CHEMISTRY IN NEW ZEALAND

JOURNAL OF
THE NEW ZEALAND
INSTITUTE
OF CHEMISTRY

Vol. 33, No. 5, October, 1969

Any Lab in Universities and Industries needs:

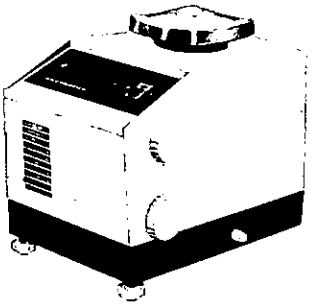
Series 2250:
A complete line of fastweighing top-loaders for samples ranging from a few grams up to 5 kg.

Series 2400 and 2600:
Different models with automatic pre-weighing and mechanical taring for your choice.

Series 1800:
A modern two-pan Micro Balance in all metal housing.

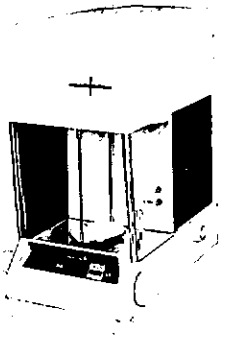
Series 4100:
Electronic Micro Balances.

Series 2250



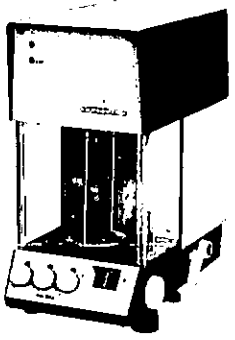
ALL DIGITAL TOP-LOADING BALANCES

Series 2400



LOW-PRICED ANALYTICAL BALANCES

Series 2600

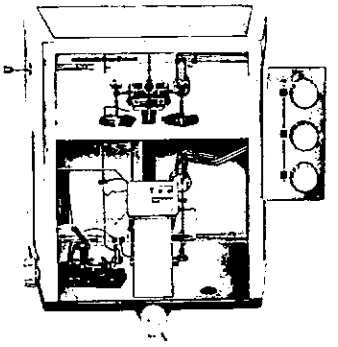


HIGHEST QUALITY RESEARCH BALANCES

Automatic Sartorius pre-weighing is the most important advance in Balance design since the introduction of the single-pan Balance.

Please request detailed literature or demonstration!

Series 1800



MODERN TWO-PAN MICRO BALANCE

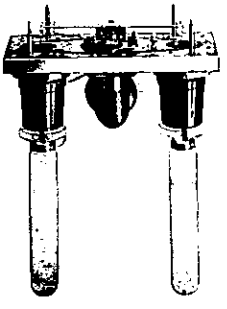
We are offering the most complete programm of modern laboratory and control Balances

Distributed and serviced exclusively by

WILTONS

P.O. BOX 367
WELLINGTON
P.O. BOX 9071
NEWMARKET, AUCKLAND

Series 4100



ELECTRONIC MICRO BALANCES

Sartorius manufactures all these balances and further instrumentation based on a century of tradition in the design and development of highquality weighing instruments

SARTORIUS-WERKE GMBH
34 GÖTTINGEN/GERMANY

CHEMISTRY IN NEW ZEALAND

Journal of The New Zealand Institute of Chemistry

Vol. 33, No. 5, October, 1969

Published bi-monthly by the New Zealand Institute of Chemistry Inc. (P.O. Box 250, Wellington)

Contents

Editor: Miss J. Mattingley, B.Sc., A.N.Z.I.C.
P.O. Box 250, Wellington.

Advertising Manager:
D. Howard, M.Sc., A.N.Z.I.C.
P.O. Box 250, Wellington.

Printed by David F. Jones Ltd., 108 Tory Street, Wellington.

COVER
Young scientists at Wellington Science Fair, September 1969. (Photo: "The Dominion").

Distribution. The Registrar:
D. J. Hogan, B.Sc., A.N.Z.I.C.
P.O. Box 1926, Christchurch.

Honorary General Secretary:
Dr. E. Harvey, M.Sc., Ph.D., F.N.Z.I.C.
P.O. Box 250, Wellington.

Employment Officer:
E. S. Borthwick, M.Sc., A.R.I.C., A.N.Z.I.C.
P.O. Box 2091, Wellington.

The Journal of the N.Z. Institute of Chemistry has an audit circulation Certificate of New Zealand Advertisers. Latest audited circulation (March 1969) 1150.

COMMONWEALTH OF AUSTRALIA

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION

DIVISION OF FOOD PRESERVATION

EXPERIMENTAL OFFICER

(CHEMIST — FOOD TECHNOLOGIST)

GENERAL: The Organization's Division of Food Preservation with headquarters at Ryde, N.S.W., carries out a comprehensive research programme on the preservation and utilization of foods. It employs about 100 professional scientists in a range of scientific disciplines at major laboratories at Ryde, N.S.W., and at Cannon Hill, Queensland. Expansion of the Division's work in meat research is now occurring at Cannon Hill where the second stage of the Meat Research Laboratory has been completed. The appointee in this instance will be located at the Meat Research Laboratory, Cannon Hill, Queensland, and will be a member of the Industry Section of this Laboratory which is supported by finance derived from the Meat Processing Industry Levy.

LOCATION: Cannon Hill, Queensland, Australia.

DUTIES: To investigate current methods of analysis used in the meat industry, devise new or improved methods, investigate problems of a chemical nature in the control of quality of meat and meat by-products, and to participate in chemical studies in meat processing research.

QUALIFICATIONS: An appropriate degree in science, food technology or agricultural science. Experience in chemical analysis in the food industry would be an advantage.

SALARY: Depending upon qualifications and experience, the appointment will be made within the salary range of Experimental Officer Class 1, $A3,265-$A5,118 p.a., or Class 2, $A5,332-$A5,989 p.a. Salary rates for women are $A428 p.a. less than the corresponding rates for men.

NOTE: The appointment will be for a period of three years in the first instance. Fares to Australia, including those of wife and dependent family, will be paid by the Organization. If the appointee is at present permanently domiciled outside Australia, return fares will be paid at the conclusion of the appointment.

Applications, quoting reference number 305/143, and stating full name, place, date and year of birth, nationality, marital status, present employment, details of qualifications and experience, together with the names of not more than four persons acquainted with the applicant's academic and professional standing, should reach:

Officer-in-Charge

MEAT RESEARCH LABORATORY, CSIRO

P.O. Box 12 CANNON HILL, QLD. 4170

by 17th October, 1969.

North Canterbury Hospital Board

Biochemist, Medical Research Laboratory

APPLICATIONS are invited for the position of Biochemist in the Radio-Immunoassay Laboratory of the Medical Unit, The Princess Margaret Hospital, Christchurch. The Immunoassay Laboratory is concerned with routine assays of peptide hormones in plasma of patients with endocrine and metabolic disorders, but there is scope for development of new assays and excellent facilities for collaborative research with other scientists in the Unit.

The appointee will be responsible to the Director and the Senior Biochemist of the Medical Unit for the routine running of the Laboratory, and will be largely free to direct the course of development work in this interesting area of endocrinology.

Applicants should have a degree in Chemistry, or preferably Biochemistry. Previous experience with radioisotopes would be an advantage, but knowledge of the Immunoassay technique is not required. Salary according to the Hospital Scientific Officers' Regulations, depending on experience and qualifications.

Further information may be obtained from The Director, the Medical Unit.

Written applications, stating qualifications and experience, and naming two referees, will be received up to 31st October by:

The Director,

The Medical Unit,

The Princess Margaret Hospital,

Private Bag, Christchurch.

WANTED TO BUY borrow or hire

Nuclear Enterprises NE 5503 or similar Scintillation Head for use with Philips scaler/counter unit. Philips PW 4042/01 Ratemeter.

Reply to . . .

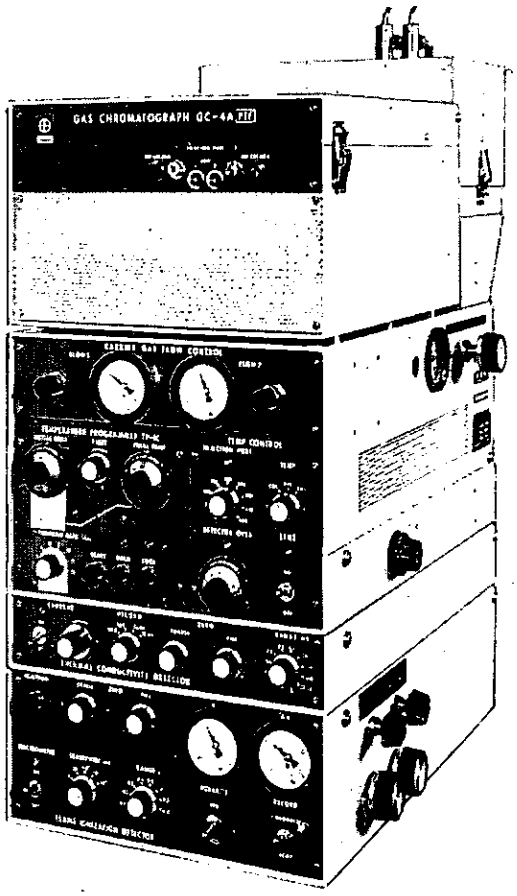
DR. J. R. L. WALKER,

CAWTHRON INSTITUTE,

P.O. Box 175, Nelson

SHIMADZU GC4AP SERIES

MODULAR GAS CHROMATOGRAPHER WITH A TEMPERATURE PROGRAMMER AS STANDARD EQUIPMENT



(1) GC-4APT TCD

(2) GC-4APF FID (FTD)

(3) GC-4APE ECD

(4) GC-4APTF TCD & (FID) (FTD)

(5) GC-4APFE FID (FTD) & ECD

(6) GC-4APTE TCD & ECD

Shimadzu Gas Chromatographs Series GC4AP are compact, low cost, modular units of first class performance, incorporating temperature programming, dual columns and permit simultaneous operation of two detectors from a choice of three interchangeable types. Thermal conductivity, flame ionisation and electron capture.

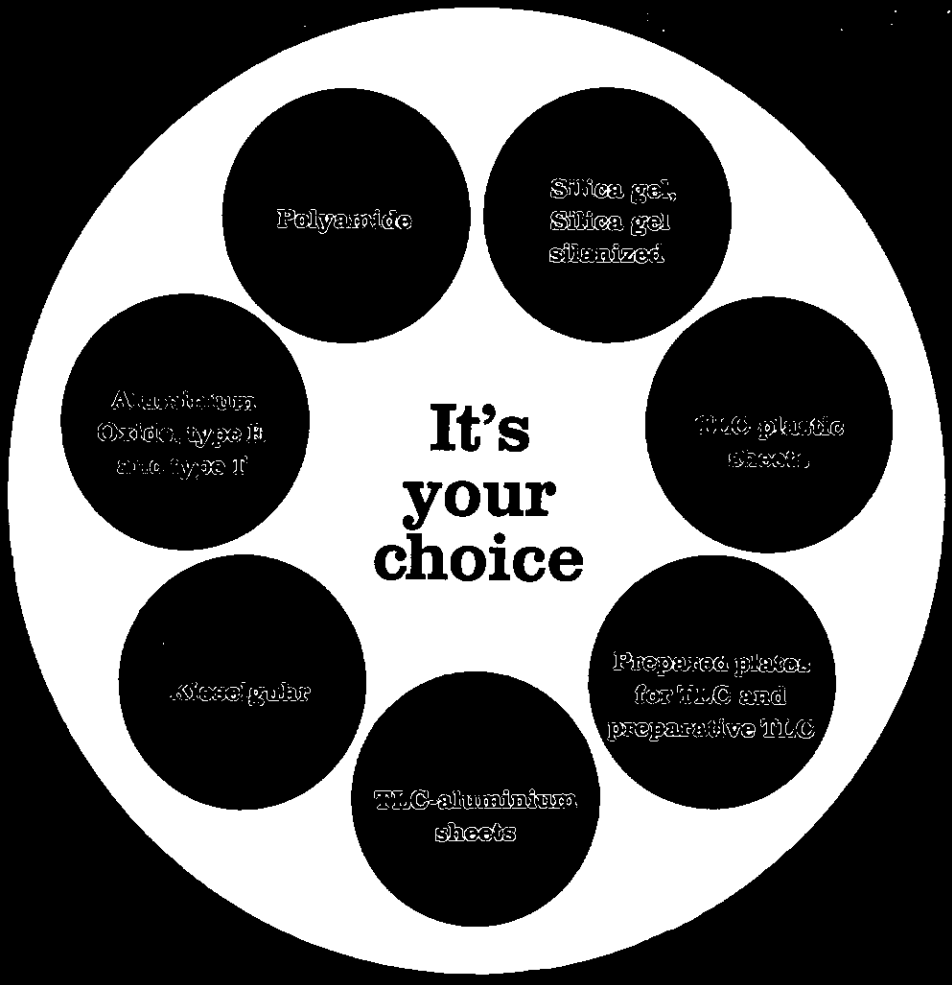
SOLE NEW ZEALAND AGENTS

TOWNSON & MERCER LTD.

Auckland	Wellington	Christchurch
2 Morgan Street, Newmarket	152 Hutt Road, Petone	120 Madras Street
Phone 34-759	Phone 692-043	Phone 60-841

MERCK

TLC Preparations



Silica gel G (with type III)

Silica gel H, HR (extra pure) (without gypsum and organic binders)

Silica gel GF254, HF254, HF254 + 366 (with fluorescence indicators)

Silica gel RP-2, RP-8
(hydrophobic silica gel for reversed phase chromatography)

Aluminium oxide G, GF254, H, HF254 basic (type B)

Aluminium oxide basic (type T), neutral (type T), acid (type T)

Kieselguhr G, Polyamide 11

Neafan® for documentation (detachable film)

Test dye mixtures (lipophilic and hydrophilic)
Ready prepared dyeing reagents

TLC-plates pre-coated
TLC-aluminium sheets
TLC-plastic sheets

For preparative thin layer chromatography:
Silica gel PF254, PF254 + 366, PF254 containing gypsum, PF254 silanized,
Aluminium oxide PF254, PF254 + 366
Prepared plates for preparative TLC

In addition, we supply all chemical aids for:
Column chromatography, paper chromatography, and gas chromatography.

Please request our special brochures!

Sole Agents in New Zealand: Henry H. York & Co. Pty. Ltd., P. O. B. 6494, Wellington
Supplies of Laboratory Chemicals through:
Watson Victor Ltd., Auckland, Wellington, Christchurch, Dunedin

E. MERCK AG • DARMSTADT

205/ENZ

CHEMISTRY — WHERE IS IT GOING?

Professor L. H. Briggs

Chemistry Department, University of Auckland

(Address to the Canterbury Branch of the New Zealand Institute of Chemistry, 16 June 1969)

When I received the invitation to lecture to the Canterbury Branch the suggestion was made that I should talk on the above title. Although not a reader of science fiction I was happy to accede to the request and give my own thoughts of where chemistry is going. As an organic chemist I shall have to admit at the outset that I may well be accused of being biased towards my own subject and found guilty.

Before I suggest where it is going I should like to say something briefly of where it has come from and where it is at present.

In the early days of chemistry the main interest was certainly in inorganic chemistry, the chemistry of the inanimate minerals from which the precious metals, gold and silver, and the less precious metals and their alloys, copper, iron, tin, lead, mercury, bronze and pewter could be obtained. Much effort was spent on the search for the Philosopher's Stone whereby the baser metals could be turned to gold, and for the equally imaginary Elixir of Life.

Something was known of organic chemistry—the compounds from living matter—and it is of interest to realise that organic compounds, the perfumes from essential oils, spices, and the dyestuff Tyrian Purple, were among the first items of international trade leading to trade routes to the East. But the chemistry of these substances was so different from inorganic substances and so intricate that it was for long believed that only the Almighty held the answers and, indeed, it was regarded as blasphemous for mere mortals to try and find the secrets of living matter.

A modern version of this belief is told of Szent-Györgyi when he submitted a paper on ascorbic acid (Vitamin C). He knew that the new compound was a sugar and the name should end in -ose but as at the time he did not know its structure he called it ignose. When asked by the editor to choose a more suitable name he replied "God knows!"

Wohler's synthesis of urea, followed by Liebig's combustion technique for analysis of carbon compounds, formed the true beginnings of the systematic study of organic chemistry. The 19th century saw the rise of synthetic chemistry along with the continued investigation of natural products. The raw materials were from coal-tar and soon the German dyestuff industry had synthetic dyes like alizarin and indigo to replace the natural imported article. As yet, synthetic chemistry had little effect on medicine. Drugs like salvarsan, acetylsalicylic acid and barbituric acid were in use but most of the drugs were from natural sources.

Rise of Theoretical Chemistry

Organic chemistry, at least up to the 1930's, was the classical period concerned with the preparation and properties of organic compounds. There were some theories and some very effective empirical rules but it took the intuitive reasoning of Sir Robert Robinson to outline the electronic

theory of organic chemistry and give an impetus to physico-organic chemistry which is now one of the larger branches of chemistry with no sign of diminishing.

There are now over 4,000,000 compounds recorded in Chemical Abstracts and if we had to study individual compounds the study of chemistry would be a hopeless task.

We are no longer concerned with:

Compound A + Compound B $\longrightarrow$ Compound C

Compound D + Compound E $\longrightarrow$ Compound F

etc. *ad infinitum*

but why and how A and B react to give C, since if we have the answer to this then we may be able to predict how D and E react to give F.

One of my answers to the question of where are we going is, therefore, to more and more theoretical chemistry as an answer to why and how chemicals react.

I should like to pay a personal tribute to Professors Packer and Vaughan for their textbook "Organic Chemistry" published in 1958, which by a unique blend of classical organic chemistry and theory blazed a new trail in the presentation of the subject which is now the normal pattern.

Today, when industry employs a university trained chemist it must be realised that he may know little of the specialised chemistry involved but it should not take him long to apply his fundamental training and bring new knowledge effectively to the problems in hand.

Rise of Instrumental Techniques

When I started research in organic chemistry I prepared my compounds by classical methods, analysed them myself by the macro-combustion technique using 0.2 g. and occasionally used a polarimeter and a refractometer, mainly to add further criteria for identification in addition to melting point and boiling point. Now we have a whole range of expensive instruments which give us information on our compounds usually using micro quantities of materials.

But before we can do a physical measurement we have to separate and purify our compounds. We have all seen the impact of chromatography, ion-exchange resins and molecular sieves on the separation of chemical compounds.

The use of gas liquid chromatography was well illustrated recently by my colleague Associate-Professor B. R. Davis and his students. In carrying out a supposedly simple conversion by the well-known Clemmensen reduction he isolated no less than 20 other compounds and by determining all their structures added considerably to our understanding of this now not-so simple reaction.

Where are we going? My answer is in two words, to *organic* chemistry and *computers*. With the rise of synthetic chemistry, petrochemicals, plastics, etc., there was a tendency to drop the word organic and use a new term, the chemistry of carbon compounds, but I would prefer to retain the term organic or biological chemistry in the above prediction of the future with the meaning, the chemistry of living matter.

In looking at the future let us look at the unsolved problems. I, as a worker in natural products can see that there is still a vast field of work ahead. Of higher plants it has been estimated that New Zealand has 2,000 species, Australia 20,000, Japan 10,000, Hong Kong, 2,000, Malaysia 30,000, Indonesia 25,000 and India 11,000 (with 2,000 of medicinal value).

The world's largest family of flowering plants is the Orchid family (20,000 species), the investigation of the alkaloids of which has just started. In few cases of plant chemistry has a complete analysis been carried out—alkaloids may have been isolated but the other constituents have been neglected. The chemistry of the higher plants of Africa and South America is hardly touched.

But in addition to that of the higher plants there is still the chemistry of fungi, lichens, bacteria, marine organisms, insects, etc. There are more fungi, by many factors, than the higher plants and many produce much more complicated compounds. One new fungal compound under investigation overseas has a ring of over 60 carbon atoms! What a challenge to chemists interested in elucidation of structure, synthesis, biogenesis, reaction mechanism, etc. To date, the emphasis in fungal chemistry has been on antibiotics but a new field awaits the exploring chemist with an intrinsic interest in new compounds.

There is no question to my mind that the discovery of new types of compounds from natural sources has been the spark to set off an explosion of so many other investigations. We do not have to reflect very long to realise the impact the steroids have made on the advancement of the whole field of chemistry, degradation, synthesis, conformation, reaction mechanisms, application of physical methods etc. Our understanding of the reproductive physiology of the female has greatly expanded through our knowledge of the steroids and has led to the Pill. In contrast with our knowledge of the reproductive physiology of the female we have still much to learn of the corresponding chemistry and activity in the male before a male contraceptive pill is produced.

The big unsolved problem is us! What is life and in these days of heart transplants, what is death? How do we tick over, with the heart pumping 5 quarts of blood a minute, 75 gallons an hour, 70 barrels a day and 18,000,00 barrels in a lifetime?

What is life and how did it start? Amino acids can be produced by the action of an electric discharge on a mixture of methane, water, and nitrogen. Can the amino acids then be used as the building blocks of polypeptides, enzymes and finally life? What is death? Only when the heart stops beating or when the cells cease to function? When do the cells cease to be active? What keeps a seed alive for many years without any apparent change? These are some of our fundamental problems.

Most of organic chemistry to date has been concerned with relatively small molecules up to say a molecular weight of 1000. With modern techniques their constitutions can now be solved in a relatively simple manner and in a short time.

It took over a hundred years of classical organic chemistry to solve the structure of strychnine, during which over 500 degradation products were obtained. Vindoline, a newly discovered alkaloid of comparable complexity, had its structure solved mainly by the application of physical measurements, i.r., u.v., n.m.r. and mass spectra with only six degradation products.

The fundamental challenge ahead is the chemistry of the larger molecules, the high polymers of nature which are the clues to life—the polypeptides, proteins, enzymes, lipids, D.N.A., R.N.A. and other cell polymeric products. What mechanism of polymerisation allows a single grass seed to germinate and in its life growth produce five miles of roots and root hairs? What type of polymer is built into pollen grains that allows them to resist decay and be found in rocks millions of years old?

Some advance has been made in the degradation and synthesis of polypeptides but much remains to be done in the synthesis of the proteins themselves. Merrifield's automated solid phase synthetic method is revolutionary in this connection but, in my opinion, it could well be used to cover the whole field of synthetic chemistry. As the Nobel Prize was awarded to Martin and Synge for their introduction of partition chromatography it could well be awarded to Merrifield for his outstanding novel contribution to automated synthesis.

The Combination of Chemistry, Biochemistry and Pharmacology

There is still a big gap between our knowledge of chemical constitution and pharmacological activity. In the search of a cure for cancer most of the results have come from empirical testing. Likewise for antibiotics these have come from empirical testing of fungal metabolites. I do not think that the combined genius of chemists and pharmacologists would ever have come up with penicillin.

A breakthrough in micro or submicro pharmacology must come before we can have an efficient system of testing new drugs. Many advances in chemistry have come from the introduction of micro and submicro methods. Only when similar micro methods are available in pharmacology and experiments on whole live animals are no longer necessary will comparable advances be made in pharmacology. We still have a long way to go in finding the biological activity of all the chemicals known. Perhaps we may need to get down to molecular chemistry which appears to be effective in such behaviour as sex attractants of insects, the alarm substances of fishes and the sexual stimulants of fungi.

Computers

I have placed the chemistry of living matter at one end of the scale and mathematics, the queen of the sciences, in the form of computers at the other. But what a lot lies in between!

First of all let us look at the problem of the increasing amount of chemical literature. The Chemical Society of London subscribes to a new chemical journal almost every fortnight and the amount already published is calculated to double in eight years. The answer lies surely with computerised information with instant retrieval.*

Even more sophisticated instrumental techniques will be available using every type of radiation known—and as yet unknown. Most of these results will be capable of being computerised and I can see the future when spectral results of various types can be fed into a computer which provides an answer that a certain group or type of compound is involved, or even in the case of unknown substances, what the compound is. Already, the X-ray crystallographer, after making his crystal measurements, through a series of computerised procedures, can obtain a three dimensional picture of his compound in print-out form.

All this involves expensive equipment so that only well endowed institutions will be able to take advantage of the computerised services. Just as medicine is moving away from the general practitioner to group specialist practice so the role of the individual chemist will pass. There is, in my opinion, already in New Zealand a need for a central services laboratory for industry where expensive apparatus can be available on a time and cost-plus basis.

And finally, I think the chemist will be contributing to human problems as well as to technology. As an example, take the melanising hormone. The colour of the skin, hair and eyes is caused by a pigment called melanin occurring in specialised cells. The same substance is found in the plant kingdom, e.g. in the blackening of peeled potatoes, the browning of sliced apples and in the common mushroom. The amount of melanin produced in the skin of *all races* is controlled by α- and β-melanotropins, poly-

---

* Since this address was given the Chemical Society of London has announced that a U.K. Consortium on Chemical Information, including the principal chemical societies, in conjunction with the American Chemical Society has acquired the rights to distribute publications and computer services of the Chemical Abstracts Service and will develop a system of processing data into the Chemical abstracts system.

As a further sign of the times it has been announced that the powerful Pergamon Press, a commercial publisher of many chemical journals, has been sold to Leasco Data Processing Equipment Corporation, an American computer leasing information service and management consultancy group.

peptides of known constitution produced by the middle lobe of the pituitary (hypophysis). This is similar to the action of other pituitary hormones which control other normal functions of the body.

Thus, is it not completely unscientific to use the amount of melanin in the skin as the main criterion of the superiority of one race over another, as so many misguided people do?

No matter what the future holds, the person who takes up chemistry as a career is assured of an exciting life and discoveries beyond our dreams of today. May he enjoy the pleasures of discovery.

THE 1969 LIST OF MEMBERS

This list contains all additions and alterations up to 8 September 1969. It is thus almost two years more up-to-date than the 1968 list which was based on data from late 1967.

The response to our letter was excellent, and almost half the members have requested some form of change. Whether or not they received it in the form they expected is another matter.

As a result of suggestions fifteen new categories have been added to the occupations. Encouraged by these the chairman spent a Sunday emptying out the Applied and Industrial categories, generally without the occupants' consent. The result is a much more comprehensive breakdown of what members are doing than the first attempt in 1968. Some may not settle too easily in the new places. "Chemical Manufacturing" is better than "Industrial" but suggestions for greater precision would be helpful for the next List.

There will be a future problem in purging the categories where members fail to notify a change of interest or occupation. As a precaution, names have been deleted whenever the listing has been in doubt.

"Administrators" and "Chemical Engineers" remain exclusive as promised. There is even a slight shift in title to give emphasis to the point. There may have been inadvertent harshness in excluding the requests of some. If we have been unjust please write, making a firm claim for the next List.

Some members still seem to be in doubt about dual listings. The Occupational List should enable one to consult a Theoretical Chemist in the Surface Coatings industry or a School Teacher who is a Spectroscopist. It does not aim at discovering a Physical Chemist who is a Theoretical Chemist who is a Radiochemist.

By contrast the modesty of the Retired is an embarrassment. Many forgot to give their address, and abandoned claim to any other category. With respect, where knowledge permitted they were put into place again. It is useful to be able to find a Retired or Part-time Microbiologist.

The patience, co-operation and criticism of everyone is sought to make this section of the List into a first class tool.

In the Alphabetical Section a new and ominous title appears. "Address Unknown". Such persons tremble on the brink of oblivion. The pedant is cutting the P.O. from P.O. Box, and the Universities make steady progress in the form of their addresses. Auckland has acquired a Private Bag in place of a Box, and Canterbury has ceased to require any container at all. Small items, but a great many fresh slugs in the galleys.

JOHN POLLARD,
Chairman, List of Members Committee.

LETTERS TO THE EDITOR

Dear Editor,

I read with considerable interest Dr. Hove's article on The Protein Problem in your June issue, and I would like to congratulate him on a well-balanced and readable summary of the situation.

I would, however, like to clear up one or two misconceptions which Dr. Hove appears to have about local efforts in this field. He states that "the protein quality of the milk biscuit had never been tested. Apparently it was assumed to retain all the goodness of the ingredients from which it is made. This is a dangerous assumption. . . ." This is not a correct interpretation of what I said at the ANZAAS meeting in Christchurch. The assumption that the wholemilk biscuit retains the "goodness" of the ingredients is based not on ignorance of the possibility of non-enzymic browning but rather on manufacturing procedures specifically designed to avoid browning. The biscuits are dried under vacuum at low temperature to a moisture content of 3 percent. While no animal feeding tests have been carried out, measurements of 5-hydroximethyl furfural before and after processing have indicated that destruction of lysine was well under 1 percent. The maximum moisture content is the same as that specified for milk powders, and has been fixed to minimise non-enzymic browning during storage.

The New Zealand Wholemilk Biscuit is essentially a ready-to-use consumer product and, contrary to what Dr. Hove states, is particularly intended for distribution in backward areas where facilities for reconstitution of milk are not available.

The published table of comparative costs does less than justice to the Wholemilk Biscuit. For a fair comparison the costs of other protein products should be given for small ready-to-use consumer packs.

I would also like to comment on Dr. Hove's assessment of the situation with regard to leaf protein. He will no doubt be aware that several groups in New Zealand are working in this field.

Unfortunately the Wisconsin process to which Dr. Hove refers is not as attractive as appears at first sight. The liquid obtained by crushing leaves contains 88-90 percent water, and to spray dry this is relatively expensive. The dried product contains around 35 percent "protein" defined as N x 6.25. In fact much of the nitrogen-containing material is not protein but chlorophyll, nucleic acids and miscellaneous low molecular weight material. Amino acid composition and biological value of the protein are calculated by Strahmann and his co-workers in terms of the yield of amino-acids obtained by hydrolysis. This procedure is defensible when working with protein material, but can be misleading where, as in the present case the (N x 6.25) protein is much higher than the true protein.

The remaining solids in the Wisconsin spray-dried material (some 65 percent) include a considerable amount of pectin and other carbohydrate materials which are not digested by non-ruminants. Further, from 20 percent to 47 percent of the original material is lost in solvent extraction. When the cost of spray-drying is related back to the amount of high-quality protein it would amount to at least 10 cents per lb protein. On top of this is the cost of solvent extraction, a process which is common to all purified leaf materials.

In spite of these comments I do agree with Dr. Hove's general comments. I do agree that this field offers "some interesting and even exciting possibilities" and I do agree that we must explore all possible methods of marketing our grass.

L. P. J. CHAPMAN.

Dr. Hove replies—

I am sorry that my review on "The Protein Problem: Grassburgers or Milk Biscuit" left an impression of a less than favourable regard for the ingenious product known as the New Zealand Milk Biscuit. Just recently I had occasion to discuss this product while we were considering the U.S.A. draft for an International Standard for Precooked Dried Cereal Foods for Children. I insisted that the language of the proposed standard be broadened to permit the inclusion of the Milk Biscuit. This draft will be submitted to and considered by the Codex Alimentarius Committee on Foods for Special Dietary Uses at its meeting in Germany in November 1969.

In response to Mr. Chapman's comments, may I say that I well know that the Milk Biscuit is manufactured under optimum conditions. This does not alter my conviction on the need for animal feeding tests. Too many times I have seen *a priori* logical deductions fail before experimental testing. I would require an extensive series of experimental-animal standard feeding tests of the Biscuit under variable times and conditions of storage. Any number of chemical indications of quality, including amino acid analysis, could not substitute for the direct feeding tests. (Parenthetically, may I express my concern that a country like New Zealand, which is so dependent on producing high quality foods for human consumption, does so little in the science of nutrition.)

I would be glad to see the Biscuit reach the most backward areas where no child goes to school because there are no schools, where there are no health facilities, where strangers and strange foods are rejected. I never suggested that the Biscuits should be compared with reconstituted skim milk! Both would be rejected. The comparison must be made with far cheaper, locally produced foods. In such totally backward areas the price of the Biscuit is non-competitive, in my opinion.

Mr. Chapman's point on cost comparison is well taken. This is a tough area for sound figures. However, the Biscuit price as quoted *is* a wholesale figure even though packaged in small units because of technological necessity. The price *is* high relative to possible locally produced protein foods to solve the protein problem. But note that there is a wide intermediate area of moderate poverty (i.e., cash equivalent income per family of $200 to $800 per year) where the Milk Biscuit would have significant impact. Push into this area.

Why not test-market the Biscuit in New Zealand? Check its acceptability! Perhaps it could compete in the more affluent nations of Europe and America. Alter its form; check flavours. Hire a marketing specialist.

On the matter of Leaf Protein concentrate, I bow to Mr. Chapman's knowledge of technological problems. I assume his statements are based on his own direct experimental determinations rather than abstract calculations, for which I have little regard. I await a grass protein product of acceptable quality at a competitive price. I feel sure it can be done.

EDWIN L. HOVE, Ph.D.,
Acting Director, Division of Nutrition, Bureau of Science, Washington D.C.

Dear Editor,

I am writing to you as advertising manager for "Science Record", the annual publication of the Science Students' Association, University of Otago. Over the last twenty years this Journal has become established as a recognised university publication throughout a market consisting of universities, libraries and research institutions both here and overseas.

This year our University celebrates its centenary and to mark this we are publishing "Record" with a substantially renewed format. The intention is to present a complete catalogue of all current scientific research in New Zealand, covering the Physical, Biological, Medical, Dental and Agricultural sciences—a plan giving further details is enclosed. In each of these sections every research institution or department is treated separately and the work of each of its members is reviewed in the form of a few succinct notes.

The past issues of "Science Record" have consisted mainly of student articles, but this year this review was undertaken in the way of an experiment to determine whether such a journal has a place among New Zealand periodicals. We feel that since the journal offers a readily available, cheap and general catalogue of the latest research activities of this country it would thus be an invaluable reference for scientists, teachers, doctors and all those interested in keeping abreast, in a broad sense, with current trends. If accepted widely this year then the Science Students' Association will produce a similar review annually, and in this way will present a permanent "record" of research in New Zealand.

The magazine itself is approximately one hundred pages long, in an attractive paper-back form. Publication is under way now and it will be available early in September at a cost of sixty cents plus ten cents postage. I should point out at this stage that this is a non-commercial enterprise undertaken on a voluntary basis by members of our association.

Our main problem at this stage is making people aware that such a reference work exists, and is readily available. Since we are a non-profit group, any large advertising campaign is out of the question, and so accordingly we ask whether you would assist us by mentioning in your magazine or news sheets that "Science Record" exists and will be available early in September. We feel sure that many of your readers would find "Record" a valuable reference and would appreciate your letting them know it was available.

Orders for the journal should include remittance and should be posted to: "Science Record", University of Otago, P.O. Box 1436, Dunedin.

M. M. GARDEN.

SCIENCE RECORD 1969

Centenial Year Edition

Articles

"Units, Symbols, Metrication"; Professor M. L. McGlashan (Exeter University).
"100 Years of Earth Sciences"; Professor D. S. Coombs (University of Otago).
"100 Years of Medical Sciences"; Dr. J. A. Kilpatrick (Otago Medical School).
Report on D.S.I.R. Balloon Project conducted from Campbell Island earlier this year.
Winning entry in Student Research Project Essay Competition.

Research Notes

Physical Sciences

Earth Sciences (Geography, Geology, Mineral Technology, Meteorology)
Chemistry
Physics
Engineering (Chemical, Civil, Electrical, Mechanical, Theoretical)
Mathematics.

Life Sciences

Agriculture (Ag. Dept., Cawthron Inst., Massey, Lincoln, Dairy, Forestry)
Biological Sciences (Biochemistry, Botany, Marine Research, Microbiology, Zoology)
Social Sciences (Anthropology, Psychology, Sociology)
Medical Sciences (Medical Schools, Medical Research Council, Dental Research).

Research Organisations

D.S.I.R., National Parks Authority, Museums, etc.

ORGANIC MAGNETIC RESONANCE

A new international journal, Organic Magnetic Resonance, caters specifically for that one field. The first issue contains an excellent collection of papers from Europe and America.

The Australasian Editor, Dr. T. J. Batterham,
The John Curtin School of Medical Research,
The Australian National University,
Box 4, G.P.O., Canberra, A.C.T.

would be pleased to receive papers connected in any way with NMR, ESR or NQR. At present, acceptable papers will be published rapidly.

Current Chemistry . . .

A DYNAMIC MODEL OF CALCIUM METABOLISM

J. H. Livesey and W. S. Metcalf

University of Canterbury, Christchurch

For some time now it has been known that from the age of about thirty-five years onwards there is a gradual decrease in the density of the bones of most people. When this decrease in density has become so great as to be readily detected by radiography, or by the increased fragility of the bones, the condition is known as osteoporosis. The density decrease seems to be caused by a loss of bone mineral and is more rapid in women than in men. While, on the average, women may lose about 30 percent of the mass of many bones by the age of seventy, the loss of mechanical strength is much greater than this because of the structure of bones. In consequence there is an increased incidence of collapsed vertebrae and of fractured femurs and wrists among elderly women. In Christchurch alone osteoporosis contributes to several fractures of the femur each week. This high incidence of osteoporosis gave the initial impetus to the present study.

Our aim is to formulate a mathematical model of human calcium metabolism consistent with as much as possible of the data presently available. The basis of the model will be a number of compartments, each containing calcium or some other relevant metabolite, with fluxes of these between the compartments, and with provision for ingestion and excretion. The masses in each compartment will change with time by an amount decided by the fluxes into it and out of it, and by the time interval. The fluxes between the compartments containing calcium are to be functions of the quantities or fluxes of one or more of the other metabolites, such as water, parathyroid hormone, calcitonin, vitamin D, phosphate ion and other ions. Controls, such as that of the concentration of calcium in the blood by parathyroid hormone, will be included. It is hoped to be able to run the model through the equivalent of a human lifetime on the IBM 360/44 digital computer, but at the moment the model covers only several weeks.

We are obtaining our data from the extensive literature on calcium metabolism and have followed other workers in using four compartments to account for the disappearance of Ca^{45} injected into a vein. We have added to this a compartmental model of the alimentary canal, originally of 10 compartments but now of 20, which at its present stage of development is giving good agreement with the observed behaviour of calcium in the gut. Also incorporated in oversimplified form is the feedback control of blood calcium and the partitioning of calcium ions between the extracellular fluid, the blood plasma and the blood proteins.

One major problem remaining is to model the mechanisms which control the growth of the skeleton in childhood and its relative stability in adulthood.

The model will enable us to test the consistency and adequacy of present data, and where there are deficiencies, to design suitable experiments to remove them.

COMMENTS ON CONFERENCE

1969

Was this a successful Conference? If success is measured by the degree to which the objectives of the Conference Committee were reached, only they can tell. However, for the rest of us this new type of Conference was a welcome change from some of the learned discourses we have endured for the sake of chemistry in the past. In those days I was always reminded, as I sat uncomprehending through some earnest but no doubt well prepared material, of that definition of an expert as one who knows more and more about less and less. If we rephrase this to "one who can communicate less and less to more and more", then the old-style conferences were fairly well defined for many of us outside the ivy-covered walls.

The choice of speakers this year, their subjects and the way they treated them made every lecture well within the understanding of every delegate. This might not be CHEMISTRY as taught and learnt at the university, but it certainly showed us the end-use of a lot of this teaching and learning.

The absence of alternative sessions for most of the time meant large audiences for the speakers—was it this, or lack of encouragement from the chair, that inhibited questions and discussion after so many sessions? I cannot believe that chemists are not interested in the present and future uses of their art, so I expected more audience response than there was.

Conference is not all work—there was a very successful wine and cheese evening, owing much of its success to the high proportion of wine and the almost complete absence of cheese! The Annual Dinner went down very well (or should I say it was washed down!) even if the waiters knew very little about their art.

The trade displays were interesting, and moving the morning and afternoon tea tables revealed that there were more than two rooms of these! A difficult choice had to be made between factory visits and student papers. I chose a factory visit, but I was assured that the student papers were of a very high standard and a good feature of the Conference. From friends who toured the chocolate factory I gathered that the pharmaceutical factory I saw was more interesting, especially as we saw and talked with some of the technical staff.

For those of us whose consciences or bosses require some reason for spending five working days away, it was a pity that the contents of pre-conference symposia were not made known soon enough in sufficient detail to get us to attend. If by some juggling the $4\frac{1}{2}$ days could have been condensed into four days, this would have suited me personally, and would seem to be a reasonable length for a Conference.

In essence, an enjoyable and valuable Conference, and one which will set a problem for future Conference Committees to match. It left me with the thought—why have a Conference like this every third year —why not every year?

C.L.H.S.

GRADES OF MEMBERSHIP

The following changes in membership requirements shall be effective from 1 January 1970.

(1) To qualify for Associateship the basic requirement shall be a B.Sc. degree as at present together with *four* years' practical experience. Those who qualify by examination may be allowed up to two years off the qualifying period of experience.

(2) A new grade, that of Graduate member, shall be introduced for those possessing the Degree requirement but lacking the practical experience. Graduate members shall have all the normal rights and privileges of Associates except to serve on Council, will pay a reduced subscription ($2.00 plus the local subscription) and may not remain in the category of Graduate member once they have qualified for the Associateship.

(3) Entry to the Associateship by examination shall be abolished and those wishing to qualify in this way should complete the examination requirement by the end of 1974. Following that date Rule 8.3 would provide the only route to the Associateship for those lacking the Degree qualification.

COUNCIL NOTES

The 1970 Conference will be held in Palmerston North.

Institute Prizes. There were no new entries for the I.C.I. prize.

Salary Survey. Seventy percent of the membership returned their questionnaire.

Careers in Chemistry brochure. 10,000 copies of this have been printed and nearly all have been distributed to schools and the Vocational Guidance Service.

Sixth Form Bulletins. The Education Department has agreed to publish a series of bulletins for sixth form pupils with suitable acknowledgement to the Institute. The Institute (through the Canterbury Branch) is preparing the manuscripts for the Government Printer. Cost to the Institute will be mainly those involved in typing the manuscripts.

Technicians' Certification Authority. Professor E. Harvey was nominated for a three-year term as the Institute's representative on the Executive Committee for Science of the T.C.A.

Equivalent Qualifications. The Membership Committee has been requested to make recommendations concerning equivalent qualifications with particular reference to the degrees of B.Food Tech.., B.Pharm. and B.E.(Chem.).

FORMATION OF SPECIALIST GROUPS AND SECTIONS

Analytical Group

Following a meeting during the Annual Conference at Otago on 26 August, a decision was made to form an Analytical Chemistry Group in the Institute.

Dr. R. R. Brooks of Massey University was appointed Chairman.

The purpose of the Group will be to bring together members who are interested in Analytical Chemistry and to negotiate for the provision of appropriate lectures or symposia during the annual conferences.

Branches will be requested to supply "corresponding members" to furnish information on local happenings of interest to Analytical Chemists.

It is envisaged that another function of this group will be to negotiate with the Council for the visit of prominent overseas analytical chemists to New Zealand in order to give lectures throughout the country.

Members wishing to join the Analytical Chemistry Group are asked to contact the Chairman at Massey University. There will be no subsciption for this Group and the emphasis will be on informality.

Organic Section

Chemists with organic chemical interests held a discussion during the N.Z.I.C. Conference in Dunedin and decided to form an Organic Section of the N.Z.I.C.

There was general agreement that the Section would act as a group which would assist the Institute to make more adequate provision for the interests of organic chemistry. The Section was to be administered by a President, Secretary and corresponding members in each university centre. The President (Professor R. E. Corbett) and Secretary (Dr. M. R. Grimmett) were elected with instructions to circulate members of the N.Z.I.C. with information concerning the proposed Section, and then to arrange for the appointment of corresponding members for 1969-70 in Christchurch, Wellington, Palmerston North, Hamilton and Auckland.

It was agreed that the probable functions of the Organic Section would be:

(i) Making recommendations to the annual Conference Committee concerning the programme, both as it relates to papers in organic chemistry, and to the correlation of the organic programme with those of other sections.

(ii) Suggesting possible overseas visitors to the N.Z.I.C. Council, and arranging symposia from time to time when appropriate overseas visitors are making brief visits to New Zealand.

(iii) Publicising the research activities of organic chemists.

It is envisaged that research summaries will be published annually in the N.Z.I.C. Journal.

The section will be open to all members (local, graduate, associate, or fellow) of the N.Z.I.C., who are interested in organic chemistry. It is to be hoped that members of this Section will also attempt to maintain a broad outlook on chemistry and join other Sections in which they are interested.

A cyclostyled sheet with further details, and a membership application form are included with this copy of Chemistry in New Zealand.

Electrochemistry Section

At a meeting of electrochemists held in Wellington on 12 August 1969, it was agreed that an Electrochemistry Section within the N.Z. Institute of Chemistry should be formed. This move has been supported by Council.

The following officers were elected:

Chairman: Professor J. W. Tomlinson.

Secretary: Dr. G. A. Wright, Department of Chemistry, University of Auckland, Private Bag, Auckland.

Correspondents: Professor G. N. Malcolm (Manawatu), Dr. A. F. M. Barton (Wellington), Dr. T. Hagyard (Canterbury), Dr. R. A. Matheson (Otago).

The main object of the Section will be to promote meetings of electrochemists on suitable occasions, particularly during annual conferences of N.Z.I.C. It is hoped that a specialist electrochemistry session will be included in the programme of the 1970 conference at Massey University. The Section will also draw up an address list of those interested in Electrochemistry, and a newsletter will be circulated giving a review of electrochemical activities in New Zealand. Membership of the Electrochemistry Section is open to members of N.Z.I.C. and all other interested persons; and they are invited to join by contracting their local correspondent or the secretary. There is no subscription.

BRANCH NOTES

Auckland

University

Professor D. Hall and Associate Professor A. L. Odell were recently awarded the degree of D.Sc.

Mr. D. Shooter, M.Sc., was appointed as Lecturer earlier this year.

Recent visiting lecturers in the Department have included Dr. J. D. Lambert from Oxford and Dr. K. Emerson of Montana State University. Professor J. A. Young of King's College, Wilkes-Barre, also visited recently and gave an informal address on aspects of teaching and assessing practice in the United States.

A Post-Graduate Course in Radiochemistry was held during May in the newly opened facilities of the Urey Laboratory and was well supported.

The Chemistry Department was well represented at the IUPAC and Coordination Chemistry Congress in Sydney: in addition to staff members, a number of senior students attended.

In August, Associate Professor Odell went on short study leave to the University of Wisconsin, making visits in Australia, Europe and the U.K. en route. Dr. M. J. Taylor will be spending two terms at the University of York with Dr. R. E. Hester in the area of far infrared and laser Raman spectroscopy.

Following interest and representations from members of advanced classes, a Student Chemical Society has come into being and regular meetings are planned.

Other recent visitors have included Professor Sir Ronald Nyholm, Professor C. A. Coulson, Dr. L. C. Cross and Professor A. W. Adamson. Professor Nyholm addressed a meeting of the Branch on the subject of "Structure and Reactions of Co-ordinated Olefins'.

Dr. Arthur Fry, University of Arkansas, has taken up a post of Visiting Professor in the department for six months. Dr. Fry is an authority on heavy atom isotope effects in relation to organic reaction mechanisms.

Dr. F. J. Aggett has been awarded a Nuffield Travelling Scholarship and will work with Professor T. S. West at Imperial College, London, while on leave next year.

Associate Professor R. C. Cambie has been appointed to the chair of chemistry being vacated by Professor L. H. Briggs next year. Professor Cambie was recently awarded the New Zealand Association of Scientists Research Medal.

Dr. C. A. O'Connor has been awarded the Hamilton Prize of the Royal Society of New Zealand.

Auckland Science Teachers' Association

The Association has initiated a newsletter for local schools in which contributions from N.Z.I.C. members will naturally play a part.

Fertiliser Manufacturers' Research Association

Dr. J. Rogers, Director, has returned after a ten weeks visit to fertiliser centres in the U.S., U.K., Europe, Africa and Australia.

Mr. P. Gallaher, Chief Chemist, visited Australia in March to see recent developments in the fertiliser industry in New South Wales, Victoria and South Australia. Current research was also discussed with C.S.I.R.O. Divisions, the Bureau of Mineral Resources and the Australia Mineral Development Laboratory.

Branch Activities

Meetings this year have been addressed by Dr. D. F. Nelson on Broken Glass and Crime;

by Professor P. B. D. de la Mare (taking the place of Dr. B. S. Hartley at short notice), on Solvent Effects and Ion-Pair Intermediates in Nucleophilic Replacement; by Dr. G. A. Wright on Chemistry in Copenhagen and by Professor G. N. Malcolm on Theory and Experiment in Macromolecular Solutions, Solids and Networks.

The June meeting was concerned with the Use and Production of Chemicals in the Pulp and Paper Industry, being a joint meeting with the A. and N.Z. Pulp and Paper Industry Technical Association.

During the University mid-term break visits for senior students were arranged under the auspices of the Institute to some 12 to 15 laboratories and industrial establishments in the Auckland area. An allied venture worth mentioning is the valuable liaison taking place between the Institute and the newly established University Appointments' Board.

Mr. L. Bolton and Mr. M. Gibson have been appointed Tutors in Chemistry at Auckland Technical Institute.

Mr. R. B. Page has been awarded a Woolf-Fisher Fellowship.

Dr. M. J. Taylor has resigned from the Auckland Branch Committee pending a period of overseas leave.

Waikato

The first appointments for the School of Science at the University of Waikato have been made.

Dr. A. T. Wilson of the Chemistry Department, Victoria University of Wellington, has been appointed Dean of the School and Professor of Chemistry.

Dr. R. M. Carr, Chemistry Department, Victoria University of Wellington, has been appointed Reader in Chemistry.

Mr. Pat Lester, Branch Secretary, has resigned from the staff of Hamilton Teachers' Training College to return to England where he will continue his university studies.

Manawatu

Massey University

Professor R. D. Batt has been appointed to the Scientific Advisory Committee for the National Heart Foundation.

A post-doctoral fellow has been appointed to the Department of Chemistry and Biochemistry and will take up his post later next year. He is Dr. E. C. Baker who is presently engaged in protein crystallography with Professor D. C. Phillips and Dame Dorothy Hodgkin.

The final stage of moving into the new Science Block by the Department of Chemistry and Biochemistry was completed with the transfer of the mass spectrometer.

Dr. G. M. Wallace, Reader in Food Technology, has recently returned from nearly nine months overseas leave. He spent three months in Thailand as a Colombo Plan Consultant where he assisted in food technology course planning. He also spent nearly three months working with Mr. N. W. Pirie, F.R.S. at Rothamsted on the extraction and uses of plant protein material from vegetation. The remainder of the time was spent visiting a number of research groups involved in fish farming.

Mr. H. A. L. Morris has left to spend some time working with a U.K. food processing firm and he will also work at the University of Illinois before returning next April.

Professor J. K. Scott is in Rome on an FAO assignment on Dairy Education. He will be visiting a number of institutions in the U.K. to examine methods and courses used in the teaching of management.

Mr. David Cullwick, a recent graduate of the Food Technology Department has been selected for a Walter Mulholland Scholarship to study towards a Ph.D. in Food Marketing.

New Zealand Dairy Research Institute

Dr. P. S. Robertson has been awarded the Special Research Medal by the New Zealand

Association of Scientists for his work in the area of dairy science and technology. His work covers a broad front ranging from the carbon dioxide content of cheese to important improvements in processing methods for the production of cheese. Much of this work is embodied in some 35 papers and 22 technical notes.

Mr. J. D. Sargent has retired from his position as Chief Microbiologist which he has held for the last three years. Prior to that time he was the Head of the Microbiology Department of Massey University.

Dr. R. C. Lawrence has been appointed to the position of Chief Biochemist. He has recently returned from Australia where he visited a number of research laboratories.

Dr. L. E. Pearce has been appointed to the position of Senior Microbiologist.

D.S.I.R.

A new Division of the D.S.I.R., Applied Biochemistry, has been created in Palmerston North. It incorporates the Food Chemistry Division previously in Wellington and the Plant Chemistry Division from Palmerston North, and initially has a professional staff of 30 and a technical staff of 40. The Director of the new division is Dr. G. W. Butler, the various sections and their leaders are listed.

Cell Biology: Dr. J. W. Lyttleton.
Natural Product Chemistry: Dr. E. Wong.
Proteins: Yet to be appointed.
Animal Nutrition: Dr. G. S. W. Reid, Dr. M. J. Ulyatt.
Lipids: Mr. P. Hansen.
Microbiology: Dr. R. T. J. Clarke.
Nitrogen Fixation, Dr. E. Moustafa, Mr. R. M. Greenwood.
Plant Biochemistry: Dr. P. J. Peterson.
Carbohydrates: Dr. R. W. Bailey.
Biophysics: Mr. K. I. Williamson.
Lincoln: Dr. R. M. Allison.

Dr. P. J. Peterson has been awarded a Science Research Council Senior Fellowship at University College, London, and is now working with Professor L. Fowden on amino-acid metabolism in plants.

Dr. P. Reay, after holding a post-doctoral fellowship in the Department of Biochemistry, University of California, Davis, has joined the staff of the Applied Biochemistry Division, D.S.I.R.

Dr. M. P. Hegarty, of the C.S.I.R.O., Division of Tropical Pastures, will spend seven months at the Applied Biochemistry Division.

Dr. R. M. Hutchins has arrived at the Applied Biochemistry Division, where he will work with Dr. G. B. Russell on insect hormone biochemistry. He previously worked in the USDA Laboratories in Beltsville, Maryland, and presently is seconded from Entomology Division.

Wellington

Chemistry Division

The highlight of the past two months' activities at Chemistry Division was the visit of Professor E. U. Franck of the Karlsruhe Institute on Friday, 15 August. Professor Franck gave a seminar on the chemistry of water at high pressure and temperatures. The work at Karlsruhe is of special interest to the geochemical group working with Dr. A. J. Ellis, as it is closely related to the natural processes occurring in New Zealand's geothermal areas. Professor Franck visited the Wairakei Section of Chemistry Division during the following weekend.

Two members of Chemistry Division are involved in visits to the U.S.A. to review work of interest in laboratories in that country. Mr. R. A. Kennerley is at present away studying matters relating to cement and allied building materials, and Mr. H. V. Brewerton will leave in early September to visit industrial, government and university organisations to assess the latest trends in pesticide research. He will also visit laboratories in Canada, Great Britain and Europe.

The Director, Dr. I. K. Walker, attended the I.U.P.A.C. Conference in Sydney and visited a number of Australian Institutes during August. Dr. D. F. S. Natusch pre-

sented papers at the Magnetic Resonance Conference at Monash University and later visited several Australian Chemistry Schools.

Institute of Nuclear Sciences

Dr. T. A. Rafter has been overseas from 4 to 23 August, visiting America, Sweden and Australia. He delivered lectures on the work of the Institute at the Nobel Symposium on Carbon Dating at Uppsala, and at the ANZAAS Conference in Adelaide.

Dr. J. R. Hulston attended the IUPAC Conference in August in Sydney and lectured on the use of computers in K/A dating. He was also included as a member of the N.Z. Atomic Energy Delegation at Lucas Heights.

Dr. L. A. McLachlan attended the 4th International Symposium on Electron and Nuclear Magnetic Resonance at Monash University in Melbourne. His paper dealt with structural studies of a liquid crystal using NMR spin lattice relaxation.

The N.Z.I.C. annual conference in Dunedin was attended by Dr. T. A. Rafter, the new President, and by Dr. G. S. McNaughton and Mr. R. J. Sparks, who lectured on analysis of steels by charged particle analysis.

Mr. K. W. Low returned in July from a three-month visit to Lucas Heights. He studied recent applications of computers to analytical problems in Chemistry and Physics.

The Nuclear Physics Section now has a PDP-9 computer in operation. This is used primarily to analyse the data produced on the 4000 channel pulse height analyser installed earlier in 1969, but its 8,000 word memory and larger word length will extend significantly the range of work previously handled by the PDP-8.

A Hitachi-Perkin Elmer recording spectrophotometer (model EPS-3T) has been installed in the Radiation Chemistry Section to aid in spectroscopic studies produced by radiation.

Victoria University

Chemical Society of London Visit

The Chemistry Department was host to the Chemical Society of London, the oldest national chemical society in the world, when it held its first official meeting outside the British Isles on 13 August. The theme of the one-day meeting was the chemistry of solutions and melts at elevated temperatures and pressures. Original papers in this field were presented by New Zealand scientists as well as three overseas authorities: Professor E. U. Franck (Institute for Physical Chemistry and Electrochemistry, Karlsruhe University), Professor C. C. Addison (Chemistry Department, University of Nottingham), and Professor O. J. Kleppa (The James Franck Institute, University of Chicago). The papers, although ranging from theory to the down-to-earth chemistry of New Zealand's geothermal systems, maintained a standard equal to that of any international conference. Just as important as the formal meeting was the opportunity for discussion between local scientists and overseas visitors during the day and at an informal function on the preceding evening. A dinner at which the guest speaker was the Minister of Science, Hon. B. E. Talboys, was followed by the Faraday Lecture, given by Professor C. A. Coulson, Rouse Ball Professor of Mathematics at Oxford. Before the Faraday Lecture, Fellows of the Society were formally admitted to membership by the President, Professor Sir Ronald Nyholm, after signing the Obligation Book which, together with the Society's silver mace, had been brought to New Zealand for the occasion.

Other recent visitors to the Chemistry Department were: Dr. A. Horney (U.S. Air Force, Arlington, Virginia, U.S.A.), Professors K. Saito and T. Fuwa (Tohoku University, Sendai, Japan), Professor D. G. Tuck (Simon Fraser University, Burnaby, British Columbia, Canada), and Professor R. M. Noyes (University of Oregon, Eugene, Oregon, U.S.A.).

Slater Laboratory

At a ceremony in the Easterfield Building at Victoria University on Tuesday, 5 August, the Organic Chemistry Teaching Laboratory was named after Professor S. N. Slater. A photograph of Professor Slater and a plaque to commemorate the occasion were unveiled by the Vice-Chancellor, Dr. D. B. C. Taylor, who acknowledged the valuable contributions made by Professor Slater to the Chemistry Department. These included the detailed planning of the Easterfield Building in which the Slater Laboratory is situated. Professor Slater recently resigned from his position as Head of Chemistry Department to devote his full time to administration in the University as Assistant Vice-Chancellor.

Professor N. F. Curtis, Professor A. T. Wilson and Dr. E. Sinn presented papers at the International Congress of Pure and Applied Chemistry and the International Conference on Co-ordination Chemistry in Sydney during August.

Two Chemistry Department staff members have been appointed to positions at the University of Waikato, Professor A. T. Wilson as Professor of Chemistry and Dean of the School of Sciences, and Dr. M. D. Carr as Reader in Chemistry.

Dr. A. G. Freeman recently departed for a year's study leave to work on the structure of polymeric tetrahedral anions with Professor D. W. J. Cruickshank at the University of Manchester.

The Mellor lecture, an annual event in the calendar of the Wellington Branch of the New Zealand Institute of Chemistry, this year marked the centenary of Dr. J. W. Mellor's birth. In honour of the occasion the lecture on Wednesday, 3 September at Victoria University was given by Professor H. N. Parton, Mellor Professor of Chemistry at the University of Otago.

Canterbury

Junior Chemical Society

The final lecture in the 1969 programme was given by Dr. M. Carr of Victoria University on "Symmetry". On the following morning members of the Society paid their now annual visit to the Chemistry Department, University of Canterbury. During the August vacation four members, selected by written examination, visited four D.S.I.R. Divisions in Lower Hutt. The two-day visit was this year sponsored by the Junior Chemical Society. Laboratories visited were Chemistry Division, Soil Bureau, Nuclear Sciences and Geological Survey.

University of Canterbury

Recent overseas visitors to the Chemistry Department have been Professor J. Ibers of North Western University, Evanston, Illinois, and Professor S. Winstein of U.C.L.A., both of whom spent brief periods in the department on the way back to U.S.A. from the IUPAC meeting in Australia.

Dr. K. Emerson has returned to Montana State University after working in the Chemistry Department for fifteen months.

Professor B. R. Penfold has returned from a year's sabbatical leave in Canada and England.

Otago

Recent months have seen an unprecedented influx of chemical visitors to Dunedin. At the time of the University Centennial a number of chemists, including Professor M. L. McGlashan (University of Exeter), Professor W. Klyne (Westfield College), Professor J. P. Tegan (Eire), Professor W. R. Cullen (British Columbia) and Dr. S. G. Wyllie (Institute of Advanced Studies, Canberra), gave colloquia. Professor C. A. Coulson gave a number of public lectures. Other visitors included Professor G. Badger (Vice-Chancellor of Adelaide University), Dr. F. H McDowall (Palmerston North), and Sir James Melville (Waite Institute), and more recently Professor R. Noyes (Oregan State University).

Before departing from New Zealand Professor R. L. Scott, the visiting Mellor Professor for 1969, and his predecessor Professor M. L. McGlashan presented to the Chemistry Department a photograph of Professor J. W. Mellor.

Delegates to conferences in Australia dur-

ing August included Professors H. N. Parton and F. N. Fastier, Drs. B. H. Robinson and C. G. Pope and Mr. R. McKeown. In the vicinity of 200 delegates attended the N.Z.I.C. Conference in Dunedin.

Recent promotions to Senior Lecturer status included Drs. G. W. Emerson (Biochemistry), R. F. Smith, I. D. Watson and M. R. Grimmett (Chemistry).

Dr. M. G. Smith (Biochemistry) has been granted a year's leave of absence to lecture at Auckland University.

Dr. D. V. Fenby will be taking leave of absence in 1970 to work with Professor B. Chu at New York State University.

Dr. J. Simpson (Bristol) has recently taken up a lectureship in Inorganic Chemistry in the Otago Chemistry Department.

Dr. Jack C. Dacre (Medical School, Dunedin) was invited by the Nuffield Foundation to take part in their "Food Safety Conference" held at Churchill College, Cambridge, England, during July. He read a paper entitled "Transport and Fate of Substances Absorbed in the Gastrointestinal Tract, with Special Reference to the Significance of Blood and Tissue Levels."

Dr. Dacre was also invited to attend the Gordon Research Conference on Toxicology and Safety Evaluations held at Kimball Union Academy, Meriden, New Hampshire, U.S.A., from 28 July to 1 August. He returned to Dunedin mid-August after visiting toxicology research laboratories in New York, Atlanta, Detroit and San Francisco.

THE REGISTRY

Fellows (elected 17/4/69):

ALLAN, James Eric, M.Sc.(N.Z.), Ruakura Agric. Research Centre, Hamilton (Scientist-in-charge, Spectrochemical Section).

HIGGINS, Desmond James, B.Sc., A.M.I.Chem.E., M.Eng., Kempthorne Prosser and Co. Ltd., Christchurch (Chief Production Officer and Works Manager, Hornby).

McNAUGHT, Kenneth John, M.Sc., Ruakura Soil Research Station, Hamilton (Scientist-in-charge, Plant Nutrition Section).

ROTHBAUM, Henry Peter, B.A., M.Sc.(N.Z.), Ph.D.(Liv.), Chemistry Division, D.S.I.R., Gracefield (Scientist).

(Elected 25/8/69):

HOGAN, Denis James, B.Sc., C.O.P. (Dairy Chem. and Bact.), Chemistry Division, D.S.I.R., Christchurch (Scientist).

RAFTER, Thomas Athol, O.B.E., D.Sc., F.R.S. N.Z., Institute of Nuclear Sciences, D.S.I.R., Lower Hutt (Director).

Honorary Fellowship

HUGHSON, Walter Gordon Mackenzie, M.Sc. (N.Z.), F.Inst.F. (Retired).

Associates (elected 17/4/69):

COWPERTHWAITE, Thomas Colin, Stewart, Foot & Co. Ltd. (Industrial Chemist).

van GAALEN, Wilhelmus A. C. T., Dip.Chem.E., Gear Meat Co. Ltd., Petone (Works Chemist).

JUDD, William Paul, M.Sc., Ph.D.(Auck.), Waikato Technical Institute (Tutor).

MOFFAT, Peter Alan, B.Sc., Leather & Shoe Research Assn., Lower Hutt (Research Officer).

PETERS, John Andrew, Dip.An.Chem.(Arnhem), Dip.Med.Tech.(Brisbane), Ruakura Agricultural Research Centre, Hamilton (Scientist).

WEAVERS, Donald George, B.Sc., Aorere College, Papatoetoe (Teacher).

(Elected 17/4/69):

BARNES, Robert Arthur, M.Sc.(Auck.), School of Obstetrics, National Women's Hospital, Auckland (Research Technician).

BEALL, Ivor Donovan, B.Sc., A.R.I.C., A.I.Mech. E., Reckitt & Colman (N.Z.) Ltd., Auckland (Chief Chemist).

BIDDLE, Roger Raymond, M.Sc.(Auck.), Orewa District High School, Orewa (Teacher).

BROOK, Roger Jeremy, L.R.I.C., Cawthron Institute, Nelson (Research Chemist).

CHOOI, Siew Yuen, B.Sc.,(Hons. Otago), Chemistry Dept., Otago University, Dunedin (Ph.D. Student).

COCKS, Sherryne Eve, B.H.Sc., Wellington Girls' College, Wellington (Teacher).

COLBY, Robin Ellis, B.Sc., U.E.B. Industries Ltd., Auckland (Quality Control Manager).

COOK, Donald Ferguson, M.Sc.(Well.), Chemistry Dept., Victoria University, Wellington (Junior Lecturer).

COUCH, Ronald Alexander Fyfe, M.Sc., Postgraduate School of Obstetrics, National Women's Hospital, Auckland (Research Chemist).

CUNDEL, Anthony Mark, M.Sc.(Well.), Microbiology Dept., Lincoln College (Ph.D. Student).
CUTFIELD, John Franklin, M.Sc.(Auck.), Chemistry Dept., Auckland University, Auckland (Ph.D. Student).
GALLAHER, Philip James, B.Sc., N.Z. Fertiliser Manufacturer's Research Assn., Auckland (Chief Chemist).
HICKMAN, Peter Geoffrey, B.Sc., Unilever (N.Z.) Ltd., Petone (Chief Chemist).
HOWARTH, David Thomas, M.Sc.(Cantua.), Christchurch Boys' High School, Christchurch (Teacher).
KING, Adrian William, M.Sc.(Auck.), Chemistry Dept., Auckland University (Research Technician).
KHALEQUE, Abdul, M.Sc.(Dacca), Dept. of Food Technology, Massey University, Palmerston North (Ph.D. Student).
McCORMICK, Ian Ross Newton, M.Sc.(Auck.), Chemistry Dept., Auckland University, Auckland (Ph.D. Student).
MILLS, John Raymond, B.Sc., Christ's College, Christchurch (Teacher).
MOLLOY, James Joseph, M.Sc.(N.Z.), East Coast Farmers Fertiliser Co. Ltd., Napier (Works Manager).
RAE, Mervyn Dominic, B.Sc., Lactose Co. of N.Z. Ltd., Kaponga (Industrial Chemist).
RAE, Wallace James, M.Sc.(Cantua), Ivon-Watkins-Dow Ltd., New Plymouth (Industrial Chemist).
ROBINS, Malcolm Douglas Wakefield, M.Sc. (Well.), Shell Oil (N.Z.) Ltd. (Marketing Chemist).
ROBINSON, Marion Frances, M.H.Sc.(Otago), Ph.D.(Cantab.), School of Home Science, Otago University, Dunedin (Associate Professor, Nutrition Dept.).
SEYMOUR, Barry Ramon James, B.Sc., Riccarton High School, Christchurch (Head of Science Dept.).
THORP, John Martin, B.Sc(Hons.), Ph.D.(Lond.), Auckland Industrial Development Division, D.S.I.R., Auckland (Scientist).
SWALLOW, William Henry, M.Sc.(Cantua.), Pathology Dept., Christchurch Hospital, Christchurch (Assistant Biochemist).
WILKINSON, Barry Ralph, M.Agr.Sc.(Lincoln), Ph.D.(Lond.), Wool Research Organisation, Christchurch (Research Biochemist).

Deaths

The following deaths were recorded with regret:
R. B. COLE, E. LEESE.

Resignations

K. B. BROOKS, Mrs. M. B. GALE, L. N. GIBBINS, J. C. McCONNELL, T. J. NISBET, D. R. OLDROYD, W. C. SOMERVILLE.

Remission of Subscriptions

G. B. BEATH, M. R. BAILEY (one year), F. CAUGHLEY, P. J. C. CLARK, L. HARTMAN, Miss P. R. JACKSON, H. L. LONGBOTTOM, D. H. McLEAN, Miss S. MERRICK (one year), M. L. H. STEWART.

Preliminary Notification

INTERNATIONAL SOLVENT EXTRACTION CONFERENCE 1971

The Society of Chemical Industry has agreed to sponsor an International Conference devoted to the science and technology of solvent extraction. This will be held in The Hague in the Netherlands during the week commencing 19 April 1971. The organisation of the Conference will be in the hands of a Conference Committee under the chairmanship of Mr. B. F. Warner.

The emphasis of the Conference will be on technical solvent extraction of both inorganic and organic substances, including basic principles and practical applications. Sessions are envisaged covering the chemistry of solvent extraction, industrial processes and economics, the performance of contacting equipment and the underlying phenomena involved, and the response characteristics and control of such units.

The Conference Committee will welcome offers of papers for presentation at the Conference. In the first instance, intending authors should submit a preliminary title and an indication of the scope of their contribution to the Conference Secretary: Dr. C. Hanson, University of Bradford, Bradford 7, U.K. It is hoped to have available in September a first circular giving further details of the Conference and copies may be obtained from:

International Solvent Extraction
Conference 1971,
Society of Chemical Industry,
14 Belgrave Square,
London, S.W.1.

COURSE IN BIOTELEMETRY

The University of New England, Department of Adult Extension, and the Australian National University, Department of Adult Education, have organised an intensive course on Biotelemetry to be held at Canberra, 1-5 February 1970. The course will be presented by Professor Stuart Mackay. Enrolments close on Thursday, 27 November 1969.

Biotelemetry methods can be important to any investigator who should study animal or human subjects without interfering with normal patterns. Miniature radio transmitters which can be swallowed or implanted in man or animals to reveal otherwise unobtainable information are being used routinely to extend our knowledge of problems in a number of disciplines. Recent developments include vectorcardiogram transmitters for the foetus before and during birth, pressure transmitters small enough to be placed in the eye, ultrasonic and radio units for freeswimming dolphins, units for tracking wild animals and pill-sized transmitters of many designs and functions that can operate continuously for years.

In human subjects such devices allow exploration of clinical conditions in otherwise inaccessible regions, and help in the testing of drugs. In animals, they permit the simultaneous study of both the behaviour and physiological (or psychophysiological) functioning of free-ranging organisms without interfering with normal activity. Related methods monitor the inside of chemical reaction vessels, pressure suits, centrifuges and treetop temperature —the latter by means of a transmitter shot into place.

The relevance of biotelemetry to many fields is indicated by some of the variables which have been monitored: motion or activity, internal temperatures; breathing patterns; blood pressures and flow rates; bleeding sites; environmental sounds; various chemical concentrations; pH and oxygen tension; bio-electric potentials including heart and brain wave patterns; gastric, bladder and uterine pressures; radiation intensity.

Ancillary methods, including the controlled disturbance of biological systems in order to understand normal component interactions and telestimulation, increase in importance with telemetry.

Biotelemetry will play an increasingly important role in hospital monitoring and could lead to such things as the electromyographic control of prostheses by passive transmitters implanted for the life of the subject.

The purpose of this course is to introduce a wide segment of the scientific community to this new and rapidly developing field. Specifically, it is to present the possibilities and limitations of these methods so that they may be incorporated effectively into many fields and so give to biologists sufficient background in electronics to enable them to select the most appropriate equipment for their needs and also to recognise proper performance. Informal discussion periods will permit close consultation between participants and staff; demonstrations, displays, motion pictures and slides will be used to make these diverse matters as graphic as possible.

In addition to the medical application of biotelemetry there is an equally obvious potential for the exploitation of this new technology for research in the fields of the veterinary and agricultural sciences. We therefore confidently expect a keen response to this course on the part of agricultural scientists engaged in many differing kinds of animal-based research as well as from zoologists and physiologists.

All enquiries and enrolments should be sent to Department of Adult Education, Australian National University, P.O. Box 4, Canberra A.C.T., from where a more detailed brochure may be obtained.

BOOK REVIEWS

Experimental Chemistry — A Laboratory Manual, by G. P. Rendle, M. D. W. Vokins and P. M. H. Davis. Published by Edward Arnold Ltd., London, 1967. 214 pages. Price 28/- U.K.

This book covers practical laboratory work for both senior forms in schools and introductory university courses, but its contents have not been determined by any examination syllabus.

In line with recent developments in the teaching of chemistry there is an emphasis on learning through experiment. Only essential theory is included and the student is expected to think for himself. Suitable questions at the end of each experiment encourage this.

In addition to sections on inorganic, organic and physical chemistry, others deal with laboratory technique, titrimetric, gravimetric, and qualitative analysis; appendices contain problems, solution preparation, and apparatus.

The physical chemistry section is particularly interesting, containing a wider field of experiments than have generally been attempted in schools; but for which most of the apparatus is already available, e.g. the introduction of chromatography and radiochemistry; the measurement of redox

potentials and the introduction of the pH meter and potentiometric titrations.

There are many more experiments in this book than any pupil can be expected to do in his sixth-form year, but the range of choice is exciting. The mole concept is used throughout and appropriate references are noted.

I consider this to be a valuable reference book for sixth-form teachers, particularly those looking for simple investigatory experiments to illustrate the fundamental concepts in teaching today.

R. E. M. HODGE.

Technique of Inorganic Chemistry. Volume VII. Edited by H. B. Jonassen and A. Weissberger. Interscience Publishers 1968. 321 pages. Price $16.00.

This latest volume in a series dealing with the numerous techniques of modern inorganic chemistry contains five reviews: "Crystal Growth Techniques" by K. Nassau; "Mossbauer Spectroscopy" by J. J. Spijkerman; "An Expedient Method for Preparative Procedures in an Inert Atmosphere" by S. Herzog, J. Dehnert and K. Luhder; "Electron Paramagnetic Resonance" by G. F. Kokoszka and G. Gordon; "Manipulation of Volatile Fluorides and Other Corrosive Compounds" by J. H. Canterford and T. A. O'Donnell.

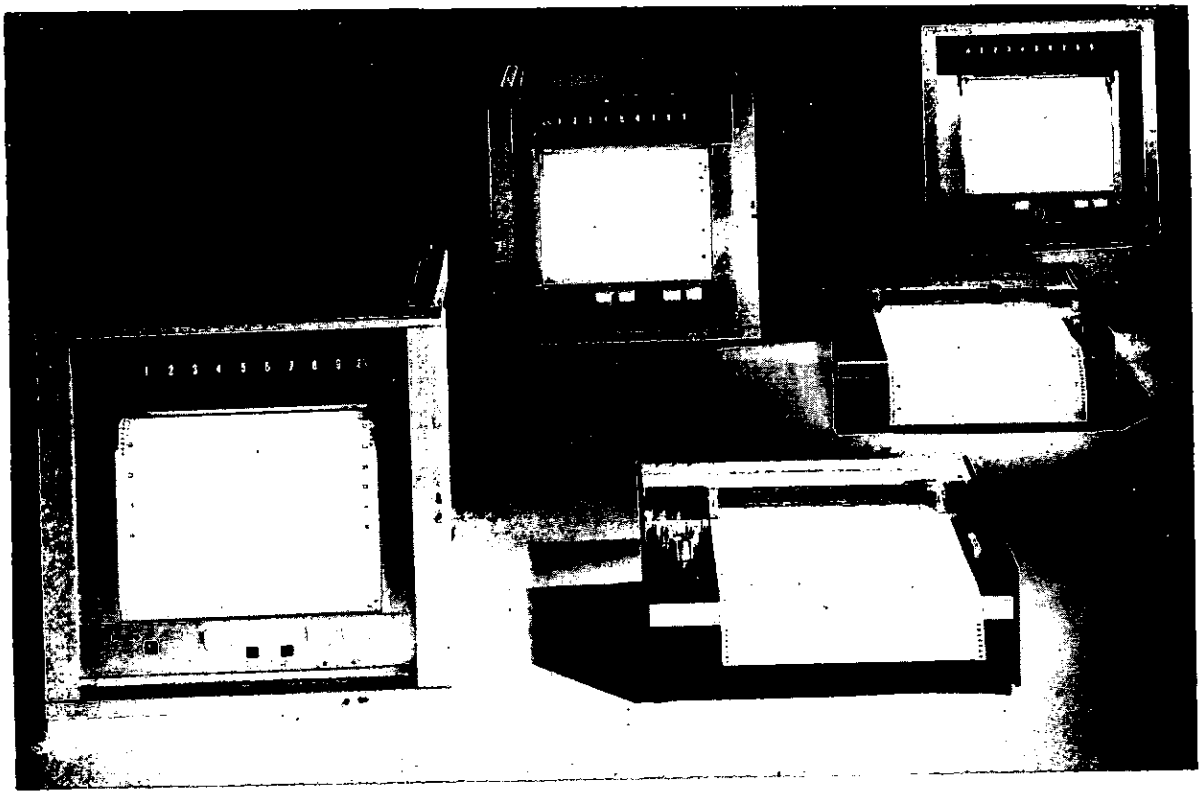
Each chapter includes a brief discussion of the underlying theory and a critical description of the experimental technique. Unlike some of the contributions in earlier volumes all these articles have something of interest for every inorganic chemist.

The first article describes the many procedures available for growing crystals from melts, solutions and vapour-phase. Only growth techniques which produce crystals with one dimension of at least 5mm and with no dimension less than 1mm are considered, and the author freely expresses opinions on the merits of each technique. Many details of industrial and laboratory equipment are presented.

Any chemist contemplating building or buying a Mossbauer spectrometer will find Spijkerman's comprehensive and detailed review of instrumentation and experimental techniques particularly useful. A short summary of applications of the Mossbauer effect is given also. On the other hand the lengthy chapter on Electron Spin Resonance is a mixture of theory, instrumentation and results. Other more recent, more readable reviews are available and this article will be of most interest to a specialist in the field.

The other two articles outline the elegant methods available for efficient and convenient manipulation of air-sensitive compounds (Herzog et al.) and volatile fluorides (Canterford and O'Donnell). Both articles emphasise that the experimental problems are now less severe than for many substances commonly encountered in the laboratory. Many clear diagrams of the necessary chemical and physical apparatus are included.

B. H. ROBINSON.



One Continuous Line...
...of Philips scientific recorders

Flatbed... Rack-Mounted, Single-Function... Multi-Function, Single Line... Multi-Point

Scientific recording may involve tiny fluctuations or wide variations . . . observation of a single function with known limits or many simultaneous measurements with widely varying time-amplitude characteristics . . . operation with a single type of scientific intrument or with a wide variety, including gas chromatographs, mass spectrometers, photospectrometers, X-ray spectrometers, calorimeters, and many others.

No matter what your need may be, when it comes to recorders for recording physical and chemical phenomena, Philips can meet it, with this continuous, unbroken line of instruments — the finest available.

Concentration on purely scientific applications has resulted in a range of recorders that is not only tailored to the job, but low in price as well. **Philips have incorporated only those features you can use!**

Here is the Philips scientific recorder line . . . a continuous line . . . a fine line . . . the newest generation from a long line of quality instruments developed and manufactured through many years of research, experience and service.

The PM 8000 A single purpose flatbed recorder offering a unique combination of accuracy operational convenience and low cost.

The PM 8100 A universal multi-purpose low price flatbed recorder with unbeatable accuracy and ease of operation.

The PR 2500 A multi-function model with accuracy meeting the most stringent demands.

The PR 2510 A single-function instrument designed to fill an important gap in scientific recording, where control or alarm are not needed, and the **PR 3500** a multi-function, multi-point instrument offering up to 24 channels, and especially suited to data logging applications.

Take today the step to modern recording. Write for our descriptive leaflet.

Head Office: P.O. Box 2097, Wellington
Branches: P.O. Box 5124, Auckland
P.O. Box 1488, Christchurch

PHILIPS

Professional and Industrial Division

They're all in the BDH Catalogue...

a range of more than 5,000 chemicals

BDH can supply almost every reagent in regular demand in laboratory practice today, as well as many developed for special applications in research and industry — reagents of the highest standards of purity and reliability.

Items of particular interest include:

'Aristar' ultra-pure chemicals: for analytical, research and industrial applications in which extreme purity is essential.

'AnalaR' analytical reagents: More than 300 guaranteed analytical reagents conforming to the recently revised 'AnalaR' specifications.

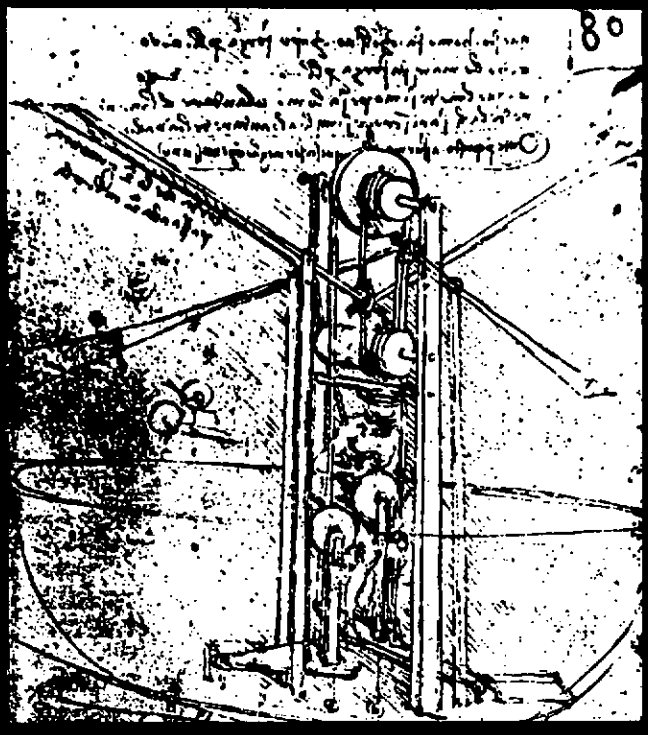
BDH Biochemicals: A comprehensive selection of high quality biochemicals and reagents including Amino acids and derivatives, enzymes and enzyme substrates, nucleotides, nucleosides and nucleic acids, carbohydrates and sugar phosphates, highly pure fatty acids and methyl esters.

Materials for chromatography and electrophoresis
Micro-analytical reagents
Organic Analytical Standards
General laboratory chemicals
Clinical reagents
Solvents for spectroscopy
Microscopical stains and sundries
Ion exchange resins
Volumetric solutions
Indicators
Test papers

If you do not already receive our monthly publication 'New Entries in the BDH Catalogue', please ask us to add your name to the mailing list.

BDH NEW ZEALAND LIMITED,
P.O. BOX 624, PALMERSTON NORTH.

Leonardo Da Vinci – artist and man of science



Leonardo, more than any man, was responsible for the changes which came over Italian painting around the turn of the 15th century. But renowned as he was as an artist, Leonardo was also a scientist. He made original and penetrating observations in almost every field of natural science—astronomy, botany, anatomy, zoology, physiology, physics, optics, geology, physical geography, meteorology, hydrodynamics and aeronautics. His notes on his observations are preserved and it is evident from them that he anticipated many important scientific developments. Not least among these was his design for a helicopter.

As an expert in the natural sciences, as a profound student of mathematics, mechanics and military engineering, as an expert musician and above all as an artist Leonardo Da Vinci excelled. Leonardo succeeded because of his enquiring mind and constant experimentation.

Constant enquiry and experimentation—that's the secret of Shell. Shell scientists are continually working to improve Shell petrol. That's why you won't get a more powerful petrol than Shell.

SHELL

For DISSOLVING· DISPERSING·EXTRACTING

— and other applications

- Accepts up to six 500 ml flasks.
- Controlled speed range up to 800 oscillations per minute.
- Integral timer, range 0 to 20 minutes, with position for prolonged shaking.

Only £42.0.0d (Price £ Sterling Ex Works, London)

FLASK SHAKER

Please write for further information to . . .

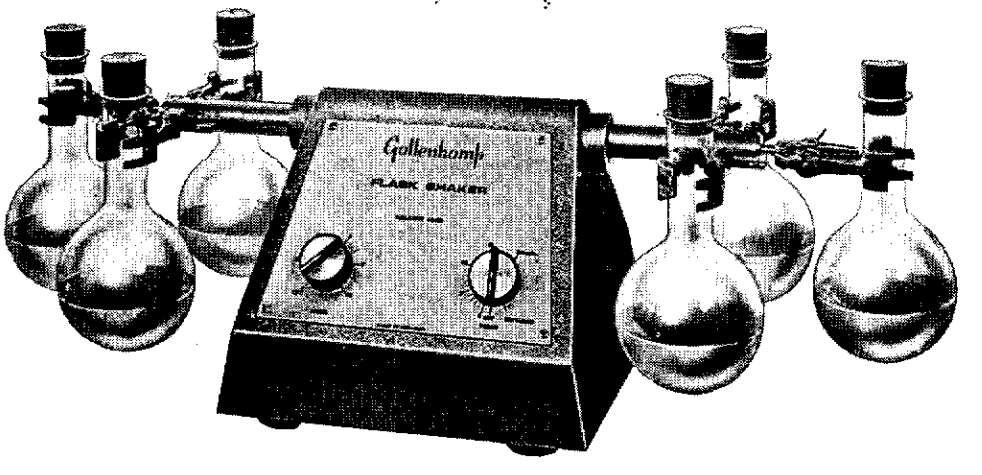
A. GALLENKAMP & CO. LTD.
P.O. Box 290, Technico House,
Christopher Street, London, E.C.2.

Our appointed distributors are . . .

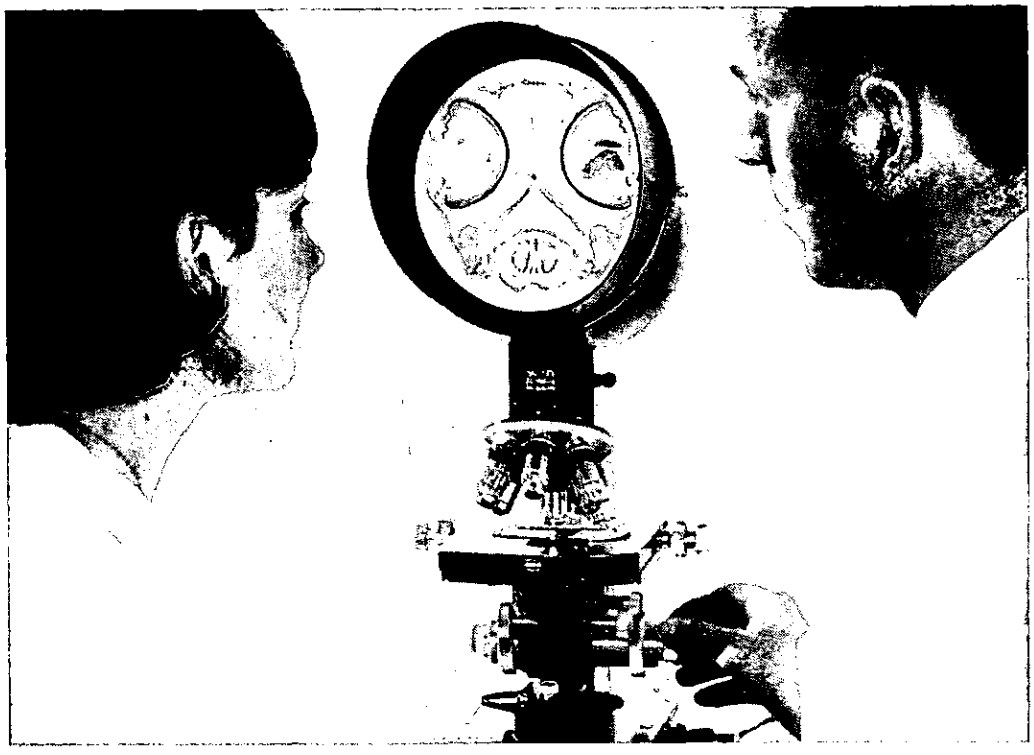
GEO. W. WILTON & CO. LTD.
Box 9071, Newmarket, Auckland
Box 367, Wellington.

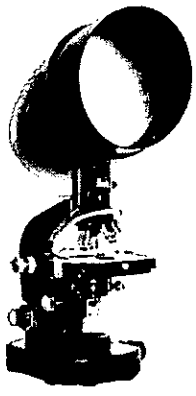
MANUFACTURED BY
Gallenkamp

NEW



Discussion round the screen





Wild M20 Research Microscope with Projection Head

Used in conjunction with the Wild M11 or M20 microscopes, the Wild Projection Head acts as a small projector. The microscopic picture is projected through a Fresnel lens, onto a 160 mm (6 1/4 in.) diameter ground glass screen. A valuable combination for school and teaching work in small groups. Accessories for photomicrography are also available. We shall be pleased to send you our leaflet M1 704 on request.

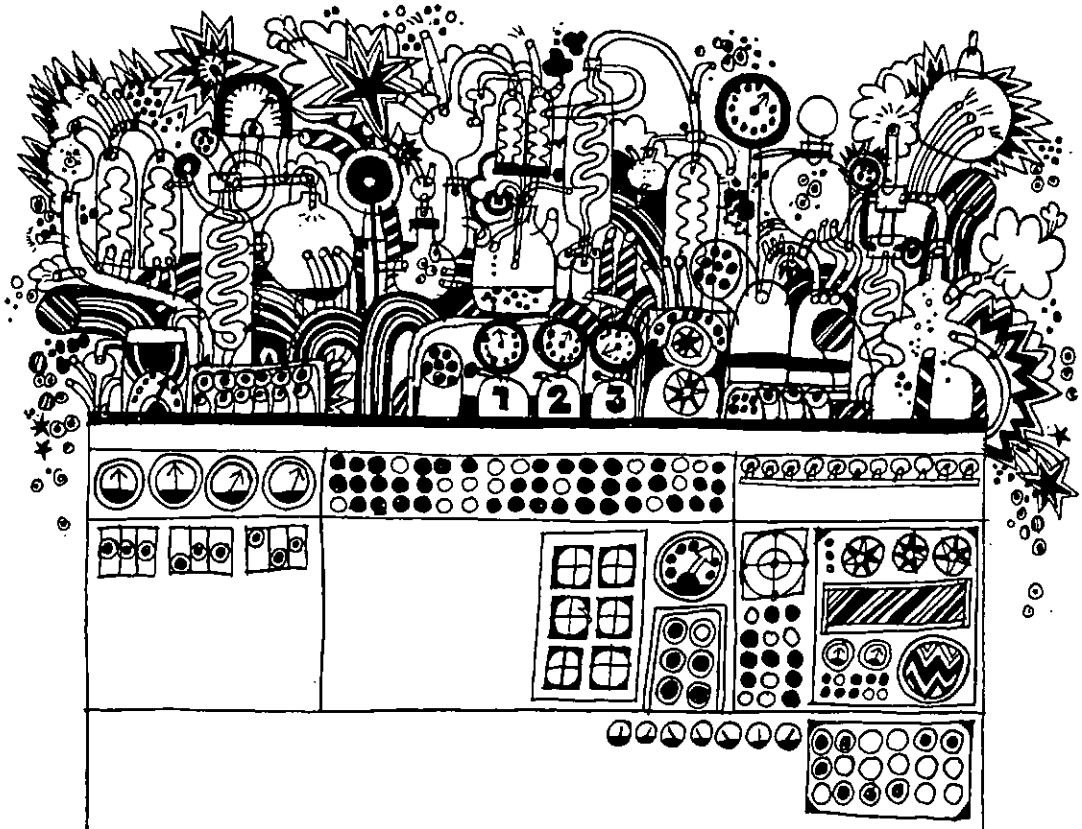
WILD
HEERBRUGG

Wild Heerbrugg Ltd., Heerbrugg/ Switzerland

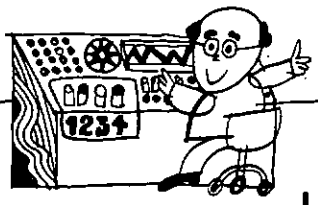
Sole Agents in New Zealand:

DENTAL & MEDICAL SUPPLY CO. LTD.

Auckland Wellington Christchurch Dunedin



To what extent is your laboratory automated?



A good many things have not yet been developed which you need in order to completely automate your laboratory. The 120 researchers in our laboratory are of the opinion that this will still take a few years.

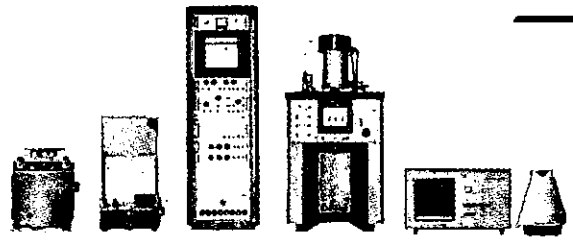
We made the first contribution to automation in 1946 with the first substitution balance which weighed samples ten to twenty times faster than the old two-pan balance. Innovations have been continuously added to Mettler balances. For example, the Mettler level-matic automatically compensates for level errors, the compact digital indicator speeds up the process of reading the results, the taring system shortens the weighing time.

If your time is still too expensive for reading off the result and writing it down, you can buy our printer balance. It prints out the result on an adhesive strip (accurate to five places). Or you can combine the Mettler with a recording device or a computer.

Some of the other Mettler measurement devices operate even more automatically than the balances. The Thermoanalyzer carries out TGA/DTG/DTA measurements simultaneously. All defining magnitudes and measurement values are drawn in colored curves.

The Mettler FP1 automatically determines melting and boiling points with an hourly capacity of more than 30 samples. It stores the measurement values digitally. The FP2 is for microthermal studies, and the FP3 automatically determines dropping points. (A bright note for the fat and oil industry.)

We have a few very new thermal and volumetric measurement devices in the research stage. A few are already in the torture chamber where we test every new measurement device with difficult endurance tests. After all, when one automates measurement processes, the automated measurement device has to really operate more dependably than the human being.



Mettler

SOLE AGENT

WATSON VICTOR LTD.

Head Office: 4 Adelaide Road, Wellington.

Branches: Auckland, Christchurch and Dunedin.