necessary requirements, companies must monitor their effluents and treat them accordingly.

This raises the question of how best to test for pollutants in the ppm to ppb range. Metrohm offer the solution with their microprocessor controlled VA processor.

Metrohm's decades of experience in the field of polarographic and voltametric analytical analysis (VA techniques) have produced a high performance instrument that often allows detection of multiple solution constituents in a single operation! Compared to alternative techniques, VA techniques usually require less sample preparation, are far more sensitive, yield multiple constituent analysis and are far more economical to purchase and maintain.

The 646 VA processor is truly the leading light in polarographic analysis. While the 646 VA processor is usually coupled with the 647 VA electrode stand, this can be replaced by the 675 VA sample changer which allows automation of 10 samples. Standard addition is used to calculate sample strengths and for this purpose the 665 Dosimat is used to perform the additions by remote control. The result is a completely hands free operation performed by preprogrammed memory.

VA techniques in Australia are growing in popularity due mainly to the increase in the number of applications and the widening fields of application.

Compare the relative detection limits shown in Table

For further information please contact John Morris Scientific Ltd, PO Box 6348, Auckland.

Element	Flame	AAS:Graphite Furnace	Cold Vapour Hydride	DPSV
As			0 0015	-
Ba	30			-
Be	15	0.3		
Cd	3	1.5	0.03	
Co	3	0.1	-	0.1
Cr	15	0.003	-	-
Cu	4.5	0.15	-	-
Fe	1.5	0.3	-	<0.0005
Hg	15	0 06		0.005
Mn	300	0 1	-	0.02
Mo	3	-	-	0.005
Ni	30	0.01	0.015	0.025
Pb	3	0.1	-	0.02
Se	15	0.08	-	1.0
Sn	150	0 06	-	0.05
Te	30	1.5	-	0.001
Tl	75	0.3	0.03	0.001
V	30	0.3	-	0.05

HACH INTRODUCES TEST KIT DESIGNED FOR SALTWATER AQUACULTURE

To help ensure efficient crop production, Hach has developed a complete, portable fish farming test kit designed specifically for saltwater applications. The new FF-3 Saltwater Aquaculture Test Kit includes all necessary instruments, reagents and apparatus to measure 10 critical parameters, including:
Acidity, Alkalinity, Ammonia, Carbon Dioxide, Chloride as Salinity, Dissolved Oxygen, Hardness, Nitrite, pH and Temperature.

Until recently, analysts needed an expensive refractometer in order to measure salinity. The FF-3 offers a reliable, inexpensive alternative. The chloride titration test included with each kit provides results with direct readout in parts-per-thousand (ppt) as salinity — at a fraction of the cost of a refractometer.

Also included in each kit is Hach's new salicylate test for ammonia-nitrogen. Since salinity will not influence test results, the Hach procedure has a distinct advantage over other interference prone methods.

For further information contact Wilton Instruments, PO Box 31-044 Lower Hutt, Phone (04) 697-099, Fax (04) 697-240

WATER ANALYSIS BY TITRATION from METROHM

The characterization of water samples is becoming more and more important. Thus e.g. the sulphate content of a water determines its aggressiveness towards concrete, the chloride content is a useful indicator of water quality and the level of calcium ions is of importance in all those cases where water hardness plays an important role.

A common method for the determination of sulphate is indirect complexometric titration, whereby the sulphate is precipitated with excess barium ions and the excess of Ba^{2+} is determined with EDTA or EGTA. The problem is that almost all waters occurring in the environment contain calcium ions, which interfere

markedly with complexometric barium determination. Ca^2 has therefore to be removed before analysis. This is usually done by means of an ion exchanger. However, this sample preparation step is time-consuming and, more over, difficult to automate.

Sulphate can also be determined by precipitation titration with Pb^{2+} or Ba^{2+}, a lead selective electrode serving as indicator. This method, in its turn, suffers from interference by chloride, which occurs in varying amounts in water samples.

There is now a method which eliminates the above difficulties in the determination of sulphate and which allows the monitoring of the "interferents" Ca^{2+} and Cl^- in the same run.

For further information please contact John Morris Scientific Ltd, PO Box 6348, Auckland.

TOTAL ORGANIC CARBON ANALYZER

The Model 700 TOC Analyzer is a versatile unit capable of analyzing a wide spectrum of sample types. It has the ability to determine TIC, TOC, and POC on the same sample. With the on-board computer, the ability to do single point calibration is simple. A precision of $\pm$ 2 ppbC or 2 percent of mean, whichever is greater, is attainable with this analyzer. The Model 700 complies with EPA method 415.1 for TOC analysis.

It has the following features:

- Suitable for high or low levels
- Same-sample TIC/TOC/POC measurement
- Requires no sample pretreatment
- Simple, single point calibration
- Low cost of operation/maintenance
- Microprocessor controlled analysis
- Digital display of concentrations
- Accepted standard for seawater/brines
- Unattended replicate analysis
- Capable of handling salines and particulated samples
- Extendable purge and reaction times
- Variable volumes, time, and temperatures
- Can be used as a screening tool
- Settable high and low alarms
- On-line analysis of drinking water

For further information contact John Morris Scientific Ltd, PO Box 6348, Auckland.

COLILERT® COLIFORM TEST

Developed in the USA the test is designed to monitor the bacterial quality of raw water and treated drinking water.

It simultaneously detects the presence of total coliforms and *E.coli* bacteria in an easily performed test that requires less than 2 minutes "hands-on" time. Conclusive results are available within 24 hours without the need for confirmatory tests or sub-cultures. The test is easy to interpret and does not require specialised staff training or expensive capital equipment.

The test is a pre-dispensed dry power reagent supplied in "ready-to-use" test formats; a multi-tube MPN in which 10 ml of sample is added to each COLILERT® tube and a Presence/Absence format for addition to a single 100 ml sample.

The prepared samples are incubated for 24 hours at 35-37°C. If coliforms are present a yellow colour develops, indicating a positive test. The presence of blue fluorescence under ultraviolet light specifically confirms the presence of *E.coli*. All competing non-coliform organisms are eliminated or suppressed by the reagent thus permitting detection of coliforms in the presence of high numbers of heterotrophic bacteria. This makes it ideal for monitoring raw water quality.

The US EPA has approved COLILERT® as an alternative method to multiple tube fermentation (MTF) and membrance filtration (MF) for the analysis of coliforms and *E.coli* in the National Primary Drinking Water Regulations (Federal Register June 29, 1989).

The product obtainable through the New Zealand agent ENVIROLAB Services Ltd, Rob Fullerton, Manager of ENVIROLAB Services Ltd can be contacted on 524-4721, at 8 Leek St, Newmarket or by post at P.O. Box 9437, Newmarket.

FAST DETERMINATION OF TRACE METALS IN WATER WITH NEW INSTRUMENTATION

For quick analysis of heavy metals in water, Radiometer Analytical A/S introduces the TraceLab™ Trace Element Laboratory. The TraceLab system determines metal concentrations below the ppb level in a few minutes. The multi-element capability makes simultaneous determination of several metals possible.

TraceLab is operated by a Personal Computer. Dedicated analysis programmes on diskettes guide the user and simplify operation. For water analysis, the TAP22 programme features simultaneous determination of Pb, Cu, and Cd in water. The dedicated programme frees the laboratory staff from method development, the actual metal ranges being all that has to be entered.

The wide dynamic range of TraceLab covers metal concentrations from 5 ppm down to 0.05ppb for Pb, and Cd, and from 5ppm down to 0.1 ppb for Cu. The time needed for an analysis is two to three minutes for levels higher than 1ppb.

In a similar way, the zinc content in water can be determined by means of a dedicated programme.

The technique used is potentiometric stripping analysis which offers detection capabilities for a dozen elements. For research work, the general-purpose programme TAP2 for method development is available.

The TraceLab system only requires electricity for installation. It is easy to move and can be placed where it is most convenient to perform the actual analysis. In stand-by mode the system can be left without supervision, ready to start analysis of samples within seconds.

For further information contact Radiometer Pacific, PO Box 58-468, Greenmount.

RADIOMETER A/S OF COPENHAGEN

Open Subsidiary in New Zealand

enquiries for Radiometer products be addressed to Radiometer Pacific Ltd., PO Box 58-468, Greenmount, Auckland, Phone 573-1110 Fax 573-1106.

THE SMALLEST FIRST LAB FOR PROGRAMMED WATER ANALYSIS HAS ARRIVED: LASA AQUA

LASA Aqua is currently programmed to produce 31 different water analyses in less than no time.

The Pocket Photometer LASA Aqua is a compact and, thanks to new technology, very small and convenient unit: 12cm wide, 18cm depth and only 4.5cm height. Depending on application, it can be powered by mains or by battery.

Besides all the technical and operating features, there is a further strong argument to support this system: its very competitive price. To go along with the LASA Aqua Pocket Photometer, there is also the compact LASA Aqua Thermostat. In a nutshell: LASA Aqua is unbeatable when it comes to routine water analyses.

For lab analyses with more extensive requirements, Dr Lange offers the high-performance photometer LP1W.

The Pocket Photometer LASA Aqua simplifies water and waste water analyses in sewage treatment plants, swimming pools, the timber, beverage, electroplating, chemical food processing and paper making industries.

The LASA Aqua is programmed to carry out the following tests.

Ammonium, Cadmium, Calcium, Chloride, Chlorine, Chlorine dioxide, Chromium, COD, Copper, Cyanide, Formaldehyde, Hardness, Iron, Magnesium, Nickel, Nitrate, Nitrite, Ozone, Phosphate, Silver, Sulphate, Zinc (pipette test).

For further information contact John Morris Scientific Ltd, PO Box 6348, Auckland.

AQUA TREATMENT LIMITED

Aqua Treatment Limited is a subsidiary company of Rankine & Hill Ltd., Consulting Engineers. Located in Rotorua, Aqua Treatment Ltd. offers a wide range of chemical analyses, using traditional and modern techniques, with an emphasis on the analysis of water, effluents and water-related materials. A microbiological section is involved in coliform counting as well as testing for Giardia in water supplies and Legionella in cooling systems. An environmental consulting service is also offered, with a particular emphasis on aquatic environments.

WILTON INSTRUMENTS APPOINTED AGENTS FOR ANALYTICAL DEVELOPMENT COMPANY, UK

Wilton Instruments is pleased to announce their appointment as exclusive distributors for the Analytical Development Company (ADC) UK.

ADC is a specialist in the design and manufacture of non-dispersive Infrared Gas Analyzers and associated equipment. Fields covered include Laboratory Research, Plant Physiology, Process Control and Occupational Health and Safety.

Applications of ADC Products include:
Combustion Analysis, Exhaust Analysis, Food Packaging, Food Storage, Greenhouse, Growth Chambers, Heat Treatment, Pollution Monitoring, Stack emissions, Fermentation, Soil and Seed Respiration.

Over fifty ADC instruments are already in use in New Zealand.

Recent instrument releases include a gas diluter for field and laboratory work that provides fourteen dilution ratios of carbon dioxide and a water vapour generator for gas analysis and instrument calibration.

For further information contact Wilton Instruments, PO Box 31-044, Lower Hutt.

WATER TREATMENT AND ANALYSIS cont.

RAPID SOLIDS ANALYSIS FOR SLUDGE MANAGEMENT

For effective sludge conditioning and dewatering, timely data on solids concentrations are needed. Although a solids analysis method that takes 4-24 hours is acceptable to report figures for historical purposes, such methods are not fast enough to be used for process control.

Using the CEM Solids Analyzer, operations personnel can obtain total solids results in less than 10 minutes. This information can be used for immediate process control, rather than waiting hours for results and then reacting to conditions that may have changed hours ago.

A significant reduction in polymer usage can be realized while producing high solids sludge.

Because it is usually not possible to rapidly check the percent solids feed concentrations, additional polymer is normally added. This polymer overdose can be very costly. For example, if an optimum polymer usage is achieved at 500ppm for a feed concentration of 4%, any polymer addition beyond this concentration has no beneficial effect. The chart at right shows that an increase in polymer concentration from 500ppm to 600ppm will cost at least $500.00 per month.

For further information contact John Morris Scientific Ltd, PO Box 6348. Auckland.

PRODUCT NEWS

SOMETHING NEW IN LABORATORY BENCHTOPS

World famous Friederichsfeld Laboratory Benchtops have come to New Zealand. For more than 80 years Friedrichsfeld have supplied high grade ceramic benchtops for use in chemical and testing laboratories. Their products have proved completely reliable being resistant to practically all chemicals; they have remained unharmed under conditions of extreme heat and cold, and have proved extremely hard-wearing in every way. Ongoing research and development ensures the ability of Friedrichsfeld to maintain these high standards and to meet new conditions and requirements as they emerge.

Over the past 20 years more than 200,000 Friedrichsfeld benchtops have been installed in many countries. They are today accepted as being of the highest standard.

These benchtops are available in grey, brown and white with other intermediate colours available on request. Maximum recommended size is 1800mm long by 900mm wide, but smaller sizes can be supplied to meet individual requirements. Cutouts for sinks and cupboards can be positioned to order.

Friedrichsfeld benchtops do not require any base, thus avoiding problems often encountered in laminated products. Because the mechanical strength is so great, a thickness of 26mm is more than adequate. Weight is therefore reduced and installation made much easier. It is however recommended that the maximum dimensions already quoted be not exceeded.

Friedrichsfeld sinks, whether cup or normal are cemented to the underside of the benchtops. Thus cemented joints in the working area are eliminated.

Advantages of Friedrichsfeld ceramic benchtops include chemical resistance to all chemicals including solvents of any kind except hydrofluoric acid; static load capacity of up to 100kg; impact and scratch resistance; thermal shock resistance within the range of conditions usual in laboratory service and easy and thorough decontamination. They are attractive in appearance due to corrosion resistance, are colourfast, scratch resistant and easy to maintain. They are also non-combustible.

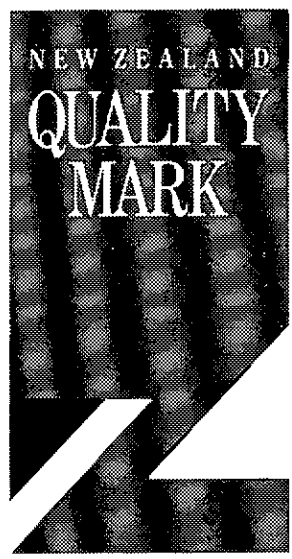
Full details of tests carried out by Pittsburgh Testing Laboratories are available from Thermoplastic Engineering Ltd on request.

NEW DATASTATION

ICI Instruments has released the new DP700 datastation which expands and adds a new dimension to their existing range of HPLC products. The DP700 has been designed specifically for the data analysis of HPLC and GC instruments. The DP700 is an IBM-PC based product and complements the existing ICI DP800 which features data handling as well as instrumental control. ICI Instruments manufactured data handling product range now incorporates the DP600 dual pen chart recorder, the new DP700 data handling datastation and the DP800 data handling and instrumental control datastation. All Trade partner enquiries are welcome for any of the ICI Instrument data handling products.

For further information contact ICI Instruments.
Telephone (09) 735-765

Are your products good enough to carry one of these marks of excellence?



Or are they amongst the "also-rans" ?

In today's deregulated and unprotected environment businesses need all the help they can get in promoting their products or services. The New Zealand Designmark and the New Zealand Quality Mark provide that help by saying to the customer, "buy with confidence".

The New Zealand Designmark is awarded to products that have been assessed and judged to demonstrate excellence in industrial design coupled with effective quality control during manufacture. To be eligible for the Designmark a product will involve elements of aesthetic, ergonomic and engineering design.

The New Zealand Quality Mark is awarded to products or services supplied by businesses that have been assessed and found to operate quality management systems to international standards. The Quality Mark may be awarded to processed or manufactured products or to services provided by New Zealand businesses.

To find out how these marks of excellence can provide your business with the competitive edge, contact :
TELARC New Zealand, Private Bag, Remuera, Auckland 5
19 Mauranui Avenue, Remuera,
Phone (09) 541-045, Fax (09) 540-962

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