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in new zealand

Vol 53 No 3 June 1989



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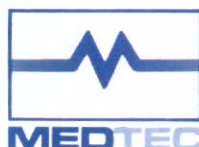
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Vol 53 No 3 June 1989

Front Cover Story

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Lavoisier, the initiation of a chemical revolution which established chemistry as an independent subject with a systematic language and theoretical framework. See page 51.

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Advertising Features

JUNE:

In this issue we feature current developments in spectroscopy, with information on products from Hewlett Packard, Gilson, Philips, Varian and Nicolet. See also the article from Stan Winter on XRF.

AUGUST:

The featured product will be balances. This is also the conference issue.

EDITORIAL

In the two months following final decisions on material for the April edition the public at large, via the news media, have been exposed to a wide range of chemically related news, the bulk of it sensationalised. We have seen cartoned milk sales slump in the wake of unjustifiable fear of harmful effects from dioxin and the carton supplier switch to an alternative cardboard as yet unavailable to the majority of the worlds' cartoned milk consumers. We have seen a major industrial project in Tasmania abandoned in the face of impossible environmental constraints. Linked with this an apparently serious suggestion that dioxin could be avoided in an office situation by changing to unbleached paper supplies.

In New Zealand pesticide residues will attract public attention as a hidden peril in our food

while the agricultural industry at large continues to strive with all its products to keep them free from a myriad of live and dead pests, and the residues of the carefully selected chemicals used to kill them, to satisfy an army of trade barrier oriented inspectors overseas. The ozone layer and the greenhouse effect both continue to get an airing with only a slight understanding of what may or may not be happening. With the Commonwealth Games imminent, performance enhancing drugs for athletes continue to receive attention with little advice to readers on what they are or how difficult and costly they are to detect in users. (On these last two topics the Auckland Branch is to be commended on its initiative in holding public meetings).

The El Dorado of safe limitless energy from nuclear fusion

has been tantalisingly reported, refuted, confirmed and again refuted by groups of chemists around the world. At least one NZIC Member overseas is known to have been working on the topic with one of the 'no result' teams.

Our fear of nuclear matters continues to be enhanced by reports of the loss of a nuclear submarine, the loss of a nuclear bomb into the sea 22 years ago and the leakage of a few tonnes of heavy water from a reactor all comments ignoring natural background radiation and the greater risk of such damaging events as motor vehicle accidents.

In an age when chemistry is being used effectively for the betterment of mankind to an unprecedented degree in all his undertakings we as professional chemists seem to be becoming less and less important in the scheme of things to the extent in

some cases of being held in public disrepute. Politics and vested interest attitudes are more important than rational factual appraisals. The funding of Research & Development and the maintenance of publicly funded establishments which are centres of excellence for a wide range of technologies crucial to the long term welfare of the nation is either undergoing or under threat of major change to a condition of reduced funding and short term thinking.

This Journal should be the vehicle for informed opinion on a variety of topics and be one of the means by which we as chemists maintain a high but not necessarily controversial profile.

The editor will be happy to receive articles on public arena issues whenever the membership feels moved to produce them.

R B Hall



1989 NZIC/NZBS CONFERENCE

21-24 August,
University of Waikato, Hamilton.



Final arrangements are now being made subsequent to the inclusion of general information about the conference, the first and final call for papers, and a registration form with the April issue of *Chemistry in New Zealand*. We hope you will be able to attend this year's conference and urge you to register as soon as possible, if you have not already done so.

PLENARY SPEAKERS AND EASTERFIELD ADDRESS

The following are biographies of some of the principal speakers who will be attending the conference.

PROFESSOR HOWARD REISS

Professor Reiss was a participant in the Manhattan Project (1944-46) and after completing his PhD thesis on "Moving Boundary Effects in Colloidal Systems" (Columbia University 1949) he worked briefly as an instructor/assistant professor at Boston University. He then commenced his influential researches in nucleation phenomena and interfacial physical chemistry.

In 1952 he joined Bell Telephone Laboratories, where he

made the first of his many important contributions to semiconductor physics and defect dynamics. He also formulated the scaled particle theory and hard particle fluids, to which he returned regularly and fruitfully in later years.

In 1962 Professor Reiss was invited by North American Aviation to build a state-of-the-art pure research laboratory in Southern California. He accepted and staffed this establishment with an exceptionally talented group covering most of the key subdisciplines in chemistry, physics and materials science. He led this group by personal example.

In 1968 Professor Reiss joined UCLA as a professor of chemistry. He continued to pursue his diverse interests in nucleation phenomena, solid-state chemistry, and the statistical mechanics of simple fluids. He also initiated many challenging new research programmes in gas phase polymerisation and ion transport in membranes.

Professor Reiss has won many prestigious awards for his research, including the Tolman Medal (1973) and the Kendall Prize in Colloid and Surface Science (1980), and he was elected to the National Acad-

emy of Sciences in 1976. He has delivered plenary talks and endowed lectures throughout the world and has regularly been consulted by professional societies, universities, government agencies and industry. He was founding editor of both the *Journal of Statistical Physics* and *Progress in Solid State Chemistry*.

PROFESSOR BRUCE STONE

Professor Stone was appointed Foundation Professor of Biochemistry at La Trobe University in 1971 and is currently Dean of the School of Biological Sciences. He took his first degree at the University of Melbourne in 1948 and after a period in the laboratories of the Department of Supply at Maribyrnong and the Commonwealth Mycological Institute, Kew, Surrey, obtained his PhD in Biochemistry at University College in London in 1954. After holding a Post Doctoral Fellowship at the National Research Laboratories, Ottawa and an ICI Research Fellowship, at University College London, he returned to Australia in 1958 to take up a Lectureship in the Russell Grimwade School of Biochemistry, University of Melbourne.

Professor Stone's research interests and publications are in polysaccharide and polysaccharide-protein chemistry and biochemistry with particular emphasis on the structure and biosynthesis of plant wall polysaccharides and the specificity and action patterns of polysaccharide hydrolases. He is co-author of a treatise on the "Chemistry & Biology of (1'3)- β -Glucans". Many of his investigations have been concerned with cell walls of cereal grains. He was the recipient of the Royal Australian Chemical Institute, Cereal Chemistry Division, F B Guthrie Medal for Cereal Chemistry in 1985. He is a member of the Editorial Boards of "Carbohydrate Polymers" and the "Journal of Cereal Science".

Professor Stone served as Victorian Representative on the ABS Council (1966-69) as Chairman of the Organising Committee of the La Trobe Meeting (1975) and was Chairman of the Standing Committee on Education (1969-71). During 1981-85 he was a Member of the Queen Elizabeth Fellowships and Australian Research Grants Committee. Since 1982 he has been a member of the Victorian Wheat & Barley Research Committees and is Aus-

ANNUAL CONFERENCE

tralian Representative to the International Carbohydrate Organisation, he served as Chairman of the Royal Australian Chemical Institute, Cereal Chemistry Division (1976-77)

Professor Stone has active links with chemists and biochemists in the Philippines. He was the Australian Vice-Chancellor's Committee Visiting Professor in the Department of Chemistry, University of the Philippines at Los Banos and the International Rice Research Institute 1978-79. Since 1982 he has been consultant to the Institute of Chemistry, University of the Philippines at Los Banos for the International Development Programme of Australian Universities and Colleges.

PROFESSOR WARREN ROPER

Readers are referred to the biographical details concerning Professor Roper, which were published in the April 1989 issue of "Chemistry in New Zealand" on the occasion of his being awarded the Fellowship of the Royal Society.

DR IAN MILLER

Dr Miller was born in Hokitika, 1942. Graduation BSc Hons (1) 1964, PhD 1967, both from the University of Canterbury. Undertook post doctoral research at Calgary, Southampton and Armidale, before taking up a position at DSIR Chemistry Division in 1971. Became Head of the Information Section in 1975, and the Applied Chemistry Section in 1978. In 1986 left Chemistry Division to form Carina Chemical Laboratories Ltd.

Scientific research has included synthesis and physical properties of compounds involving cyclopropane rings and carbonium ions; the chemistry, photochemistry and photophysics of

lignin related compounds and similar phenolics; the high temperature/pressure chemistry of cellulose and lignin; the chemical structure of algal polysaccharides, and some theoretical papers including the predicted consequences of strained rings, and also some quasi-classical quantum mechanical analyses of orbitals and the consequences of orbital bending.

Applied research has included energy analyses pertaining to liquid fuels production, the recycling of wastes, the production of agar, and petrochemical developments.

On a practical level, a process has been invented for recycling plastics of mixed origin and mixed colours to produce colourless pure fractions (this has been pilot tested); a process has been invented for making high quality agar from unsorted seaweed (this was the basis of a recent joint venture, but implementation has been delayed through ICINZ withdrawing from the venture); the opportunity to manufacture pyromellitates from durenene produced at Motunui was identified, and following an extensive publicity campaign carried out by Dr Miller, this project should be proceeding; and finally a new process for manufacturing agarose has been invented, and this is being implemented at Gracefield. Dr Miller was awarded the Shell Prize for Industrial Chemistry in 1988, largely as a consequence of this work.

Dr Miller is currently a Director of a number of companies including Vela Agarose Ltd (Chief Executive), Carina Chemical Laboratories Ltd (Managing & Technical), Sunrise Chemical Industries Ltd (Technical) and ICI Synchem.

PROFESSOR GRAHAM JOHNSTON

After a basic training as an

organic chemist at the Universities of Sydney (University Medal and First Class Honours in Organic Chemistry with Professor C W Shoppee, FRS FAA) and Cambridge (PhD with Lord Todd, FRS FAA, Nobel Laureate) and post doctoral training at the University of California at Berkeley (with Professor M Calvin, FMRS, Nobel Laureate) Professor Johnston opted to apply organic chemistry to the study of biological systems, in particular the central nervous system, and to investigate molecular aspects of CNS function as a neurochemist. This work was carried out at the John Curtin School of Medical Research, Australian National University, in close collaboration with Professor D R Curtis, FRS FAA, during the period 1965-1979 before Professor Johnston returned to the University of Sydney as Professor of Pharmacology in 1980. He has been Head of the Department of Pharmacology since 1983.

The investigations at ANU resulted in the discovery and development of a variety of "neurochemicals" now in widespread use in neuroscience including the GABA antagonist bicuculline, the conformationally restricted GABA agonists muscimol and THIP, the GABA uptake inhibitors nipecotic acid and ACHA, the conformationally restricted glutamate agonists ibotenic acid and kainic acid, the non-metabolisable glutamate uptake substrate D-aspartate, and the glutamate uptake inhibitor threo-3-hydroxy-aspartate. Developments resulting from work at the University of Sydney are ZAPA, a low affinity GABA agonist, and a new class of adenosine antagonists, the pyrazolo [3,4-c] pyrimidines.

Major findings from the biological studies carried out in Canberra and Sydney include

the discovery of multiple receptors for GABA, glutamate and aspartate; mechanisms for the modulation of GABA receptors by drugs such as barbiturates and benzodiazepines and by endogenous substances ("GABARINS"); the possible role of impaired uptake mechanisms for glutamate being involved in neurodegenerative disorders such as Huntington's disease; the activity of certain insecticides on GABA-benzodiazepine receptor complexes; and findings on the involvement of GABAergic mechanisms in central control of blood pressure, stress-induced analgesia and hepatic encephalopathy. Professor Johnston's latest findings are concerned with the modulation of GABA receptors by steroids, which are active at very low concentrations; steroid modulation of GABA receptors may be important during stress.

More than 240 publications have resulted from these neurochemical and neuropharmacological investigations; these publications have been extensively cited by the international scientific community and have led to Professor Johnston's being listed in The 1,000 Contemporary Scientists Most-Cited 1965-1978 by the Institute for Scientific Information and published in "Current Contents" in October 1981. Professor Johnston is ranked 4th amongst 12 Australian scientists on this list.

Professor Johnston has a close involvement with scientists concerned with the biological applications of chemistry both in Australia and internationally: he was elected council member of the International Society for Neurochemistry 1977-1981 and Chairperson of the Future of ISN Committee 1979-1983. He is Chairperson of the Organising

Continued next page

Left to right: Reiss, Stone, Roper and Miller.



ANNUAL CONFERENCE

Cont from previous page.

Committee for the 13th International Meeting of the International Society for Neurochemistry, to be held in Sydney in 1991. He is Australian Correspondent to the International Committee on Medicinal Chemistry. Professor Johnston was closely involved in the planning of the International Union of Pharmacology (IUPHAR) 10th International Congress of Pharmacology held in Sydney in August 1987, as a member of the IUPHAR International Advisory Committee, the IUPHAR National Organising Committee and Co-Chairman of the IUPHAR Scientific Programme Committee. He was leader of the Australian Delegation to the IUPHAR General Assembly in 1987.

Long term involvement with the Australasian Society of Clinical and Experimental Pharmacologists and being involved in the creation of a new division of the Royal Australian Chemical Institute resulted in a unique appointment "double" in 1986 as President of the Australasian Society of Clinical and Experimental Pharmacologists and Chairman of the Royal Australian Chemical Institute Division of Medicinal and Agricultural Chemistry.

Professor Johnston is currently President of the New South Wales Branch of the Royal Australian Chemical Institute and a member of the National Committee for Pharmacology of the Australian Academy of Science. He is also a member of the Medical Research Advisory Committee of the Australian Nuclear Science and Technology Organisation.

Active in the promotion of Biomolecular design as a major R & D growth area in Australia, Professor Johnston organised the Boden Conference on this topic in 1988 and has been developing a biomolecular graphics unit at the University of Sydney in collaboration with Professor H C Freeman, FAA, for a state-of-the-art computer graphics molecular modelling installation.

He has been instrumental in obtaining the approval of the University of Sydney Senate for the setting up of a Centre for Toxicology to promote teaching and research in toxicology in Australia, with a particular interest in the toxicological assessment of new medicinal and agricultural chemicals developed in Australia.

Professor Johnston is a member of the Editorial Boards of the following international scientific journals:

Brain Research, Clinical & Experimental Pharmacology & Physiology, Epilepsy Research, European Journal of Pharmacology—Molecular Pharmacology, Journal of Neuroscience Methods, Molecular Brain Research, Neurochemistry International



G. Rewcastle

Visiting Lectureships for 1989 are:

Inaugural Australasian Visiting Lecturer to the British Pharmacological Society and Royal Australian Chemical Institute Lecturer to the New Zealand Institute of Chemistry.

Professor Johnston's current research is funded by a Programme Grant, "Neurochemical Pharmacology of Synaptic Transmission in the Brain" from the National Health & Medical Research Council of Australia (\$405,000 in 1989) a Project Grant, "Synthetic Derivatives of Bicuculline for Pharmacological and Immunological Investigation of GABA Receptors" from the Australian Research Grants Scheme (\$30,000 in 1989) and a Research and Development Contract, "New Neuroactive Drugs" with Australasian Drug Development Ltd (\$165,000 in 1989).

DR GORDON REWCASTLE

Readers are referred to the biographical details concerning Dr Rewcastle, which were published in the December 1988 issue of Chemistry in New Zealand, when it was announced that he was the winner of the 1988 Easterfield Award.

The title of Dr Rewcastle's Easterfield Address will be "Synthesis and Development of two

new Classes of Anticancer Drugs: The Tricyclic Carboxamides and Xanthoneacetic Acids". He will be discussing both the chemistry involved in the synthesis of these classes of compounds, as well as the rationale behind their development.

DR SYLVIA RUMBALL

Dr Sylvia Rumball is a Reader in the Department of Chemistry and Biochemistry, Massey University. She has an MSc (First Class Honours) in Chemistry from Canterbury University, a PhD from Auckland University and post doctoral experience at Oxford University and Cornell University. In 1986, she spent a period at the University of California (Davis) and the Dunn Institute Cambridge UK.

Dr Rumball was appointed to the staff in 1967. From 1972 onwards her appointment has been part time to allow for the bringing-up of four children. She has been involved in chemistry teaching at all levels, internal and extramural, and a multidisciplinary course on "Human Lactation & Infant Feeding" in the Social Sciences Faculty, and has also been actively involved in extension work. Her research interests have centred on the structure and function of the human milk protein, lactoferrin, and the biochemistry of human milk, and the role of human milk in infant nutrition and development.

Dr Rumball is the staff representative on the Professorial Board, and is a member of the Form 7 Programme Advisory Committee, Human Ethics Committee, AUT Committee, and the Status of Academic Women Committee. She is also a consultant for the La Leche League (NZ) and the International Lactation Consultant Association. Dr Rumball is actively involved in promotion in science. She is president of the interim Science Centre Board (Manawatu) which is promoting the setting up of an interactive science centre in the Manawatu and is chief judge for the Hawkes Bay Science Fair.

DR BOB BUCKLEY

Dr Buckley was an undergraduate at Massey University and obtained his PhD in Physics at Victoria University, Wellington. He has been a Post Doctoral Fellow in Physics at Simon

Fraser University, Vancouver, Canada (1979-1981) and a Visiting Scientist, Exxon Research & Engineering Co., Annandale, NJ, USA (1987)

Dr Buckley has worked in the Materials Group, Physics and Engineering Laboratory, DSIR, since 1981, and is a Section Leader.

MR DAVID FROW

Dave Frow was born in Durban, South Africa and graduated with a degree in mechanical engineering from the Natal University in Durban.

In 1971 he joined the Electricity Supply Commission (ESCOM) in South Africa and spent some years on operations at the Arnot Power Station commissioning the 6 x 350 megawatt units.

In 1974 he received a Confederation of British Industries Scholarship and spent 14 months obtaining practical experience in the United Kingdom with CA Parsons Limited, and Babcock & Wilcox Limited. The former included steam turbine manufacturing and design experience, and the latter included nuclear reactor construction and maintenance experience.

On returning to South Africa in 1975 he continued his career with ESCOM in charge of engineering services and maintenance at various stations including the Malta Power Station (6 x 600 megawatt). This position included responsibility for the station chemistry department with its very sophisticated water treatment plant.

In 1979 Dave travelled with his family to New Zealand to take up the position at New Zealand Electricity's new Huntly Power Station (4 x 250 megawatt). After a number of years as Station Engineer in charge of engineering services, he became Station Manager at Huntly. The Station Engineer role included responsibility for the station chemistry section.

In 1987 he was appointed as General Manager of Electricity Production in the newly formed Electricity Corporation of New Zealand Limited. His current responsibilities include the overall management of the Corporation's 40 power stations.

He is a Director on the Board of Trans Power New Zealand Limited who manage and operate the entire New Zealand national transmission system.

ANNUAL CONFERENCE:

SYMPOSIA AND OTHER MEETINGS

An outline of the symposia and meetings being organised was given in the April 1989 issue of "Chemistry in New Zealand". Further information is now available concerning the following sessions.

CELL WALL BIOCHEMISTRY SYMPOSIUM

Professor Bruce Stone's plenary lecture will form part of this symposium.

Contributions to this symposium will also be given by:

Dr Phillip Harris, University of Auckland, who will give "An overview of the composition of plant cell walls, and the diversity of interest in plant cell walls in New Zealand".

Dr John Munro, DSIR, Biotechnology Division, who will talk about "Aspects of plant cell wall (fibre) in relation to ruminant nutrition".

Dr Michael Hobbs, Department of Food Science, University of Otago, who will give an address entitled "Aspects of plant cell walls in relation to fruit ripening".

Professor Roy Daniel, University of Waikato, who will present information on "Enzymes for the degradation of cellulose and hemicelluloses".

The AGM of the New Zealand Biochemical Society is to be held at:

5:00 pm, Tuesday
22 August 1989.

CHEMICAL INDUSTRY—EDUCATION INTERFACE FORUM

In this time of rapid change both in education and in manufacturing there is an urgent need for effective interaction between chemical educators and the chemical industry.

Recently there has been significant progress and cooperation in defining issues of mutual concern and interest such as the symposia organised by the New Zealand Royal Society and by STAC. There is real willingness to proceed from dialogue to action and this FORUM provides an important opportunity for all interested chemists to contribute to the directions this cooperation should take. Educators, industrialists and students are particularly urged to attend.

An invited panel will introduce the main issues and perspectives. There will then be an opportunity for wide-ranging discussion. The panel will include representatives from:

STAC (Science & Technology Advisory Council)
Royal Society Standing Committee on Education
New Zealand Chemical Industry Council
Education
Industry

Some Issues . . .

How can the Chemical Industry best contribute to Education?

How can Educators best accommodate the reality of Industry?

What are the employment prospects for chemistry students?

How should New Zealand Chemical Industry be incorporated into chemistry syllabuses?

What effective mechanisms are there for enhancing Industry-Education cooperation?

FORMATION OF A PHYSICAL CHEMISTRY GROUP — INAUGURAL MEETING

At an informal meeting at Palmerston North during the 1988 Conference a motion was passed to the effect that steps should be taken to set up a Physical Chemistry Group within the NZIC framework. It was generally agreed that the time was right to provide a vehicle for enhancing the interactions between NZIC Members who identify with Physical Chemistry in general or specific ways. Suggested activities for the group included mini-conferences, symposia and a newsletter. At present Physical Chemists may belong to the Thermodynamics Group and/or the Electrochemistry Group but in the majority of cases do not have a specialist grouping in other areas.

It is hoped and intended that the Thermodynamics Group and the Electrochemistry Group will become part of the new Physical Chemistry Group (though the Electrochemistry Group may wish to retain an identity in the meantime). It seems both desir-

able and likely that sub-groupings in Colloid & Surface Science, Spectroscopy, Radiochemistry, Applied Physical Chemistry, Reactions & Mechanisms etc. could be encouraged by the formation of an umbrella organisation.

Please send your comments and suggestions regarding the formation of a Physical Chemistry Group to: **Dr's A G Langdon & A M Cartner**, Dept of Chemistry, University of Waikato, Private Bag, Hamilton.

The inaugural meeting of the group will be held during the Physical Chemistry Specialist session of the 1989 Conference. The session will receive invited lectures from Professor H Reiss (UCLA) on "Conducting Polymers", and Professor R Giordano (Messina, Italy) on "Neutron Scattering in Macromolecular Solutions". Additional review-type research papers will be invited from the physical chemistry community once we have received the abstracts for oral and poster presentations.

Further Information

If you have any queries regarding this year's conference, please do not hesitate to contact:

The Conference Secretary, Dr Lyndsay Main, Department of Chemistry, University of Waikato, Private Bag, Hamilton, or any of the specialist group session organisers listed in the February 1989 issue of "Chemistry in New Zealand".

OTHER CONFERENCES, SYMPOSIA

EuAsC₂S 2nd EurAsia Conference on Chemistry In Seoul, Korea 16—20 April, 1990

This large English language conference will have sessions on:

- Bio inorganic Chemistry
- Computational Chemistry
- Coordination Chemistry
- Environmental Chemistry
- Natural Products Chemistry
- Organometallic Chemistry
- Polymer Chemistry
- Solid State Chemistry
- Solution Chemistry

A number of distinguished chemists from Europe, USA, Australia and Japan will attend

as plenary or invited lecturers or organisers of mini symposia. All correspondence should be addressed to:

Professor Youngkyu Do
Secretary EuAsC₂S - 1990
Dept of Chemistry KAIST
Cheongryang P O Box 150
Seoul 130-650
KOREA

32nd IUPACC Congress
Stockholm
2-7 August 1989

Organised by the Swedish
National Committee for
Chemistry

For details of this international Congress refer to the April edition of Chemistry in New Zealand

The Australian Corrosion Association (Inc) is to present a symposium entitled "Corrosion Control in Industrial Water Systems"

Subjects to be covered during the one-day symposium will include;

Boiler & Cooling Water Corrosion Control & Treatment, Pre-Treatment of Water Systems, Costs of Non-Treatment, Experiences of Large Industry, and discussion of General & Specific Inhibitors & Coating Systems. Corrosion Monitoring & Cathodic Protection will also be covered.

An overseas speaker is to open the symposium with a Keynote Address and a panel discussion will finish the day.

The Symposium is to be held in Auckland on 13 July 1989 at DSIR, AIDD Brooke House, 24 Balfour Rd, PARNELL

COST:
ACA MEMBERS
.... \$140
NON MEMBERS
.... \$170

Cost includes morning and afternoon teas, lunch and the proceedings of the symposium.

Further information contact the Symposium Convenor, Evan Jones, Portals NZ Ltd, P O Box 13558, Auckland. Phone (09) 641 079 Fax (09) 640 782 or Rex Lyndon, Gamlen Chemicals Ltd, P O Box 14258, Auckland. Phone (09) 592 799 Fax (09) 595 790

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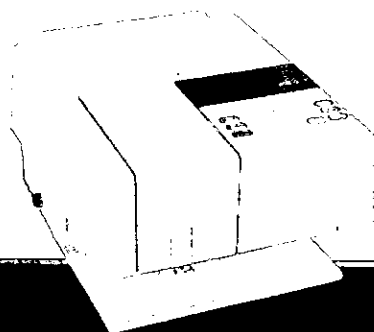
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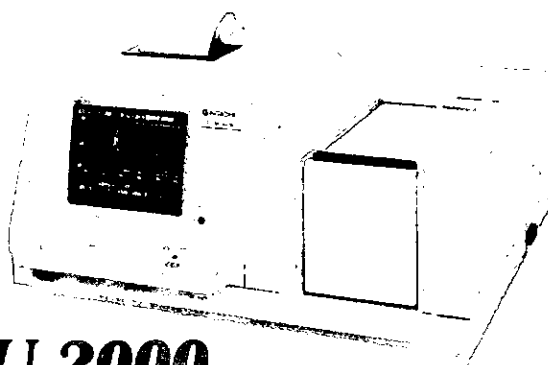
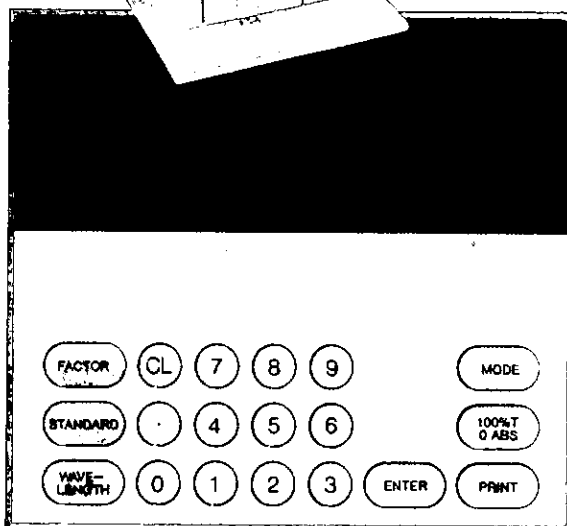
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Lavoisier's *Traite Elementaire De Chimie* (1789)

David V. Fenby, Department of Chemistry, University of Otago, Dunedin.

March 1789—the publication of the *Traite Elementaire de Chimie* by Antoine-Laurent Lavoisier (1743-94) (Figure 1), an important event in the Chemical Revolution.

July 1789—the fall of the Bastille, the symbol of the French Revolution.

In this bicentenary year, it is tempting to begin with words used by Wurtz in introducing his history of the subject: "Chemistry is a French science; it was founded by Lavoisier of immortal memory."¹ Such a view, while understandable as part of the patriotic fervour of the time (the eve of the Franco-Prussian *debacle*), is, however, not one that I propose to defend. Lavoisier himself insisted that the New Chemistry should be thought of as Lavoisier's Chemistry and not French Chemistry.²

The Chemical Revolution

The Chemical Revolution - so many have written about it; so few have stated what they understand by the term. I use it to denote the great reform in chemical theory and nomenclature that took place towards the end of the 18th century. Lavoisier's pre-eminence in this is comparable to that of Newton, Darwin and Einstein in other scientific 'revolutions'. Arguably, the Chemical Revolution can be said to have commenced in 1772, the 'Crucial Year'³ in which Lavoisier performed the first of his recorded experiments on combustion. The publication of Lavoisier's *Traite*, in which the New Chemistry was presented by its principal architect, marks the conclusion of the Chemical Revolution.

In 1753, Venel pointed to the need for a revolution in chemistry, one that would place the subject at least on a par with theoretical physics. With prophetic insight, he predicted that this would require 'an able, enthusiastic and bold chemist.'⁴ Soon after his first experiments on combustion, Lavoisier outlined a research programme which he believed would bring about 'a revolution in physics and in chemistry.'⁵ In 1790, Lavoisier sent copies of his *Traite* to Benjamin Franklin; in the accompanying letter, he referred to "a revolution [in chemistry] which has been accomplished since you left Europe, a revolution that I look upon as well advanced or even as completely finished."⁶ Lavoisier's contemporaries, including his opponent Joseph Priestley, recognised his work as a revolution in science, but it was only following the publication in 1890 of Marcelin Berthelot's *La Revolution Chimique: Lavoisier*, that the term Chemical Revolution received its present-day currency.

With the Chemical Revolution, chemistry finally emerged as an autonomous discipline. At the beginning of the 18th century, chemistry was not yet free from alchemy; its status was that of a mere handmaid to medicine and pharmacy or that of a branch of Newtonian physics. At the end of the century it stood as an independent subject, one in which the material world was described using a 'chemical' systematic language and explained using a 'chemical' theoretical framework. The next major advance came early in the 19th century when Dalton merged Lavoisier's picture of the material world with an atomic model.

Traite

Lavoisier's *Traite* was first published in Paris in March 1789; the title page is shown in Figure 2. The work enjoyed a



Figure 1 Antoine-Laurent Lavoisier (1743-94).

wide circulation; in the two decades following its first appearance, there were more than 20 editions published in seven countries. (I will quote from the English translation by Robert Kerr in 1790⁷.)

The *Traite* is often grouped with works such as Copernicus's *De Revolutionibus Orbium Coelestium* (1543), Newton's *Principia* (1687), and Darwin's *The Origin of Species* (1859). While it is undoubtedly one of the classics of science, it differs in two respects from most of the books in this category: first, it was written, as the title indicates, as an *elementary* textbook; second, most of its contents had appeared in earlier publications by Lavoisier and coworkers. The *Traite* was not even the first introductory textbook in which the New Chemistry appeared; the new theory and nomenclature were in the third edition of Fourcroy's *Elemens d'histoire naturelle et de chimie*, which, although dated 1789, appeared in December, 1788.

Lavoisier introduced the *Traite* with a *Discours preliminaire*, an important and much analysed essay in which he outlines the background to the book, the philosophical principles on which it is based, and its contents. His initial objective in writing the *Traite* was to elaborate upon a *Memoire*, dealing with a new chemical nomenclature, which he had read to the *Academie Royale des Sciences* in April, 1787. However, being unable to separate the language of the subject from the subject itself, Lavoisier found that the work became an elementary textbook on chemistry.

In stressing the importance of language, not merely for descriptive purposes but as the essential tool in reasoning, Lavoisier was a disciple of Condillac, a French philosopher who was influenced by Newton and Locke. Observation and experiment were, Lavoisier stated, of central importance: "I have imposed upon myself, as a law, never to advance but from what is known to what is unknown; never to form any conclusion which is not an immediate consequence necessarily flowing from observation and experiment."⁸ Here, Lavoisier echoes, as so many had throughout the 18th century, Newton's *Hypotheses non fingo*. The importance that Lavoisier attached to experiment is strikingly evident throughout the *Traite*: many experiments, both his own and those of others, are reported, some for the first time; in a novel departure from what was customary, a major part of the book deals exclusively with

TRAITE ÉLÉMENTAIRE DE CHIMIE,

PRÉSENTÉ DANS UN ORDRE NOUVEAU

ET D'APRÈS LES DÉCOUVERTES MODERNES;

Avec Figures :

Par M. LAVOISIER, de l'Académie des Sciences, de la Société Royale de Médecine, des Sociétés d'Agriculture de Paris & d'Orléans, de la Société Royale de Londres, de l'Institut de Bologne, de la Société Helvétique de Basle, de celles de Philadelphie, Harlem, Manchester, Padoue, &c.

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Sous le Privilège de l'Académie des Sciences & de la Société Royale de Médecine.

Fig 2 Title page of Volume 1 of the first edition of the *Traite*, published in Paris in March, 1789.

experimental techniques. But Lavoisier's statements in the *Discours préliminaire* and the conspicuous role of experiment in the *Traite* must not lead one to underestimate the role of his fertile imagination; many of the experiments are intimately connected with Lavoisier's theoretical ideas. Indeed later in the book, Lavoisier acknowledges the role of 'guess-work': "It is difficult, in our endeavours to discover the principles of a new science, to avoid beginning by guess-work; and it is rarely possible to arrive at perfection from the first setting out."⁹

Following the *Discours préliminaire*, the *Traite* is divided into three parts:

- Part I — on the formation and decomposition of aeriform fluids [gases], on the combustion of simple bodies [elements], and on the formation of acids.
- Part II — on the combination of acids with salifiable bases, and on the formation of neutral salts.
- Part III — on the instruments and operations of chemistry.

The work was illustrated by 13 folding plates engraved from drawings by Madame Lavoisier. As an elementary textbook, the *Traite* was unique: it incorporated Lavoisier's theories; it presented the new chemical nomenclature; the subject matter was treated in a novel way.

The New Chemistry involved several interconnected parts. In the following sections I will consider these as they appear in the *Traite*. The Chemical Revolution can then be seen in broad perspective; contrary to popular opinion, it involved much more than the downfall of the phlogiston theory of combustion.

Matter

(1) Elements

Lavoisier divided the material world into simple substances (elements), those that had not been decomposed ("the last

point which analysis is capable of reaching"¹⁰) and combinations of these (compounds). In the *Traite*, he provided a table of the simple substances (Figure 3), usually considered as the first table of elements, and several tables of combinations of these simple substances.

Lavoisier's simple substances, which soon became the elements familiar to us today, are actual substances, the nature and number of which were established experimentally. They stand in marked contrast to earlier elements: the earth, air, fire and water of the Greeks; the salt, sulphur and mercury of Paracelsus; the water of Helmont; etc. Such elements were metaphysical, ideal substances: each entered into the composition of all substances, but could not exist in isolation; each possessed certain qualities or forms, the sum of which led to the properties of matter; change in form led to the transmutation of one element to another.

In defining his simple substances on an operational basis, Lavoisier accepted that the list would change. In the table (Figure 3) in the *Traite*, for example, he included certain earths (lime, magnesia, etc) because they had so far resisted decomposition, but he conjectured that they were in fact compounds.

(2) Caloric

Light and caloric (the matter of heat) are the first two simple substances listed by Lavoisier. Of the former, he says little; caloric, however, is of central importance in his chemistry.

At the microscopic level, Lavoisier's world is one of particles subject to opposing forces: a natural attraction and a repulsion caused by the presence of caloric. Such forces give rise to chemical phenomena. For example, a substance can exist in solid, liquid and gaseous states according to the quantity of caloric it contains. Hence, a gas such as oxygen was a compound of an oxygen base and caloric; when Lavoisier wrote of the 'decomposition' of oxygen gas, he referred to the disengagement of caloric when, for example, oxygen reacts with certain metals. In the *Traite* there were many references to a world of interacting particles, but Lavoisier did not elaborate, considering the topic unsuitable for an elementary book.

Throughout the *Traite*, caloric is usually treated as a real substance, one made up of mutually repelling particles. With the development of the concept of energy in the mid-nineteenth century, it was accepted that heat is not material and that it is not conserved; Lavoisier was wrong. Possibly because of this, the role of caloric in Lavoisier's work has seldom received the emphasis that it deserves. His chemistry was a system within which caloric occupied a pivotal position.

(3) Conservation of Matter

Although Lavoisier was not the first to assume the conservation of matter, the *Traite* contains, as far as I know, the first statement of such a principle:

"We may lay it down as an incontestible axiom, that, in all the operations of art and nature, nothing is created; an equal quantity of matter exists both before and after the experiment"¹¹

Gases

(1) The 'aerial dimension'

In his *Traite*, Lavoisier discusses several experiments showing that air and water, the elements of Greek antiquity, were not simple substances; "that atmospheric air is composed of two elastic fluids [gases] of different and opposite qualities,"¹² and "that water is composed of two elements, oxygen and hydrogen."¹³ Such views, so unexceptional today, differed dramatically from those of the mid-eighteenth century. At that time, air, the only recognised gas, and heat were usually assumed to be 'instruments', physical agents which, while playing an essential role in much chemical reactivity, were not involved chemically. With Lavoisier, air (and later, as they were

discovered, the various gases) and heat became chemicals, reactants and products in chemical reactions. According to Guerlac, the first and decisive step in the Chemical Revolution was Lavoisier's recognition that air could play a chemical role,¹⁴ that gases had to be included in the chemical bookkeeping. Chemistry had acquired a new 'aerial dimension.'¹⁵

(2) Combustion

Combustion and calcination (metal + metal oxide) reactions are central in Lavoisier's work on the chemical reactivity of air (and later, various gases). The factors that lead him in 1772 to consider such reactions and, in so doing, to propose that air was chemically involved have been detailed elsewhere.³ This analysis suggests that his original object was to explain effervescence. In assigning a chemical role to air, Lavoisier was extending a concept that he had developed concerning heat. He believed that heat, air and water could exist in two forms, fixed and free, in a substance, and that in the fixed form they were chemically united.

In the mid-eighteenth century, the phlogiston theory, founded by Becher and developed by Stahl, was widely accepted. This held that all combustible substances and metals contained a principle, phlogiston, which was released during combustion and calcination reactions, this sometimes resulting in heat and light. Lavoisier proposed that such reactions involved a chemical combination with air (or, following its discovery, with oxygen) during which caloric in the gas is disengaged, this accounting for the heat and light that often accompany such reactions. The debate between phlogistonists and anti-phlogistonists was so vociferous and has received so much analysis that, for many, it is synonymous with the Chemical Revolution.

The *Traite* was not a direct assault on the phlogiston theory; this had been launched earlier. The object was to present Lavoisier's chemistry in broad perspective; phlogiston is mentioned, but only incidentally.

(3) Oxygen

While Lavoisier did not discover oxygen (Priestley and Scheele independently did so), he did recognise its significance in combustion, calcination and respiration. The gas became central within his chemistry; it followed light and caloric in his table of simple substances (Table 3). Lavoisier believed that oxygen, or strictly the oxygen base, is the principle of acidity; indeed its name derives from this assumption. He confidently predicted that muriatic acid [HCl] "like all other acids, is composed by the union of oxygen with an acidifiable base"¹⁶. In showing that this was not so, Davy demonstrated the Lavoisier's theory of acidity is incorrect.

Nomenclature

The second half of the 18th century saw a great increase in the number of known substances, and the traditional, unsystematic terminology [based on physical properties (colour: *plumbum nigrum*; texture: *butter of antimony*; taste: *sugar of lead*), people (*powder of Algaroth*), places (*terra anglica rubra*), medicinal properties (*specificum purgans Paracelsi*), method of preparation (*spirit of vitriol*), etc] became increasingly untenable. Not only was the language increasingly burdensome, but it was often ambiguous and even contradictory. The need for reform became acute. Further, philosophers such as Locke and Condillac had stressed the importance of language, and Linnaeus, with his binomial system in botany, had shown that reform was possible.

Attempts to introduce a systematic chemical nomenclature, in which Bergman, who had been a student of Linnaeus, and Guyton de Morveau were pre-eminent, culminated in Guyton's

TABLE OF SIMPLE SUBSTANCES.		
Simple substances belonging to all the kingdoms of nature, which may be considered as the elements of bodies.		
	<i>New Names.</i>	<i>Correspondent old Names.</i>
Light	- - -	Light. Heat.
Caloric	- - -	Principle or element of heat. Fire. Igneous fluid. Matter of fire and of heat. Dephlogificated air.
Oxygen	- - -	Empyreal air. Vital air, or Base of vital air.
Azote	- - -	Phlogificated air or gas. Mephitic, or its base.
Hydrogen	- - -	Inflammable air or gas, or the base of inflammable air.
Oxydable and Acidifiable Simple Substances not Metallic.		
	<i>New Names.</i>	<i>Correspondent old names.</i>
Sulphur	- - -	The same names.
Phosphorus	- - -	
Charcoal	- - -	
Muriatic radical	- - -	
Fluoric radical	- - -	
Boracic radical	- - -	Still unknown.
Oxydable and Acidifiable Simple Metallic Bodies.		
	<i>New Names.</i>	<i>Correspondent Old Names.</i>
Antimony	- - -	Antimony.
Arsenic	- - -	Arsenic.
Bismuth	- - -	Bismuth.
Cobalt	- - -	Cobalt.
Copper	- - -	Copper.
Gold	- - -	Gold.
Iron	- - -	Iron.
Lead	- - -	Lead.
Manganese	- - -	Manganese.
Mercury	- - -	Mercury.
Molybdena	- - -	Molybdena.
Nickel	- - -	Nickel.
Platina	- - -	Platina.
Silver	- - -	Silver.
Tin	- - -	Tin.
Tungstein	- - -	Tungstein.
Zinc	- - -	Zinc.
Soluble Simple Earthy Substances.		
	<i>New Names.</i>	<i>Correspondent old Names.</i>
Lite	- - -	Chalk, calcareous earth. Quicklime.
Magnesia	- - -	Magnesia, base of Epsom salt. Calcined or caustic magnesia.
Barytes	- - -	Barytes, or heavy earth.
Argill	- - -	Clay, earth of alum.
Silex	- - -	Siliceous or vitrifiable earth.

Figure 3 Lavoisier's table of simple substances; ref. 7, pp. 175, 176.

collaboration, from early 1787, with Lavoisier and coworkers. The result was a new nomenclature, one based, on Lavoisier's system, presented to the *Academie Royale des Sciences* in memoirs which were published as the *Methode de nomenclature chimique*, (1787). Lavoisier's initial intention in writing the *Traite* was to elaborate this new nomenclature.

Lavoisier's world of simple substances and combinations of these provides the basis for the new terminology. The names for compounds indicated their compositions: oxyd of sulphur, sulphurous acid, sulphuric acid. While many of the names have changed, the basis of chemical nomenclature adopted by Lavoisier and coworkers has not. In the *Traite*, Lavoisier presented many tables of compounds (some of which were unknown), often placing new and old names side by side. Some saw the dependence of the new nomenclature on Lavoisier's system as a weakness; Thomas Jefferson commented that 'One single experiment may destroy the whole filiation of [Lavoisier's] terms and his string of sulfates, sulfites and sulfures may have served no other end than to have retarded the progress of the science by a jargon ...'¹⁷ Certainly there was opposition to the new nomenclature, in particular from de la Metherie, editor of the influential *Observations sur la Physique* from 1785 to 1817. The publication of the *Traite* and also the introduction (in 1789) of a new journal, *Annales de Chimie*, by Lavoisier and supporters must be seen

within this context of opposition. They were, to some extent, vehicles of propoganda, produced to support Lavoisier's chemistry and the new nomenclature.

Conclusion

In assessing Lavoisier's significance in the history of chemistry, Guerlac commented that "If he did not create a new science *ex nihilo*, as some earlier writers believed, he and his disciples nevertheless refashioned the materials, the concepts, and even the language of chemistry so radically that, despite a long and complex early history, the science as we know it today seems almost to have been born with him."¹⁸ Lavoisier was aware that he had brought about a revolution in chemistry, a revolution that he considered finished by 1789, the year of the beginning of another revolution, one that would eventually claim his life.

In the *Traite* he presented the fruits of his labours.

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Chemical Processes in New Zealand Past, Present & Future

J. E. Packer, Chemistry Department, University of Auckland.

With the publication of a second volume of "*Chemical Processes in New Zealand*" last July, and with the project being financially successful it is perhaps time to think about future developments. In this article I would like to briefly review the history and current status of this project, and to express some thoughts on future development and to ask members of the Institute for ideas and suggestions.

Past ...

The true initiator of this project was a school chemistry teacher who asked me if the Institute could do something to make information about chemistry practised in New Zealand available to schools. Ashley Wilson, then chairman of the Auckland branch had expressed some thoughts to me that we should be doing something along these lines, so we got together and launched an appeal to industry and business backed by John Pollard, then national president. We raised \$4000 which covered all the expenses incurred in organising, typing, drawing and printing a first run of 500 copies in August 1978. Rather cheekily we sent a copy and an invoice to every secondary school in the country and the vast majority paid for and kept the copy. The demand was such that we printed a further 500 copies in December 1978 and another 500 in June 1979. These were all printed by Maxwell Printers in Auckland. In August 1985 we printed a further 300 at the Auckland Technical Institute.

Three articles from a recently given refresher course for

teachers at Victoria University gave us a start for material. The audience targeted initially was 6th & 7th form students and their teachers. To this end, as far as possible, articles were written jointly by a school teacher (or in a few cases by my bright 1st year university students) and a professional chemist involved in the particular process. This approach with considerable editorial input (Anna Brooker editing the section on metals) resulted in most articles being of 7th form level with the importance of basic principles then in the 7th form prescription being highlighted. What I did not anticipate was the much wider audience which the book attracted. Many members of the Institute bought copies and it became widely used as a source book in engineering schools, technical institutes and training colleges.

Editing was complete at the end of 1977 when I left for a year's sabbatical leave and a committee of Robyn Dormer, Laurence Evers, Frances Gifford & Milton Gibson completed the proof reading, engaged a printer and set up the organisation for sales and distribution. From the outset until the present time Frances has acted as treasurer and Milton as sales and distribution manager. Each year the finances have been audited by the auditor of the Auckland branch and the balance sheet been available at the Auckland branch AGM. However the project has been run quite independently of the Auckland branch.

When it was felt that enough new chemistry existed for a second volume (as distinct from a second edition) a second appeal for funds was launched with the support of Alan

Mackney, then national president, and a further \$7000 raised. This has allowed the printing of 1500 copies at the Auckland Technical Institute without going into the red. Unfortunately pressure of other work prevented me organising teacher-professional chemist cooperation on the same scale as previously, and on the whole articles in volume two have been written by professional chemists with less editing to make them more suitable for 7th formers.

My aim was to have all the material for volume two collected and edited by the end of 1984 when I was again going on leave, but I fell well short of this. Roger Whiting offered to become co-editor and carry on the project in 1985. Roger had edited and had had all material typed by the end of 1985. However there were still a number of promised articles which we thought were essential for volume two which had not materialised. So there was a further delay while we extracted these articles and the second volume came out three years later than I had originally planned.

A major consideration in producing both volumes has been to keep costs to a minimum so schools can afford to buy them. Thus money was not spent on artists to make high class drawings or diagrams. The development of word processors and laser printers allowed the quality of print in volume two to be much improved. Had programmes such as Chemdraw & Macdraw become available two years earlier the whole appearance of volume two would have been greatly improved. Developments in this area ensure that future publications can be made to look much more professional without incurring additional expense.

Present ...

At the moment the affairs of this project are in the hand of a committee of four, Frances Gifford, Milton Gibson, Roger Whiting and myself with sales of volume two progressing reasonably steadily. We have over \$8000 in the bank available for future developments. Because of the current economic situation we did not like to send all schools an unsolicited copy of volume two as we did with in 1978 with the first publication.

Future ...

It is 11 years since the original publication and consequently a considerable amount of material is now out of date. Thus I think we should now start planning for a new edition with the intention of publication about the end of 1993. This raises a

number of questions which I would like members and possible users of a new edition to think about and send me their ideas and suggestions.

- 1 Should we update all existing processes in both volumes?
- 2 Should we identify new processes and obtain new articles?
- 3 At what level should the article be pitched?
- 4 Where do we draw the boundary between Chemical Processes and Consumer Chemistry?
- 5 What information on employment, turnover, output etc. would be of interest?
- 6 How do we go about tackling a new edition?

My own view on questions 1-3 are yes, yes, and on the whole to a 7th form level with a proviso that there may be some articles which could be written for a younger audience, and some which might not be appropriate to secondary students but which would be of interest to appreciable numbers of institute members or certain groups of tertiary students. But in general I believe the articles at a 7th form level are most appropriate. There is no clear boundary between processes and consumer chemistry, and no doubt consumer aspects of chemistry are of considerable interest to schools. But to expand too far into this area could result in too large a publication. We really do need information on question five. To use the modern terminology (which appalls me) what do the "consumers" want?

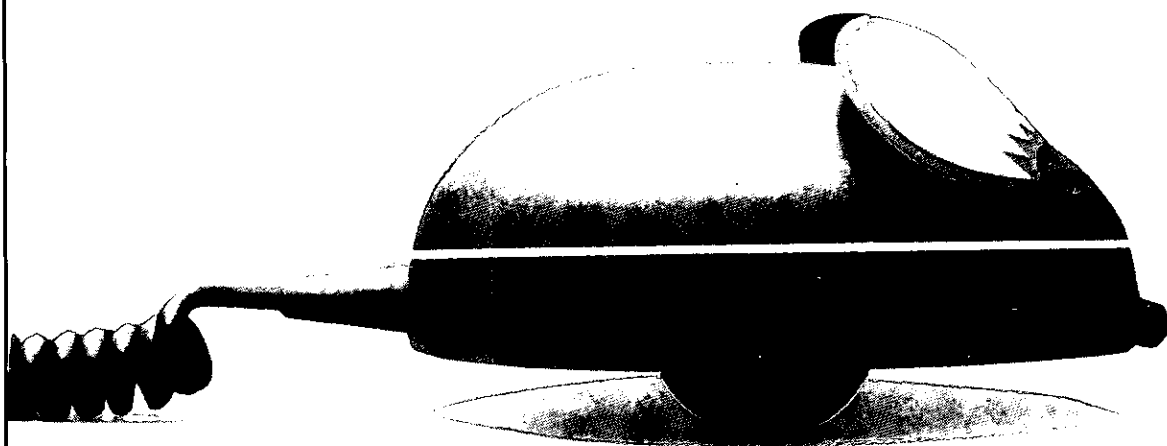
Now to question six. A new edition will be a major project and involve much work for many people. We need to identify the processes and organise people to be responsible for producing articles on them. It might be appropriate to have several editors each taking on the job of arranging for the writing or revising of a group of related articles. Do we attempt to make use of teacher/professional chemist combination again? Are there teachers, probably in the tertiary area, who give their students projects which would produce essays or information that could be used in a new edition? Are there members, perhaps retired with time on their hands, who would like to become involved?

Please write to me with your thoughts on the future direction that "Chemical Processes in New Zealand" should take, with suggestions, ideas or offers of help and willingness to become involved.

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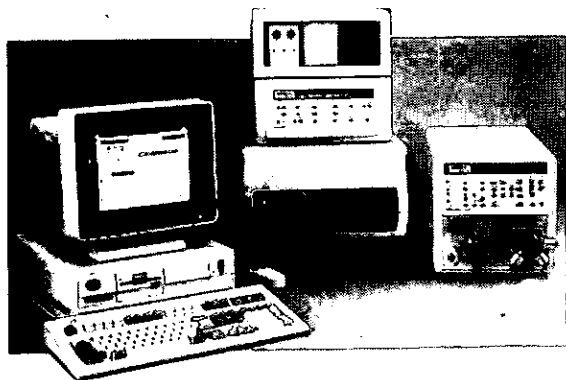
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Mr D. S. Winter, Technical Manager, Southland Co-op Phosphate Co. Ltd
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If the goniometer is scanned over its angular range a record of 2θ against intensity is obtained. Since the value of 2θ is fixed, each peak will correspond to a certain wavelength. Tables of 2θ vs atomic number and wavelength are used to identify the chart.

In analysis mode the goniometer is motor driven to the specific angles at which peak intensities occur for the elements of interest in the specimen and photon counts accumulated.

On a modern spectrometer up to 360 samples can be loaded and analysed under computer control for as many elements as desired.

The first stage in X-ray analysis is to prepare a homogenous sample free of dust and moisture and of a size suitable to the sample handling system of the spectrometer. A portion of sample is ground in a ring and puck mill, or similar, for a time suitable to reduce particle size effects when the sample is irradiated. This can vary from 10 seconds to 10 minutes depending on the sample type.

The second stage is to press the powder into suitably sized disks. We use our own design of press capable of up to 75 tonnes over a 50 mm diameter. If the sample is not self supporting, PVA or similar agents can be added as binding agents.

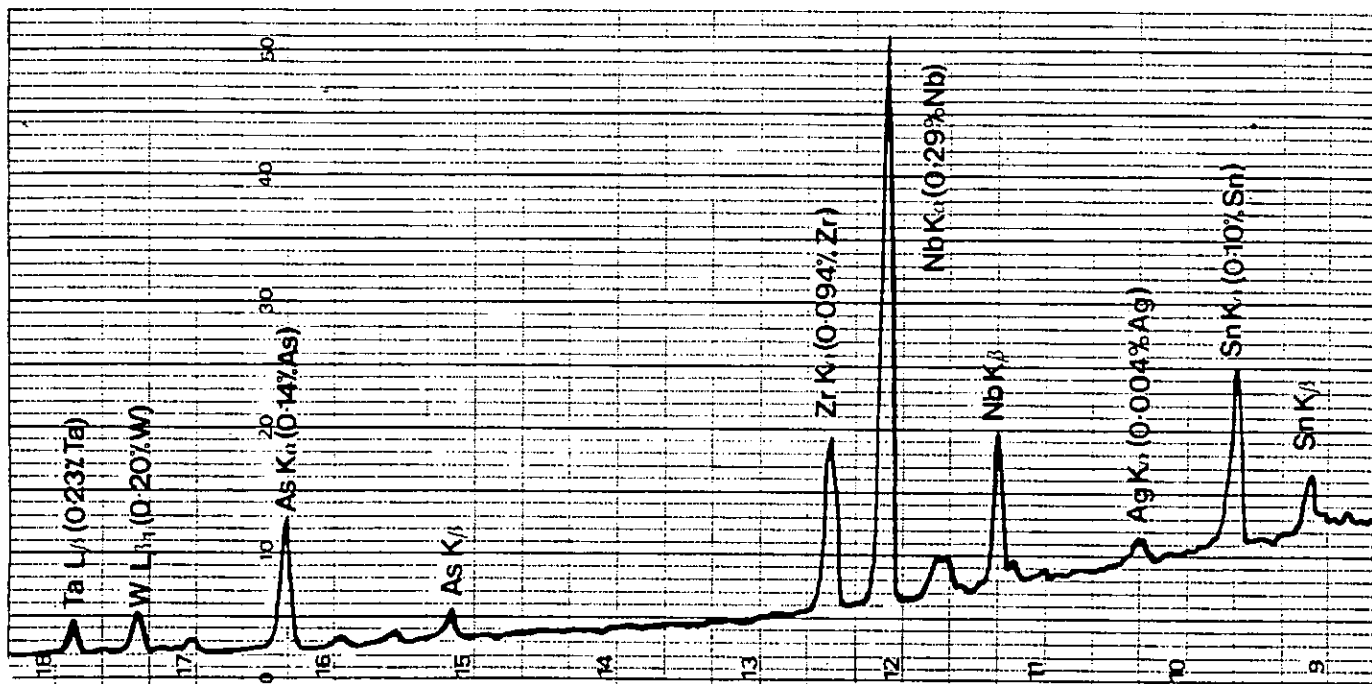
Metal samples are simply machined in a lathe.

Liquids require special sample holders with a mylar film base and a helium atmosphere in the spectrometer.

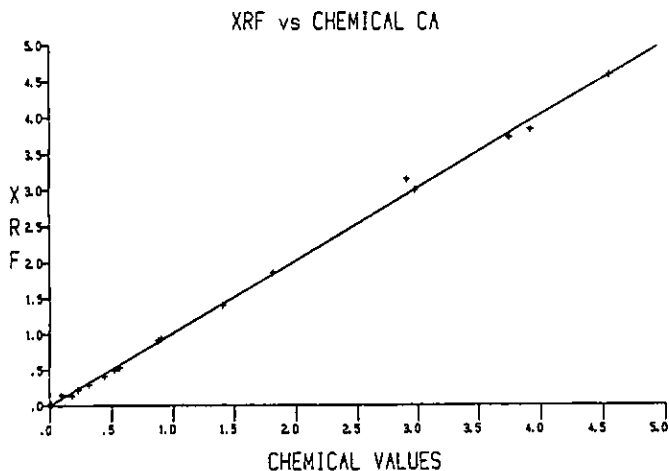
Having prepared a suitable sample it is necessary to calibrate the spectrometer for the sample type and elements of interest. This initial calibration can be time consuming but once performed will only need updating at each six monthly service period. It is best to use internationally accepted standards for this purpose e.g. NBS, BAS etc as some risk is associated with synthetic or self-determined standards.

X-ray analysis, in common with other spectroscopic techniques, suffers from interferences for which corrections have to be made and to this end Philips provide Fundamental Correction Factors of "Alphas" to be used in a computer based system which also provides report generation facilities.

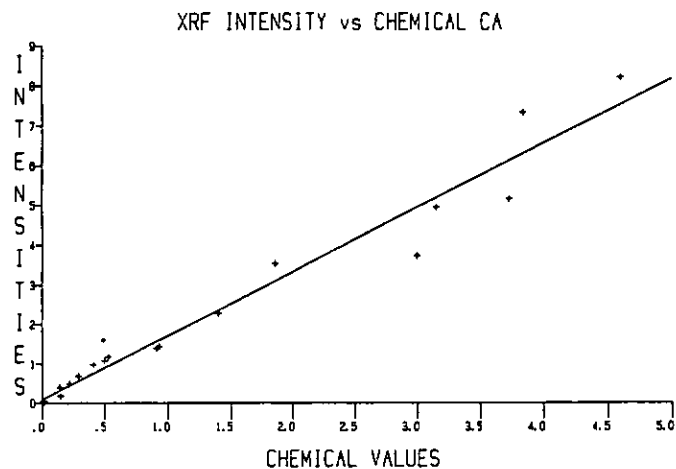
We have found that when the system is properly calibrated and programmed it can be used by unskilled labour with a trained supervisor to attend to hardware and software maintenance as required.



Wavelength scan of a mineral sample.



Shows the relationship between X-Ray and wet chemistry methods for calcium in plant tissues.



XRF intensity vs chemical CA.

Sample types able to be handled are only limited by operator ingenuity but some examples are given in the following list of materials processed in our laboratory.

- 1 Alloys: niresist, stainless steel, bronze etc
- 2 Minerals: phosphate rock, limestone, fertiliser, Mg silicates etc
- 3 Scales, mud, dusts, catalysts etc from acid plants
- 4 Effluents and wastes
- 5 Plant and animal tissues from field trials or advisory samples
- 6 Identification of unknown materials
- 7 Environmental monitoring
- 8 Soil samples
- 9 Oils and sludges for wear metals
- 10 Treated timber

This list is just a start into the analysis required in a busy works laboratory.

The following tables and figures give an indication of typical performance that can be expected for routine analysis by XRF.

Count rate measurements are affected by interelement effects. When a sample containing a number of elements is exposed to radiation from the X-ray tube the intensity of the fluorescent radiation is influenced by the other elements present in the sample. This can result in a measured intensity that is either higher or lower than it should be. Using a mini computer it is possible to correct for matrix effects using a purely mathematical treatment of the count rate data.

The instrument measures a series of known standards of a type similar to the unknowns to be processed. The instrument

REPEATABILITY DATA FOR A P W 1400 UNDER ROUTINE OPERATING CONDITIONS

- 4 months since calibration
- rhodium spectrometry tube
- monitor is a fused bead
- 24 repeat analyses spread randomly over the four months

TABLE 1 MAJOR ELEMENTS

Element	Na	Mg	Al	Si	P	S	Cl	K	Ca
Conc. %	.96	5.52	3.83	6.77	.43	.23	.07	.74	.77
95 % C L	.007	.023	.017	.029	.001	.001	.001	.003	.003

TABLE 2 TRACE ELEMENTS

Element	Mn	Fe	Cu	Zn	Mo
Conc. ppm	3530	9850	479	761	633
95 % C L	12	33	2	3	2

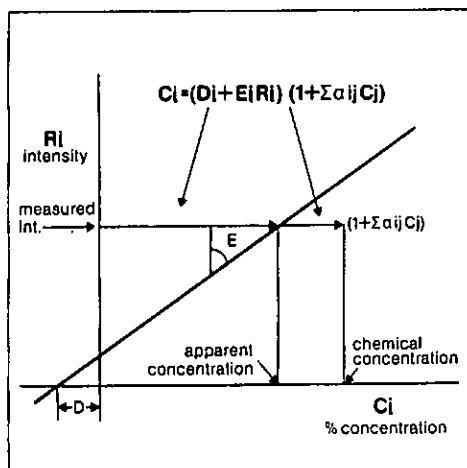
dependent values D & E are computed from the input data to enable the calculation of apparent concentrations in unknowns.

Final results corrected for interelement effects are then calculated

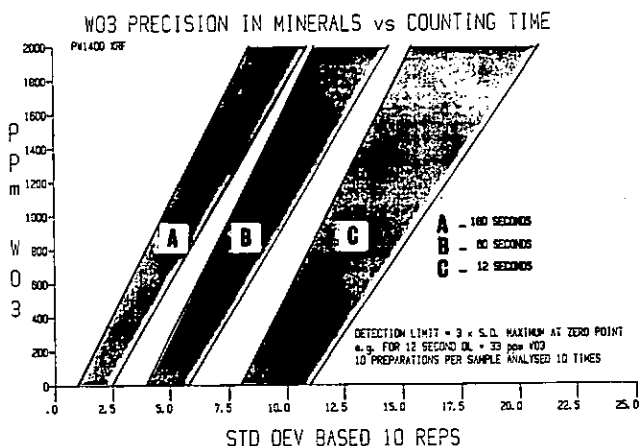
Because the collection of intensities follows a normal distribution the accuracy of any set of intensities is a simple relationship between the total number of counts measured and the time taken. The above table shows the results of 10 samples prepared 10 times and read 10 times each at three different time intervals.

At 1000 ppm W03 and 60 seconds count time the variation due to counting is 8 ppm with a sample preparation error of +/- 2 ppm

Conversion of intensities to concentrations.



The effect of counting time on precision.



AUCKLAND BRANCH ATMOSPHERIC POLLUTION AND OZONE DEPLETION

A public discussion meeting was held in Auckland on the evening of Thursday 30th March on the topic of Atmospheric Pollution and Ozone Depletion.

The meeting was well attended by members of the public substantially boosting normal meeting attendances to 175.

Associate Professor John Hay, Director of Environmental Studies, Auckland University, explained how Antarctic weather patterns allowed the development of an ozone depleted tropospheric region roughly centred on the South polar land mass each southern spring. Lack of turbulent mixing with lower altitude air and very low temperatures due to lack of solar radiation during winter allows conditions to develop which can lead to ozone depletion reactions occurring when the troposphere is illuminated prior to the onset of summer turbulent mixing. Ozone depletion is most marked near the pole and becomes less measurable at lower latitudes. Actual levels of ozone in the polar troposphere vary with time and location each polar spring. Lack of data covering many years and a number of locations is hampering the development of a full understanding of the phenomenon. Measurements over the last six or seven years appear to show a downward trend but there is considerable natural variability to be taken into account.

The significance of ozone depletion is the risk of ground level or sea level exposure of living organisms to 300 nanometers, and lower, ultraviolet radiation. Ultraviolet radiation in this wavelength region is normally fully absorbed by ozone in the atmosphere and does not reach the earth's surface where it would have a damaging effect. There is as yet no evidence of an increase in levels of ultraviolet radiation at ground level nor is there any past record of ground level exposure from which to draw conclusions.

Man's influence on the annual ozone depletion phenomenon over and above natural events appears to be real and associated with certain stable organochlorine compounds.

Dr Steve de Mora of the University of Auckland described the reactions involving stable chlorofluorocarbons which can lead to ozone depletion under conditions existing in the troposphere.

The important reactant with O_3 is Cl released from a stable molecule by ultraviolet radiation. In the absence of competing chain reaction quenchers such as nitrogen oxides due to their freezing out, a sustained chain reaction can develop leading to ozone depletion. Ozone formation due to illumination of air by the sun is an ongoing process. Under conditions such as those that exist in Antarctica depletion reactions exceed formation reactions.

Tropospheric ozone levels are normally in the order of 1 part per billion, and in the depleted region levels are lowered to 0.4 parts per billion. Measurements suggest that ozone depletion is occurring at all latitudes with temperate zone levels apparently two percent less than normal.

Chlorofluorocarbon compounds vary in their chemical stability and in their propensity to become ozone layer depletion initiators. A wide variety of compounds released to the atmosphere are potential contributors to the effect. Chemical stability allows diffusion to the troposphere rather than being decomposed in the lower atmosphere and washed out rainfall.

Mr Lindsey Roke Chief Engineer Fisher & Paykel Ltd, related his experiences in drafting the Montreal Protocol.

The New Zealand usage of chlorofluorocarbon compounds is accounted for in refrigeration, foaming agents for plastics, aerosol propellants and fire extinguishers. The global usage of CFC compounds is approximately one million tons and New Zealand uses about 0.2% of this. The refrigeration industry uses only a small fraction of this amount. The development of CFC compounds in the early 1930's allowed major advances to be made in the development of small refrigeration units. Because CFC compounds are stable, non-toxic and non-flammable they are now used in a very wide range of other applications. It is the inherent chemical stability of CFC compounds that implicates them in the ozone depletion effect.

Although many of the end uses of CFC compounds involve long term containment in refrigeration units and locked in foam plastics and the like it is inevitable that all that has been made will sooner or later leak into the



John Sherlock, John Hay, Lindsay Roke & Steve De Mora answer questions after presenting their papers.

atmosphere. An immediate stop to the use of the compounds is not possible. The Montreal Protocol provides for progressive worldwide reduction and elimination of the use of CFC and halon compounds potentially damaging to the ozone layer. It is not a simple matter to change to alternatives. A manufacturing plant has to be set up to make them, equipment to use them has to be designed, proven and manufactured, all involving massive global expenditure and financial risk. Some economies will not be able to make the needed changes quickly — others will.

Lindsay Roke emphasised that CFC compounds are not the only potential ozone depleting compounds in use. The important fire fighting chemicals known as halons produced in large quantities worldwide are three to ten times more effective in depleting ozone. Although less effective weight-for-weight than the usual CFC compounds, familiar chemicals such as chloroform, carbon tetrachloride and drycleaning fluids produced for many years in large tonnages are all contributors to the problem.

Mr John Sherlock, Technical Director of Johnson's Wax, and President of the Aerosol Association, spoke on the aerosol industry's plan to complete the change to non-ozone depleting propellants by 1990. This change is possible because of the initiatives that have been taken voluntarily over a long period.

TODAY'S AEROSOLS — CHANGING FOR THE BETTER Information on Aerosols and the environment

Since 1975 local aerosol manufacturers have voluntarily reduced their use of chlorofluorocarbons (CFC) as propellants. Over the next decade their use of CFC's was reduced by 50%, despite overall increases in aerosol production and consumption.

The industry lobbied Government to provide hydrocarbons from the Kapuni Gas Field, at a time when this resource was merely being burnt off and local manufacturers were experiencing difficulties in gaining access to alternative propellants. In 1978 regular bulk deliveries of hydrocarbons to the aerosol industry commenced.

Throughout this process the Aerosol Association of New Zealand provided technical advice and support for companies as they shifted to alternative propellants. Overseas experts on new propellants like DME have spoken at technical seminars and overseas literature on the issue has been distributed to members.

As New Zealand moved towards ratification of international protocols relating to protection of the ozone layer representatives of the Association took part in the attendant consultative processes.

By its responsible attitude to the issue, the Association has sought to provide a lead to other industry users of CFC's.

During moves leading up to New Zealand's ratification of the

Continued next page

BRANCH NEWS

THE ABUSE OF DRUGS IN SPORT

This interesting address on 16 May attended by 50 people was the second of the initiatives taken by the Auckland Branch to popularise chemically based topics.

The panel consisted of two speakers:

Mrs Sue Nolan (MSc (Hons) in Biochemistry—Victoria University)

Sue is a Senior Forensic Toxicologist at Chemistry Division, DSIR, Auckland, and the Project Leader for Sports Drug Testing. In 1987 she spent six weeks in Calgary, Canada, studying the methodology for Sports Drug Testing at the Winter Olympics IOC accredited laboratory. She also worked in that laboratory during the 1988 Winter Olympics analysing samples from the athletes.

Dr Tony Edwards (MB ChB (Otago) Dip Obst (Auck) Dip Sports Medicine (London))

Tony is a General Practitioner at Half Moon Bay, and the Auckland University Sports Medicine Clinic. He is the Chairman of the Doping Subcommittee of the New Zealand Federation of Sports Medicine, and a member of the NZO & CGA Medical Commission.

Both Sue and Tony have coordinated the programmes for the collection of urine samples for testing from New Zealand

Athletes over the past 15 months.

Sue Nolan outlined the long history of performance enhancing drugs by athletes. Drugs were used by the Romans to provide the spectators with a better show in gladiator combats. Competitive cyclists became regular drug users 80-90 years ago.

Since the 1960's anabolic steroids and amphetamines have been developed, used and progressively outlawed in international sport. Successful control and elimination of drugs in sport requires considerable knowledge and skill on the part of the analysts charged with the collection and analysis of samples from athletes. Elaborate procedures are needed to avoid possible cheating or mistakes.

The cost of setting up an analytical laboratory to the required standards is in the \$1.5–\$2 million dollar range, and two years to perfect techniques. A typical laboratory might handle 6000–7000 samples per annum at a cost to the user of up to \$300 per sample. The emphasis is on reliable detection of drugs qualitatively. In only a few cases are levels quantified. Over recent years improvements in the understanding of the chemistry of abused compounds in the body has led to very high levels

of confidence in their detection making drug taking a high risk activity for an athlete.

Tony Edwards spoke about the medical effects of drugs on users and the issues involved. Men run risks such as higher levels of blood cholesterol, liver cancer, prostate gland enlargement, testicular atrophy, and other problems. Women may experience permanent changes to their voice and muscle patterns.

Drugs are used by athletes for reasons such as prestige, money and other benefits. Until the public and sportsmen accept that "Drug Free" in sport is a virtue, attempts to cheat will continue at a personal and perhaps international level. Random testing of athletes coupled with reliable analysis will do much to reduce the problem.

Much has been made of accidental exposure to banned substances in food or medication. Eventually athletes and their advisors will become educated to a point where accidental exposure does not occur.

WAIKATO BRANCH

Dr Rob Archibald addressed the Waikato Branch on 29 March 1989. Dr Archibald of MRINZ, had to combat low attendance, and the lack of a slide projector but went on to discuss some especially interesting aspects of food packaging, supermarket design (in the USA) and dietary trends among various groups of the population.

Some soul searching in the interim resulted in a much better attendance at a talk given by **Dr Alistair Wilkins** (Chemistry Dept, University of Waikato) on GCMS studies of honey, on 19 April. Member interest is expected to improve further now that the full year's programme has been distributed.

BAY OF PLENTY SUB-BRANCH

Twenty-eight people attended the first meeting of the Bay of Plenty Sub-branch for 1989, on Tuesday 14 March. The subject, "Environmental Issues & Policy" was clearly and enthusiastically aired by **Dr David Anderson**, Technical Director, Hickson World Timber Ltd. David Anderson is a knowledgeable chemist who carries the responsibility for research and development, production, and all matters relating to environment, health and safety for the Hickson Group of Companies.

Issues particularly facing the

wood preservation industry were amplified, as that industry is a major user of some raw materials considered toxic, and also faced with waste disposal problems. Comparisons were drawn between the EEC and USA issues and legislations, and those pertinent to New Zealand. Dr Anderson's visit to the region was particularly timely with the Government's sponsorship of the Resource Management Law Reform. The BOP Sub-branch gratefully acknowledges the assistance of Hickson Timber Protection (NZ) Ltd, Auckland, in making Dr Anderson's visit possible.

NOTICE

ANIMAL REMEDIES BOARD SEEKS CONSULTANTS

The Animal Remedies Board is charged with licensing all animal remedies imported into or manufactured in New Zealand. This means all applications for product licences are screened for need, efficacy, safety and quality.

In the past the Board has utilised the knowledge and experience of appropriately qualified personnel in committees as 'expert referees' to support the veterinary and scientific staff in the secretariat.

As international standards are becoming more stringent it is becoming increasingly evident with many drugs, that committee meetings alone cannot provide the atmosphere for concentrated assessment of specialist areas of research, development and quality assurance. Accordingly the Board has decided to reduce the committees to one and seek the assistance of experts on a contract basis as required.

Consultants are required in the following areas:

- Analytical Chemistry
- Animal Remedies (general)
- Antibiotics (new actives)
- Biometrics/Statistics
- Endocrinology
- Fish Vaccines
- Formulation Chemistry
- Formulation & Dosage Design
- Formulation & Pharmacokinetics.

Those interested may write directly to:

The Registrar
Animal Remedies Board
c/- Ministry of Agriculture & Fisheries
P O Box 2526
WELLINGTON

ATMOSPHERIC POLLUTION

Continued from previous page

Montreal Protocol, the Association played an important part in gaining support for the Protocol from other industry groups who use CFC's.

In April 1988, following extensive consultation with its membership, the Association gave a public undertaking that its members would cease their use of CFC's by the end of 1989. (Certain products for which there are currently no alternative propellants - mainly in the pharmaceutical field - are exempt from this).

This voluntary undertaking - which has since been matched by aerosol associations in Australia and Britain - was well in advance of the industry's legal obligations under the Montreal Protocol.

To date no other industry association has given a similar undertaking or made any public statements about when it will cease using CFC's.

The Association is monitoring the progress of its members towards this phase out date. Results of these surveys indicate that the few remaining users of CFC propellants will have shifted to other propellants by mid-1989.

FACTS & PERCEPTIONS

Due to its visibility in the marketplace, the aerosol has continued to attract a disproportionate burden of the opprobrium relating to the CFC issue.

Such concentration on the aerosol industry is, however, increasingly out of touch with reality.

Only 20-25% of aerosols available in New Zealand use CFC's as propellants. By the end of 1989 these will have shifted to alternative propellants.

Aerosol's however, account for only approximately 30% of New Zealand's CFC consumption.

NOTICES

ROYAL SOCIETY OF CHEMISTRY OVERSEAS TRAVEL AND RESEARCH FUNDS

The Royal Society of Chemistry, Burlington House, Piccadilly, London, operates a Research Fund to assist members in their research by the provision of grants of about £350.00 for the purchase of chemicals, equipment or for running expenses of chemical education research. Applicants from overseas are especially welcome and there are additional funds set aside for those from developing countries. The Society also has two funds that can assist with stop over expenses in Commonwealth countries (The Corday-Morgan Memorial Fund) and in developing countries (The International Committee Fund).

RESEARCH FUND 1990

The RSC Research Fund exists to assist members in their research by the provision of grants of up to about £350.00, for example for the purchase of chemicals, equipment or for running expenses of chemical education research.

If you work in a university outside the UK, or in a polytechnic, college or school anywhere and your work is held up for lack of moderate funding, the Research Fund may be able to help you.

A limited number of grants,

each of approximately £350.00 will be awarded for 1990. Applications from members of the Royal Society of Chemistry will be considered on merit but account will be taken of any other source of financial aid available to applicants.

Funds are limited, so preference will be given to those working in less well-endowed institutions; applications from those in UK universities will not normally be entertained. Council is particularly anxious to see inventive applications of a 'pump priming' nature and is prepared to consider applications from those working in chemical education as well as chemistry research.

Members in developing countries should note particularly that additional funds have been available for 1990 by the Society's International Committee, to provide grants for successful applicants from such countries. Preference will be given to those able to cite collaborative research projects with UK institutions.

THE CORDAY—MORGAN MEMORIAL FUND

The RSC Corday-Morgan Memorial Fund exists to assist members of any established Chemical Society/Institute in the

Commonwealth to visit chemical establishments in another Commonwealth country. There is no restriction on age, but the visits must be clearly of benefit to the country concerned. The intention is to help applicants to make stopovers in, or diversions to such countries while travelling for other purposes and it is hoped that lectures will be given during a visit.

The grants will complement, where appropriate, those for visits to developing countries available from the International Committee's fund, and funding would cover the additional travel costs involved, together with appropriate subsistence.

The maximum award to any individual is normally £500 and persons eligible must be citizens of, and domiciled in, any Commonwealth country. Applicants must be travelling to another country (not necessarily in the Commonwealth) and would normally stop en route to visit a third country which must be in the Commonwealth.

Applications should be submitted on the official form and will normally be considered within one month of receipt.

VISITS TO DEVELOPING COUNTRIES

The Society, through its International Committee, has established a scheme of awards to enable members of the Royal

Society of Chemistry to visit chemical establishments in developing countries. The visits must clearly be of benefit to the country concerned and the visitor would be expected to give lectures and engage in other forms of information exchange. The grants will complement, where appropriate, those for visits to Commonwealth countries available from the Corday-Morgan Memorial Fund.

The intention is to help applicants to make stopovers in or diversions to a developing country while travelling for other purposes. Support for travel within a developing country may be given when appropriate. Applicants must be members of the Society and the funding would cover the additional travel costs together with appropriate subsistence, up to a maximum of £500.00.

Applications should be submitted on the official form and will normally be considered within one month of receipt.

Application forms available from:

The International Committee Awards
c/o The Local Affairs Officer
Royal Society of Chemistry
Burlington House
Piccadilly
LONDON W1V 0BN.

WINSTON CHURCHILL MEMORIAL TRUST

The Winston Churchill Memorial Trust Board is again calling for applications for fellowships. Entries close at the end of July 1989 for awards to be taken up in 1990 for study and research overseas.

The Trust fund was donated by New Zealanders as a memorial to Sir Winston Churchill who wished to be remembered by some means which enabled people to travel where this promoted understanding and was for the betterment of mankind. The income from the fund is used for grants to New Zealanders for any study project which advances their occupation or field of interest, in some way benefits New Zealand; or helps to maintain the Commonwealth as a beneficial influence in World Affairs.

There are no prescribed qualifications, academic or otherwise for the award of a Churchill Fellowship. Merit is the pri-

mary test, whether based on past achievement or demonstrated ability for future achievement in all walks of life. The value of an applicant's work to the community and the extent to which it will be enhanced by the applicant's overseas project are important criteria taken into account in selecting Churchill Fellows.

The aim of the Trust's publicity policy is to attract a substantial flow of suitable applicants for fellowships from which approximately 20-25 high quality fellows can be selected each year.

Applications are called for in an open category and consequently the fellowships awarded cover very diverse fields of study. In 1988 the Trust Board awarded 24 Fellowships to New Zealanders for projects to be carried out in 1989, including the following:

Rob Burden, an environmental scientist with GCNZ Consultants Ltd, Auckland, will visit

Canada and the United States on a Churchill Fellowship to gain first-hand experience of the latest methods for assessing and managing mine wastes. As New Zealand does not have a recent history of hard-rock gold-mining, limited expertise is available in this country to assess the potential environmental problems associated with mine wastes. Mr Burden plans to meet with Specialists in North America to discuss New Zealand projects and to assess new techniques that would be applicable to those projects.

In March this year, **Mr Bruce Murray** of Wellington, Principal of Naenae College Lower Hutt will travel to the United Kingdom to observe the way in which various schools and institutions in England are able to provide useful and relevant secondary school courses which encourage students to remain at school to age 17 or 18.

Freda Pearce of Wellington, a social worker with the New Zealand Association of the Deaf, will attend short training courses and observe working models of programmes for the deaf in the United States and United Kingdom. On her return to New Zealand it is Mrs Pearce's intention to set up New Zealand's first community centre for the deaf in Wellington.

Louise Croot of Dunedin, a Health Development Liaison Officer with the Otago Area Health Board, Dunedin will attend a two week British Council Seminary on "Healthy Cities — The New Public Health" and visit some European healthy cities.

Applications should be made to:

The Secretary, Winston Churchill Memorial Trust
P O Box 10-345,
WELLINGTON
Tel. 738 699

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The new Sartorius Analytic series – 0.1 mg to 210 g. Double the display speed of other analytical balances, with unobstructed viewing from 5 sides.

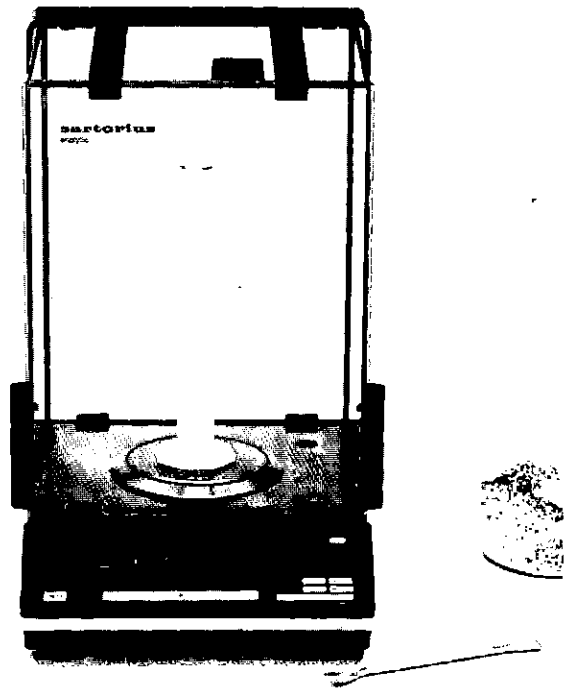
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- **Flexibility** – menu settings programmable to meet any conditions.



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SPECTROSCOPY

New Enhancement for the Hewlett Packard Diode Array UV/VIS Spectrophotometer.

1. The IBM PC based operating software for this instrument has recently been upgraded to take advantage of recent developments in computer hardware. New features include high resolution VGA/EGAS colour graphics support, support of a wide range of printers and plotters, software control of autosamplers for total automation and easier interaction with other PC applications. These enhancements are available to existing users by way of a software upgrade.

2. A new system for automatic tablet dissolution testing, has been released. This is based on the HP8452A Diode Array Spectrophotometer and includes the spectrophotometer, automatic sampling hardware for up to six vessels, computer hardware and system software, for a completely integrated single vendor solution. The software runs under Microsoft Windows and has a unique two structure to address the level conflicting needs of simple routine testing and sophisticated method development capabilities. The Diode Array Spectrophotometer, because of the rugged design and lack of moving parts is ideally suited to this type of testing, providing accuracy, precision, and low cost of ownership not available with conventional instruments.

3. A book describing the design concepts and practical advantages of diode array spectroscopy is available from Hewlett Packard. The book describes the basic theory of UV/visible spectroscopy and compares the two technologies (diode array and conventional) in theoretical and practical terms. This book is available free of charge from Medtec Products Limited.

For further information please circle no. 3 on reader reply card.

Automation of Spectrophotometric Measurements

A fully integrated system for the automatic operation of a uv spectrophotometer is described in an application note available from John Morris Scientific.

Based on a Gilson autosampler (model 221), a Gilson diluter (Model 401), a Perkin-Elmer uv spectrophotometer (550-s), Elman flow cell and a PE recorder (561), and a Desaga Frigostat refrigerator, the unit is used for automatic enzyme determinations. The specific method described in the paper is glutathione analysis.

Full details of the performance of the system are given in the paper. While the total time required for analysis is only slightly less than that for manual operation, the main advantage of the system is that multiple determinations can be made with minimal operator input throughout most of the working day.

For further information please circle no. 4 on reader reply card.

New Matrix Correction Facility Extends Philips XRF Software

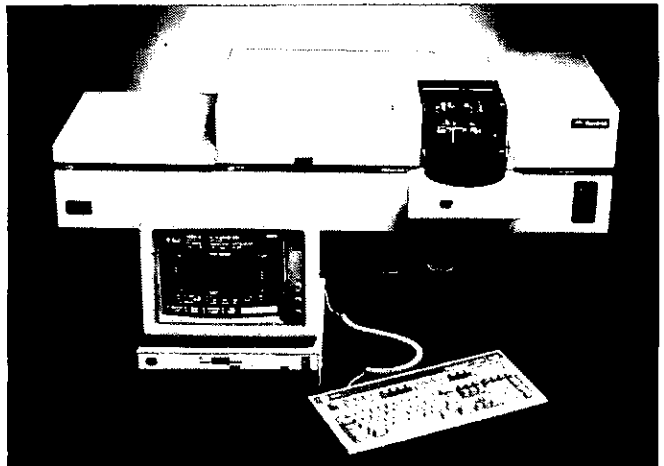
Philips Analytical has added an optional program for calculation of theoretical 'alpha' matrix correction coefficients to the X40 software package for its range of x-ray spectrometers.

Unique to Philips, theoretical alphas were previously supplied in the form of printed tables. Their use greatly simplifies instrument calibration, as experimental determination is only necessary to correct for instrument-dependent influences. This is accomplished with far fewer standard than would be required to compensate for inter-element effects – especially in complex materials.

In addition factors such as sample inhomogeneity, variations in preparation, undetected line overlaps – or even simple typing errors – can be masked when empirically calculated factors are used. This is because the regression routine applies a best fit to all points on the line, including any which may be incorrect.

The on-line programme gives users rapid and economical access to this valuable facility. Alphas can be derived for any type of material, without need to purchase numerous tables or type in large volumes of data – again saving time and eliminating another potential source of error. It is also possible to utilise a combination of theoretical and experimental alphas, if necessary.

For further information please circle no. 5 on reader reply card.



Varian Covers the Field In Atomic Absorption Spectroscopy

Varian manufactures four highly successful ranges of Atomic Absorption Spectrometers.

With the SpectrAA 10/20 series for routine analysis, one has a choice of single or double beam, interlocked or automatic gas box, single or 4 lamp turret. High speed Deuterium background correction is also optional.

Even though the SpectrAA 10/20 is designed for the budget conscious customer, they have a number of features usually found on more highly priced AA's – microprocessor control with video display and disc drive. The optics feature a holographically etched grating, hard overcoated mirrors, and are sealed against the environment.

The second member of the Varian family of SpectrAA's 30/40 both feature automated wavelength drive, automated spectral bandwidth selection. A high speed deuterium background corrector is standard and one has the choice of either an automatic gas box or a fully programmable gas box. The SpectrAA 30 has a manual 4 lamp turret and the SpectrAA 40 has a motorised 8 lamp turret as standard. The instrument is controlled by the well proven DS-15 command station. This both controls the spectrometer and processes the signal. It features a high resolution video display and 2 disc drives for method and result storage.

They are able to do up to a 12 element analysis, and the SpectrAA 40 coupled with the P.S.C.-56 sampler is able to analyse up to 67 samples unattended. Coupled with the proven G.T.A.-96 the SpectrAA 40 is able to do unattended overnight analyses for maximum productivity.

When the SpectrAA 30/40 is used in conjunction with the p.s.c.-56 sampler and the V.G.A.-76 accessory, automated multi-element hydride analyses is possible utilizing the continuous flow concept that Varian pioneered. Sample throughput is typically 60 per hour and precision levels are less than or equal to 1%.

The third member of the Varian family of A.A.'s is the SpectrAA 300/400. This uses the same optical bench as the SpectrAA 30/40, which features a high quality monochromator, utilises hard overcoated mirrors only, for high light throughput, a holographically etched grating, and again the optics are sealed against dust and vapour.

The SpectrAA 300/400 replaces the DS-15 command station with the industry standard I.B.M. PS/2 Series 30-286. This enables the user to have all methods and results on either hard or floppy disc and the result files are fully utilizable by third party software such as Lotus 1-2-3 for customised report generation. One of course, has the advantage of high resolution colour graphics and a colour printer is also available. The Johnson AX-2 has also been certified to operate the SpectrAA 300/400 A.A.'s

The 4th member of the Varian A.A. family is the SpectrAA 30/40, 300/400 ZEEMAN series. This range is a dedicated furnace series and features the Zeeman technique of background correction. The Varian ZEEMAN Spectrometers utilize a furnace based on the proven G.T.A.-96 graphite tube atomizer.

For further information please circle no. 6 on reader reply card.

PRODUCT NEWS

Nicolet FT-IR 205 Spectrometer

The NICOLET Model 205 is a fully integrated Infrared spectrometer. This versatile instrument features a field-tested, rugged, interferometer; an integrated, high-performance computer for instrument control and spectral data processing; and pre-aligned accessories for rapid, reproducible sampling.

While these features alone do not make a workhorse spectrometer, the 205's true push-button simplicity, compact design, and high-speed operation provide the important final touches.

Fully Integrated Package –

An optimum combination of spectrometer, computer hardware and software, plus plug-in sampling, meeting all the needs of the modern laboratory.

Push-Button Simplicity –

At the end of the day, what everyone needs is a fast, accurate answer. The Model 205 provides the solution at the touch of a button – push-button spectroscopy at its best.

Fast Operation – Horsepower means nothing if the spectrometer does not meet the workload. The Model 205 operates with speed matched to the needs of the busiest laboratory.

Interactive Graphics – Demanding problem-solving situations require fast access to the data. High-speed interactive graphics provide all the flexibility for solving the most demanding problems.

Extensive, Easy-to-Use Software – Much of the power of modern spectrometers lie in the software. The Model 205 is no exception, providing push-button access to a comprehensive set of spectroscopic functions.

Compact Design – Bench space is usually at a premium in most laboratories. The Model 205 relieves this problem by providing a small-footprint, feature-packed instrument.

Nicolet instruments are available in New Zealand through Watson Victor Limited

For further information please circle no. 1 on reader reply card.

Alltech has new Toll-Free Number

With the introduction, on 1 April 1989 of the new Telecom '800' toll free service, Alltech has, simultaneously, announced its new number, eliminating toll charges for all callers throughout New Zealand.

The new number for Alltech is 0800-652766

Econo-Cap™ Capillary Columns

ALLTECH is proud to announce a new line of capillary columns based on the three most popular GC phases: SE-30, SE-54 and Carbowax®. All Econo-Cap™ capillaries are produced from the same raw materials used for the high-priced, individually tested capillaries.

Manufactured at the Applied Science Division location at State College, Pennsylvania, U.S.A., the manufacturing techniques used for Econo-Cap columns are the result of considerable refinement and new testing methods to achieve a high degree of reproducibility in coating and immobilization.

Each Econo-Cap column is a product of this new batch production and testing method, and

is mounted on a rugged new stainless steel cage. The Alltech cage is constructed of highly polished stainless steel and is designed to prevent any abrasion to the tubing. Keeping the polyimide layer intact helps to prevent spontaneous breakage and contributes to longer column life.

For further information please circle no. 2 on reader reply card.

Acquisition of Stevens KMS Scientific

As from the 10 April 1989 Labsupply Pierce NZ Ltd has purchased the Scientific division of Stevens KMS.

We are pleased to advise that it is 'Business as Usual!' All the products and brands previously available from Stevens KMS are available from Labsupply Pierce NZ Ltd.

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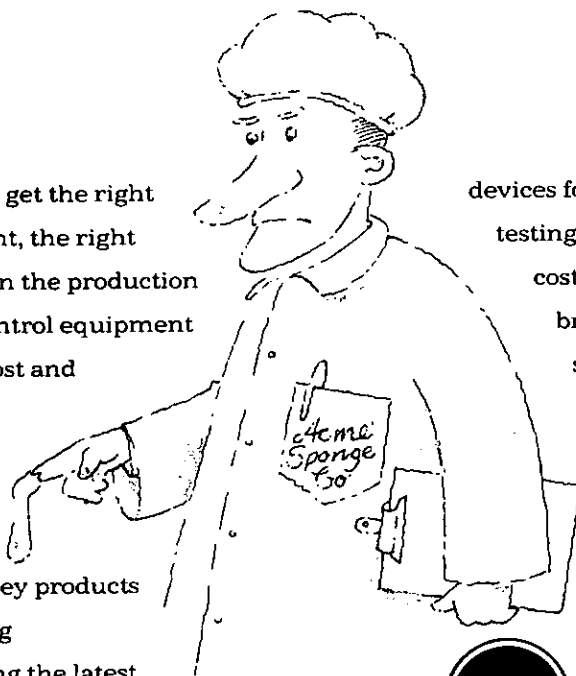
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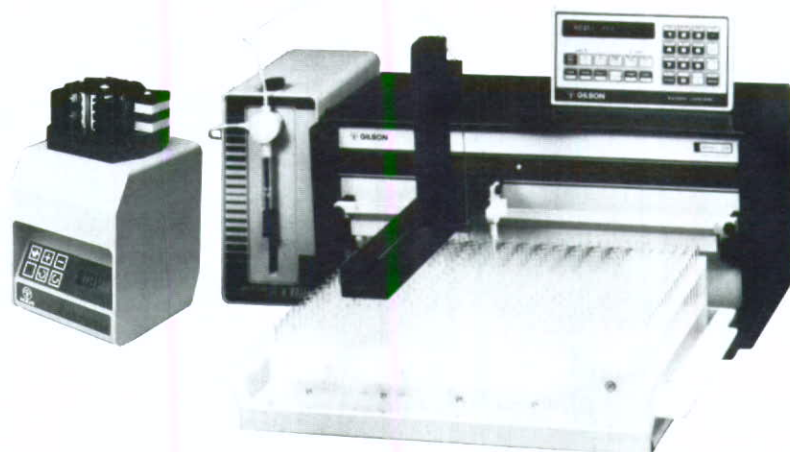
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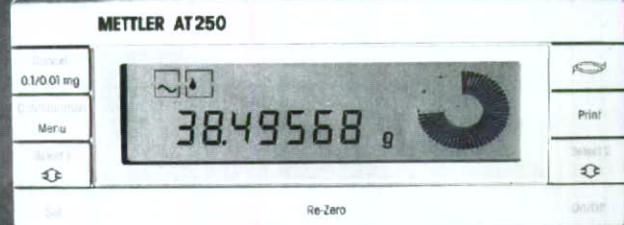
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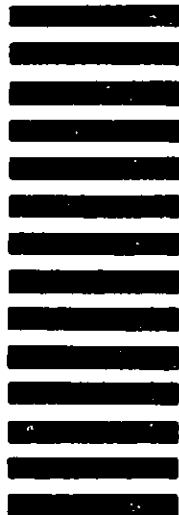
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