

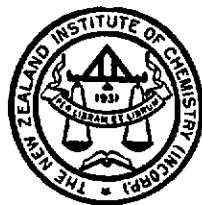
JOURNAL OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY

Vol. 29

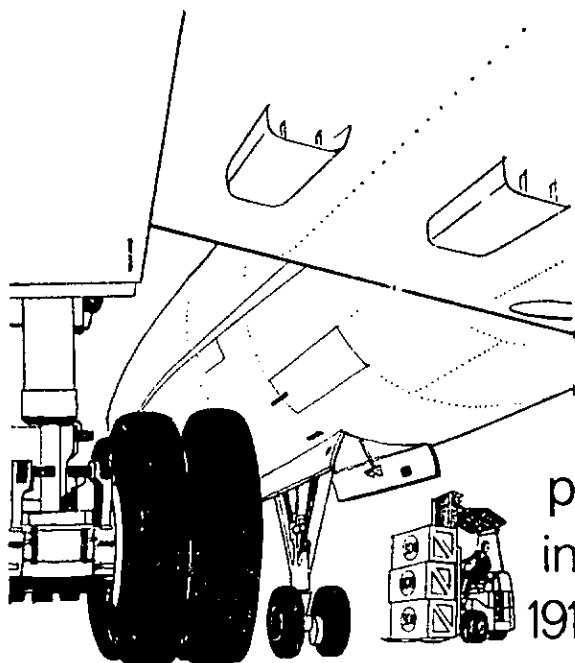
No. 3

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JOURNAL OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY

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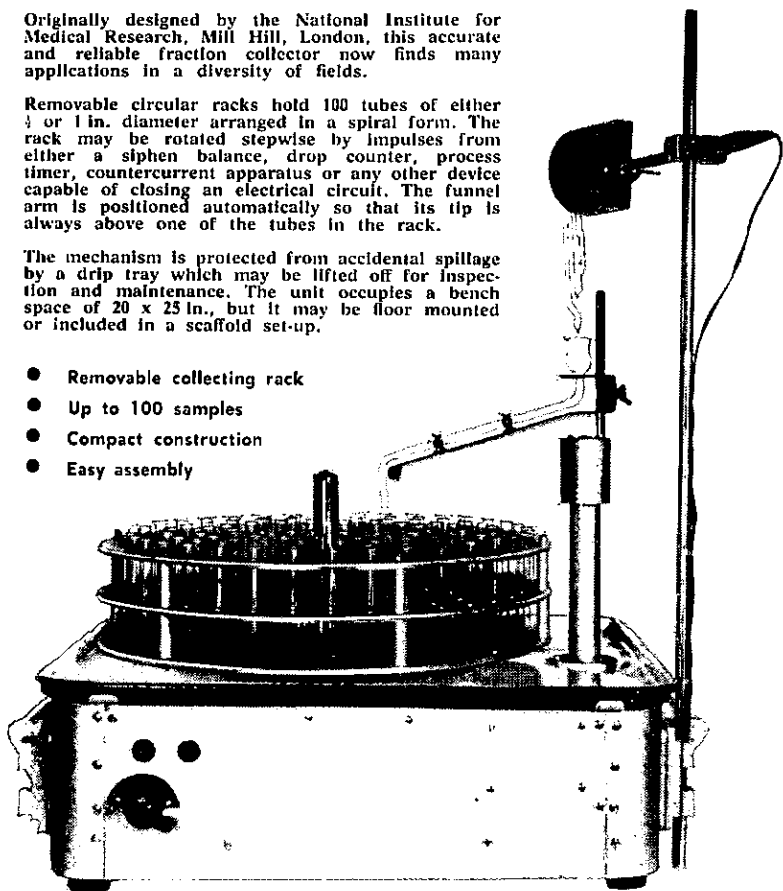
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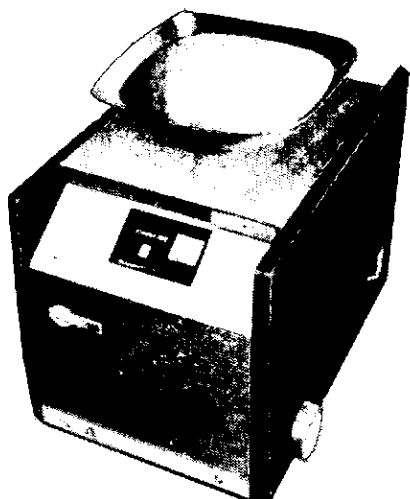
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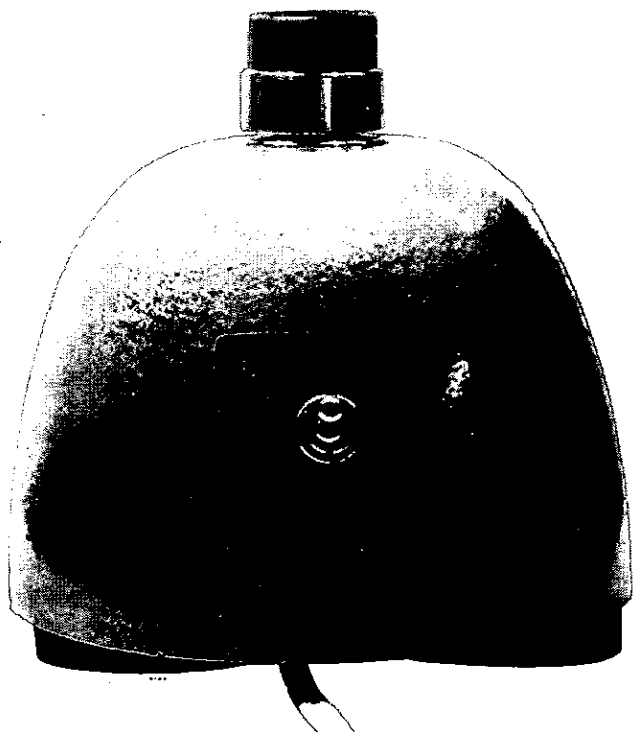
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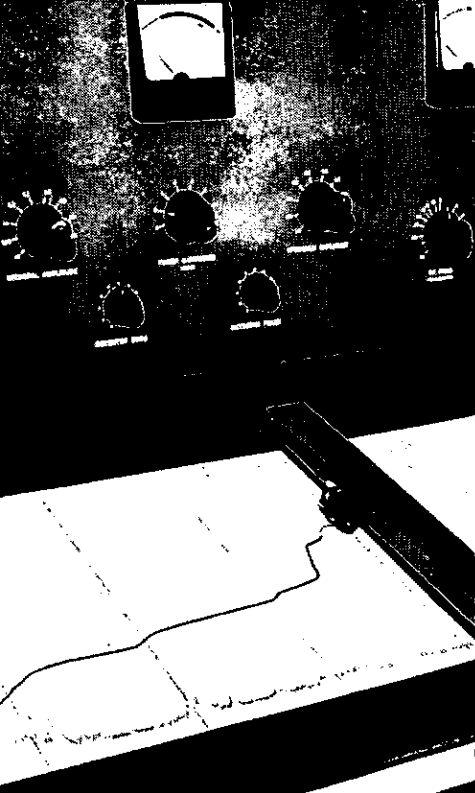
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JOURNAL OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY

Vol. 29, No. 3

JUNE, 1965

CONGRATULATIONS TO CHEMISTRY DIVISION

I am happy to be associated with this issue of the *Journal of the N.Z. Institute of Chemistry* which features the Centenary of Chemistry Division, Department of Scientific and Industrial Research.

From a one-man laboratory set up in 1865 to assay the mineral samples collected by the Geological Survey, Chemistry Division has developed into an organization with a total staff of over 170 of whom almost half are professional officers. In addition to providing chemical, chemical engineering and metallurgical services to other government departments, it has assisted both primary and secondary industries.

It has also undertaken research aimed at developing our country's agricultural and forest products and mineral resources such as ironsands and pozzolans.

I am pleased to note that the scientists at Chemistry Division are also interested in improving analytical techniques and in developing new methods of analyses which will make them better equipped to deal with any problems which may arise in the future.

With the increased service now being given to industry by Chemistry Division and other branches of D.S.I.R., I am confident that science will in the future make an even greater contribution to our national development than it has in the past.

B. E. TALBOYS

Minister of Science



CHEMISTRY DIVISION, D.S.I.R.

Established August 1865

Contributed by G. Chamberlain, Chemistry Division, D.S.I.R.

It is difficult in this modern age to appreciate the efforts and problems of a hundred years ago. New Zealand was then a young colony, with a small but growing population, struggling to expand its economy through industrial and agricultural production. The vision of the people associated with the development of its natural resources is well illustrated by the following statement made in 1865:

"The day may be distant when the forests and fertile plains of New Zealand will resound with the clang of the forge or the hum of the factory, and the midnight glare of the furnace illumine the surface of her lakes and rivers, but it is no mean thing for us to know that we have at our hands the elements which will set in motion and feed these great engines of civilisation."

The potential extent and value of the natural resources of New Zealand were clearly demonstrated at the New Zealand Exhibition of 1864-5. The Commissioners of the Exhibition recommended that a full survey of the natural resources of the colony should be undertaken, and the Government adopted this recommendation by establishing and staffing a Colonial Museum and Laboratory in Wellington. Dr (Sir) James Hector was appointed Director, with Mr William Skey as Analytical Chemist. Both had previously been employed by the Geological Survey of Otago, and they came to Wellington in August, 1865, to take up their new appointments. Other staff appointed at that time consisted of geologists, a botanist and a zoologist. One of the main purposes was to conduct a survey of the geology of New Zealand and to achieve this Hector established the Geology Department of the Colonial Museum. Thus, one hundred years ago there were established the organizations from which evolved the Dominion Museum, Chemistry Division D.S.I.R., and Geological Survey D.S.I.R.

Until his death in 1900, Skey was responsible for the work of the laboratory, and until 1896 was the only full-time chemist employed by the Government of New Zealand. In its early years the laboratory was working under difficult

conditions, somewhat isolated from the scientific world, with makeshift equipment and accommodation that barely resembled the laboratory of today. In considering the early achievements of the Colonial Laboratory, we must remember that, when it was established, only twenty-five years had elapsed since the first settlement was founded in New Zealand. For the first thirty years, the scientific achievements of the laboratory were the work of one man, and even on its 50th anniversary, following a rapid increase in scientific interest in the Colony, the total staff was only fourteen.

At first the laboratory was installed in temporary accommodation, a workmen's shed near the museum building. Many stories concerning the difficulties of working in this shed have come down the years, not the least of which is that Skey frequently found that the workmen were using his coal samples to keep the home fires burning. These stories may not be true, but at least in the first annual report to the General Assembly, Hector stated that " . . . the accommodation and appliances afforded for this purpose by the present laboratory are so insufficient as to endanger the accuracy of the results obtained, and cause great loss of time and waste of material". His plea for better accommodation was successful and a new laboratory building, behind the museum, was completed in February, 1867.

In 1866, the Adulteration of Food Act was passed to provide for maintenance of satisfactory standards in foodstuffs. This Act provided for a Colonial Analyst to be appointed by the Governor, as well as analysts appointed by the Provincial Superintendents. Hector was the first Colonial Analyst, and local analysts were appointed by the Provincial Governments of Otago, Canterbury, and Auckland. These local analysts were not associated with the Colonial Analyst and did not come under his control.

Thus, in its early years, the Colonial Laboratory was primarily associated with the Colonial Museum and the Public Health Department, and its main purpose was to meet the chemical needs of these two organizations. Most of the early work consisted of analyses required in the survey of the natural resources of New Zealand, and in assisting industry to utilize these resources. Such analyses were mainly of coal, clays, minerals, rocks, metallic ores, and other materials which might be useful to manufacturing industry, construction industry, and agriculture.

The status of the Colonial Museum and Laboratory was changed in October, 1867, by an Act of the General Assem-

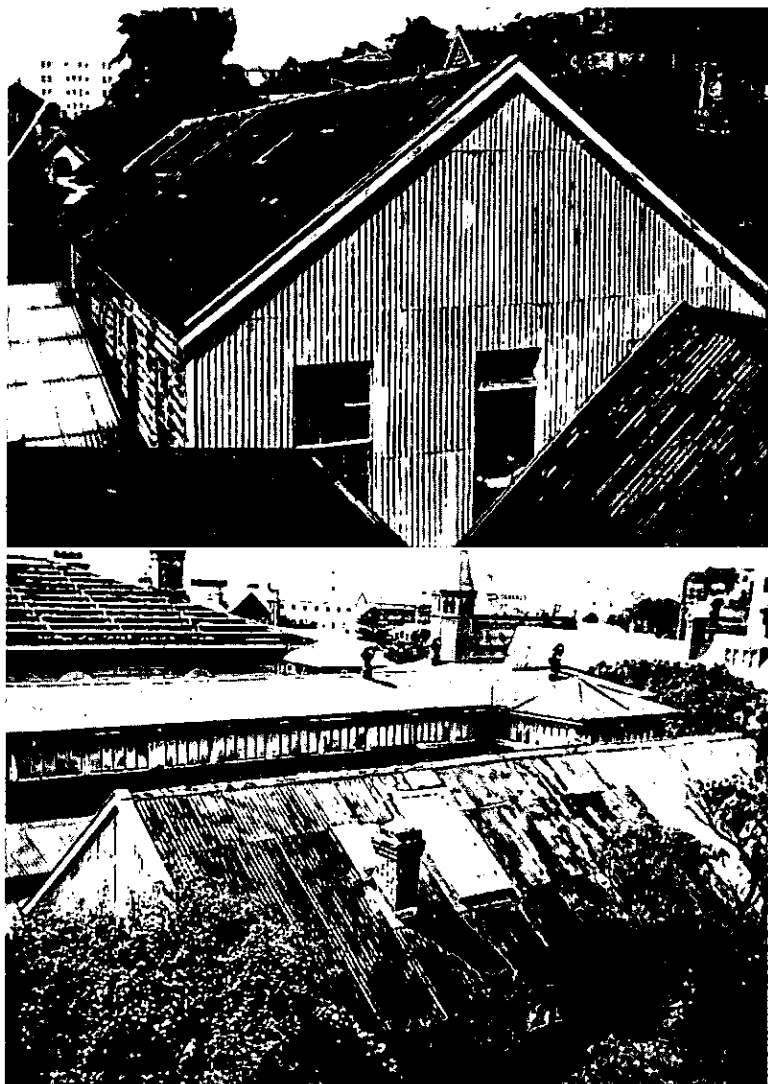
bly, the preamble of which stated: "Whereas it is expedient to make provision for carrying out the geological survey of the Colony and to establish and incorporate a public institution in the City of Wellington to be called 'The New Zealand Institute' which institute shall comprise a public museum and laboratory and a public library . . .". Hector was appointed Manager of the New Zealand Institute and was thus responsible for the administration of the laboratory. The New Zealand Institute and its associated organizations came within the jurisdiction of the Colonial Secretary.

The use of natural resources, the promotion of new industries, and improving of the efficiency of existing industries, have influenced the work of the laboratory during the hundred years since it was established. Many of the industries now established in New Zealand, including those established in recent years, were first considered in the mid-nineteenth century. For instance, in the laboratory records for 1868 we read "Inquiries having been addressed to the Department as to the most favourable localities for the construction of saltworks, among other information obtained in reply was the composition of the water from the ocean adjacent to New Zealand, as compared with the sea in the Northern Hemisphere". We are not told what happened to the proposed salt industry, but it is only within recent years that production of salt from the sea has become an established industry.

Cast iron produced from ironsand by Taranaki Iron Works was analysed by the Colonial Laboratory in 1870, and further samples representing various improvements in the process were analysed in the years up to 1896. There have been many attempts to use these ironsands for making iron and steel, but the industry has not yet been established. In 1963-4 the laboratory assisted in an economic feasibility study of iron production based on ironsands, and it is now likely that this will become a major New Zealand industry within the next decade.

In New Zealand today organic chemistry is basically the chemistry of the natural products which are related to the economy of the country, and it is fitting that at an early stage in the history of the laboratory this type of work was undertaken. Thus, in 1867 Skey was studying the effect of copper ammonium solutions upon vegetable fibres, presumably with a view to rot-proofing the fibres. This type of work is still being studied today. A fragrant substance was isolated from a resin in 1868 hinting at the present day utilization of pine oils for perfumery bases. New Zealand

native trees, particularly those with medicinal or poisonous principles, have long held a fascination for chemists. In 1869, the common coprosma species, taupata, was examined for possible alkaloids, although it was not until 1940 that the true nature of the yellow dyes was elucidated. Skey



The first Laboratory, at the rear of the Colonial Museum, 1867.

reported that no alkaloids of the quinine group were present, and this was later confirmed. Skey was also aware of the bitter substance present in the nut of the karaka tree and he had a continuing interest in alkaloids from New Zealand native trees such as the rangiora, which is now being studied at Ruakura.

Paints were included among the great variety of samples examined by Skey. He considered this section of his work important enough to warrant a separate heading in some annual reports of the Colonial Museum and Laboratory. Paints in those days were made from white lead, red lead, and "Ferruginous earth" mixed in oil, and much of the work was examination of these materials for adulterants. In 1890, the detection in white lead paint of "16.23% of earthy matters, principally sulphate of baryta" resulted in the return of "a bulk of several tons" to the sender at his expense as not being "genuine white lead paint, as per samples furnished by the sender and shown to be pure in this laboratory".

Some consideration was given to application factors, as with a sample of "non-corrosive paint" examined in 1897 about which Mr Skey commented "this paint is no doubt non-corrosive, but it is one that takes a long time to dry."

The solution of problems encountered in the field by user departments is illustrated by a sample received in 1890 of "Zinc white paint for adulterants and cause of darkening in air sent by the Marine Department". Analysis of this sample showed that "the paint is largely adulterated with a baryta compound and that the discoloration observed is due to a small quantity of lead". In 1898, the Under-Secretary for Public Works forwarded "white lead paints for analysis on account of a dispute between the Government and certain contractors". In this case Skey reported that he was unable to detect any adulterants and said "the paint appears well leaded and well mixed".

Many samples of red earths forwarded from various parts of New Zealand were examined for their suitability for use as pigment in red iron oxide paints. These locally produced pigments coloured most of the red paints, known as "haematite paints" which were used on iron structures such as bridges in the early days.

The early work of the Colonial Laboratory is frequently of special interest because of its association with history, quite apart from the technical nature of the work involved. For example, in 1867 we find that "During the last three months Mr Skey has been principally occupied in examining

the intimate composition of the rocks passed through in the Lyttelton tunnel — and his investigations, when completed, will contribute a most important element towards the valuable scientific results which will be derived incidentally from this great engineering work”.

Significant events in the history of New Zealand are recalled by their brief mention in the following quotation from the records of 1872: “Another sample of a very valuable petroleum has been received from the East Coast, from a place named Manutaki, behind Waiapu, and was collected by the Maori Chief Ropata, whilst searching for Te Kooti.” This sample of petroleum, and the many that followed, show the efforts made in the last century in the search for oil. In the comment on a sample received in 1886 we are informed that the Southern Cross Company, drilling for oil in the Waiapu Valley, had gone down to 1,700 ft without finding more than indications of oil. At this time Taranaki mineral oil had been available for over ten years, and samples had been examined periodically by the laboratory.

Some early laboratory reports are amusing because of the glowing comments on the quality of local products. Typical of these is the comment on a sample of table sauce, manufactured in Wellington in 1880, that “It is pleasant and appetizing, quite equal to Messrs Lea and Perrins’ manufacture. It should secure a good trade, and drive out of our markets all the imported sauces of its kind.”

In 1885, the administration of the New Zealand Institute Act and the various organizations under the management of the Institute, was transferred from the Office of the Colonial Secretary to the Minister of Mines. A further re-organization took place in 1893, when the Colonial Laboratory was separated from the New Zealand Institute, and placed under the control of the Mines Department. Skey was then designated Analyst to the Mines Department and Colonial Analyst.

Skey was something of a poet and published a volume of poems, among them a facetious piece entitled “The Author’s Epitaph” which reads

*Here lieth one who'll ne'er be missed
New Zealand's primal analyst,
Of such enquiring turn of mind,
He wormed out all that he could find,
Wormed nature's little secrets out,
Then blabbed them queerly all about,
For this one day in angry pet,*

*Imperative she sued for debt,
So here by worms in turn he's wormed,
To things more useful thus transformed.*

William Skey died at his home in Wellington on October 4, 1900. His achievements in the Colonial Laboratory were described by Hector in an obituary notice as "he attained to such a position as to be recognized as one of the world's famous authorities in certain branches of chemical science".

Local newspapers and journals published the following advertisement for a successor to Skey

APPLICATIONS are invited, up to Monday, the 3rd December, for the position of Analyst to the Mines Department and Analyst under the Adulteration Prevention Act, at a salary of £400 per annum. The person who may be appointed will be required to reside in Wellington.

and in January, 1901, the following statement was released to the local press

MR JAMES SCOTT MACLAURIN, D.Sc., F.C.S., has been appointed Analyst to the Mines Department, and also Analyst under "The Adulteration Prevention Act, 1880". Mr MacLaurin, who had a very successful career in chemistry, geology, and other subjects at the University College, Auckland, has been closely associated with Mr J. Pond, F.C.S., Auckland, and working in his laboratory, for the past eighteen years, first as assistant, and latterly as a partner. During that period, in addition to the analyses performed under The Adulteration Prevention Act and the Manure Adulteration Act, a large number of assays from the various gold- and coal-fields were conjointly made by Messrs Pond and MacLaurin, while very considerable researches were jointly undertaken in the cyanide treatment for the Cassel Gold-extracting Company.

Soon after his appointment, MacLaurin stressed the need for better accommodation, and the Government approved the construction of a new laboratory building. This must have taken much longer than expected for, in the annual reports of the next four years, MacLaurin refers repeatedly to "the new Laboratory which is to be constructed shortly". The new building for the analytical and geological branches of the Mines Department was completed in 1905. It was a two-storey brick building situated on the south side of Sydney Street, near the corner of Museum Street, and only a few yards from the old laboratory. The analytical department occupied nine rooms of which the largest, the main laboratory, was 28 ft square. Shortly after moving, MacLaurin expressed the opinion that "The laboratory is well fitted with apparatus, etc., for carrying on the various branches of analytical work, and has proved to be very



Furnace room in the new building, 1905.

convenient and well suited for the different classes of work undertaken." This building housed the laboratory, or part of it, for the next 56 years.

The year 1906 was notable for the very large increase in the work of the laboratory; nearly double that of the previous year. This was partly due to the work done at the laboratory erected by the Mines Department in the exhibition grounds at Christchurch. This laboratory was open to the public during the Exhibition, and attracted large numbers of sightseers; it was staffed by Mr W. Donovan and Mr R. L. Andrew, both of whom later became Directors of Dominion Laboratory.

Dr Maclaurin's designation was changed to Dominion Analyst in 1909 when New Zealand was raised to Dominion status. At this time there was some re-organization of the scientific services of the Government. Administration of the laboratory, now the Dominion Laboratory, passed to the Department of Internal Affairs, and at the same time the Chemistry Division of the Department of Agriculture became a section of Dominion Laboratory. Agricultural analyses were carried out by the laboratory until 1915 when the Chemistry Division of the Department of Agriculture was re-established.



Mines Department laboratory in Christchurch Exhibition, 1905.

In 1909, the administration of the Explosive and Dangerous Goods Act was assigned to Maclaurin when he was appointed Chief Inspector of Explosives. By introducing an effective system of testing and inspection, Maclaurin re-organized the administration of the Act. He was also largely responsible for the form in which the Gas Regulations, issued in 1924, were finally drafted. Maclaurin was appointed Chief Gas Examiner, and as such controlled gas and meter testing throughout New Zealand. During these years the work of the laboratory had expanded so rapidly that it was necessary to open branch laboratories at Auckland (1924), Christchurch (1926), and Dunedin (1928).

Poisonous honey has sometimes been found in New Zealand, and in 1911 chemists at the then Dominion Laboratory investigated a case in which a Dargaville man died

from poisonous honey. This study was made by testing the honey by feeding it to mice, while at the same time feeding safe honey to other mice. The mice given the poisonous honey died, but a full examination of the honey revealed no known metallic poisons nor alkaloids to be present. In 1933, a further sample of poisonous honey was also examined using the mice assay technique, with inconclusive results. The common bush, the tutu, was known to be poisonous to stock in 1869 and Skey had succeeded in isolating an oily substance that contained some of the poisonous principle. This very crude extract was fed to a cat and caused the convulsive spasms characteristic of tutu poisoning. Nearly 97 years ago, Skey proved that the active principle was a non-nitrogenous alkaloid, a surprising fact even today. It was 1960 before the chemical structure of tutin was finally elucidated, and now honey suspected of being poisonous is examined for the presence of this compound. With modern techniques the whole question of poisonous honey is now being re-examined and very small quantities of tutin have been detected. As before, this honey is collected from areas containing the tutu bush.

The search for petroleum in New Zealand has a long history. In 1866, shortly after the laboratory was formed, a sample of petroleum from Waiapu (East Coast) was examined, and similar samples were constantly being sent to the laboratory and studied. Thus benzol was found in New Zealand petroleum in 1878, and paraffin deposits at Waiapu were restudied in 1881. In 1903, crude oil samples from New Plymouth and from Greymouth were investigated, while in 1908 the Gisborne area was also examined. Oil samples from Westport were studied in 1909, and in 1910 gas samples from No. 2 and No. 3 bore in Taranaki were shown to have a composition similar to that later found at Kapuni in 1960. Oil samples were also found near Rainbow Mountain at Waiotapu in 1910. In 1924, natural gas from Blenheim was studied. Thus, at least 50 years ago, the main surface indications of oil in New Zealand had been chemically examined. This work has continued to the present day. Many of the gas samples from the modern wells are first analysed at Chemistry Division.

Apart from Skey's earlier work, the organic chemistry work of today probably commenced in 1913 with the study of a vegetable oil from native timber in Westland. The oil was considered to be of the kauri gum type, a finding very much in line with present day thinking. Kauri gum was an

important economic varnish ingredient in the earlier days of this century, and from 1914 onwards numerous samples were studied. These culminated in a continuous method of purifying kauri gum in 1938, but by that time synthetic resins had displaced the natural material.

The search for natural tannins or dyes to replace fustic, the basic dye used in New Zealand khaki during the Great War, was commenced in 1915 when manuka and red birch extracts were examined. These products were not as effective as fustic in dyeing wool, but nevertheless indicate the forward thinking of those days. Wool grease was studied in 1921 and 1929. The action of preservatives in penetrating wood was first considered in 1928.

At the turn of the century, the work of the laboratory came mainly from the Mines Department and the Department of Health, although other departments used the services of the laboratory in a small way. For instance, the Police Department sought the assistance of the laboratory as early as 1871 when toxicological examinations were carried out in connection with cases of suspected poisoning, and analyses of printing inks were made to find the methods used in a case of forgery of postage stamps. Some enterprising persons had discovered that the colour of the one penny stamp could easily be changed to resemble that of the sixpenny denomination. To discourage further attempts at forgery, the Post Office, on the recommendation of the laboratory, changed the composition of the printing inks, and interchanged the colours of the denominations concerned. In the early years of this century, many other Government departments began to use the services of the laboratory. The effect of this was not felt immediately, for the Geological Survey branch of the Mines Department was disbanded in 1903. This resulted in a considerable reduction in the analyses required of geological samples. Dr Maclaurin worked with one assistant until 1905, when further additions to the staff were made necessary by the increasing work from the newly re-established geological branch.

The Department of Scientific and Industrial Research was established in October, 1926, and it was decided to bring together under this department a number of scientific services then under the control of other Government departments. One of these was Dominion Laboratory, which was transferred from the Department of Internal Affairs. There was some change in the policy of the laboratory which was described in the first report of the department as:

In order to increase the value of the services rendered by the Dominion Laboratory to other State Departments and to the manufacturing industries of the Dominion, two additional staff appointments were made — a Technical Research Chemist and a Research Physicist, both New Zealanders. Arrangements also are in train for the formation of a Technological Bureau of Information attached to the Dominion Laboratory, so that inquiries may be dealt with expeditiously, each of the technical officers of the Laboratory being responsible for a section for which his training renders him most suitable. Further accommodation also is being arranged for at the Dominion Laboratory, so that the state of congestion which has existed there for the last ten years, and which, owing to its having necessitated the dismantling and re-erection of apparatus for each test, has led to considerable waste of time and delay in obtaining results of tests, will be obviated. The Laboratory also will take over for the Labour Department the custody of the ultimate standards of weights and measures, so that the Laboratory's Physicist may collaborate with the Inspectors in comparison with the working standards.

A Fuel Research Association was formed in 1927, attached to Dominion Laboratory, to carry out physical and chemical examinations of New Zealand coals, and research on low-temperature carbonization, briquetting, and new developments in coal utilization. The Fuel Research Association was disbanded in 1932 when the Coal-mine Owners' Association withdrew its financial support.

On the retirement of Dr Maclaurin in 1930, he was succeeded as Dominion Analyst and chief Gas Examiner by Mr William Donovan, and as Chief Inspector of Explosives by Mr R. M. G. Butcher. This latter branch of the work was transferred back to the Department of Internal Affairs.

In the next decade, the staff of the laboratory increased to a total of about fifty. Accommodation, in addition to the main laboratory building, was provided in the old museum annexe, several temporary buildings, and domestic buildings which, with considerable ingenuity and much inconvenience, were converted into chemical laboratories of various kinds. One of the buildings was said to have housed Dick Seddon's horse. This story may not be strictly correct; but the building was certainly a stable, for the loose-box doors remained long after it was converted for use as a laboratory. The housing of the laboratory could hardly be called imposing or adequate, although the equipment was ample and up-to-date. It was during this period that the spectrographic section of the laboratory was set up. It was equipped with a Hilger quartz spectrograph and the necessary auxiliary apparatus.

The first reference to *Pinus radiata* oleo resin occurs in 1930 and today the information regarding the actual constituents present in the resin is little different from that known 35 years ago. Pyrethrum, an insecticide gaining prominence again now, was considered to have an economic future in 1933 when experiments with the Botany Division were aimed at producing high yielding pyrethrum flowers in New Zealand. It was concluded that a Japanese variety with 0.75% pyrethrin in the dried flower head could be grown successfully in New Zealand. However, by 1936 various clones yielding between 1.0 and 2.5% had been selected, and shown to grow well. Ragwort, the well-known stock poison, was shown to contain 0.15% crude alkaloid in 1933 and the pure compound was isolated by 1934. In 1935 it was concluded that this alkaloid was identical to that isolated from Canadian ragwort, and named jacobine. Having determined the active principle, chemists in 1936 and 1937 studied the variations in toxic concentration at various growth localities and at different stages in plant development. Chemical studies had also been made of *Phormium tenax*, New Zealand flax, during the mid-thirties.

With this background, work on wood extractives was also undertaken and the New Zealand native trees silver pine, pink pine, rimu, and miro, were also examined. The more precise methods now available are enabling these studies to be extended, but the major compounds isolated then were correctly identified and characterized. At the outbreak of World War 2 there was a reawakened interest in the possibility of growing medicinal plants in New Zealand. Various plants such as *Digitalis purpurea* containing digitalis, *Datura stramonium*, containing hyoscyamine, *Belladonna* containing strychnine, and *Gentiana corymbifera* were examined. *Gentiana corymbifera* extracts were compared favourably with the official drug extract gentiana butea, yet at this stage there was little information concerning the actual chemicals present. These have now been elucidated.

Mr Donovan retired in 1941, owing to failing health, and Mr Robert Leslie Andrew was appointed Director of Dominion Laboratory, Dominion Analyst, and Chief Gas Examiner.

War conditions gave rise to a considerable increase in the chemical service work required by Government departments. Regular tests of milk and water supplies for military camps were made, and a large variety of materials were tested in connection with the purchase of defence stores.

Several special projects relating to war requirements were also undertaken as, for example, a chemical engineering investigation of producer-gas as an emergency fuel for motor-vehicles.

Defence work in the laboratory produced a number of incidents, one of the most spectacular of which occurred in the Auckland Branch. In preparing a small quantity of DM (phenarsazine chloride) for use in chemical warfare training, the reaction (which is exothermic) got out of control. Windows were opened and the laboratory, which was then situated on the 7th floor of a building, was quickly evacuated. The DM escaping from the windows drifted down to street level and produced the unusual sight of numbers of sneezing pedestrians.

By 1945 accommodation for the laboratory had again become a problem. In that year the Director reported, "In view of the many and varied activities of the Laboratory, accommodation has for a long period been far from adequate, and the position during recent years has become acute. It is hoped that this will be remedied in the near future. . . ." The Director was so confident that this would be done that he assembled his staff and explained that the laboratory would soon be moving to new premises, probably at Gracefield. The expected "soon" actually turned out to be fifteen years.

The end of the war in Europe was celebrated in the laboratory within minutes of the news being received. The various sections of the laboratory had their own particular way of rejoicing — for instance, the chemical engineers set off a rather effective siren to sound the "all clear".

Mr Andrew retired in 1946 and was succeeded by Mr W. A. Joiner. In 1947, Mr F. J. T. Grigg, previously in charge of the Christchurch branch laboratory, was appointed Director, Dominion Analyst, and Chief Gas Examiner.

By 1955 it became obvious that, to provide suitable accommodation for the laboratory, it would have to be moved from the Sydney Street site. In that year the chemical engineering and coal work of the laboratory was moved to Gracefield, Lower Hutt, where a large store shed had been converted for use as a laboratory.

Also in 1955, the 90th anniversary of the laboratory, "Open Days" were held during which the general public was invited to inspect Dominion Laboratory, its work and equipment. This was the first time in its history that the

CHEMISTRY DIVISION, D.S.I.R., CENTENARY

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The business houses listed in these pages have expressed the wish to join in congratulating the Chemistry Division on its one hundred years' service to New Zealand.

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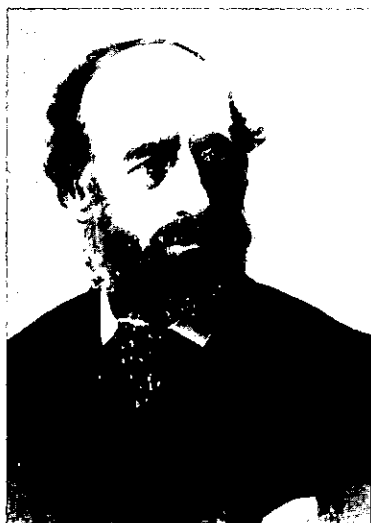
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W. Donovan
1930–1941



R. L. Andrew
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W. A. Joiner
1946



F. J. T. Grigg
1947-1961



I. K. Walker
1961-

laboratory was opened to the public. All sections, including those located at Gracefield, provided exhibits of their work. The exhibition aroused widespread public interest, and about 6,000 visitors crowded the congested premises during the four days. Visitors included several Cabinet Ministers, Members of Parliament, heads and staff of most Government departments, the Mayor of Wellington and local body officers, university staff and students, and a wide section of the general public. The exhibition fulfilled a very useful function in explaining the work of the laboratory to the public. Shortly before the exhibition, uranium was discovered in the Buller Gorge. Samples of the rock were displayed at the exhibition, and the clicking of a Geiger counter provided an interest which for many of the visitors would be better described as a fascination.

Analysis of specimens showed that this rock contained sufficient uranium for economic working if the deposit proved to be extensive, and if extraction of the metal presented no difficulties. Later investigation showed that the deposit was not extensive.

Land in Gracefield Road, Lower Hutt, was bought and the planning and construction of new buildings for the laboratory went ahead. The first building was occupied in late 1957, but it was 1961 before the Sydney Street buildings were finally vacated by Dominion Laboratory. Sydney Street had then been the home of the laboratory for 95 years.

Mr Grigg retired in 1960 and Mr I. K. Walker was appointed Director of Dominion Laboratory. In 1961, Mr P. J. Clark was appointed Dominion Analyst and Chief Gas Examiner.

In 1964, the laboratory was renamed "Chemistry Division, D.S.I.R.". The staff then totalled 158, of whom 64 were professional chemists or chemical engineers.

Some of the work of Chemistry Division has grown so much that it has become desirable to establish separate laboratories with specific terms of reference to deal with it. As these new laboratories were established Chemistry Division has normally withdrawn from work in those fields, thus being enabled to concentrate on new problems. Thus, in 1915, the Chemistry Division of the Department of Agriculture was re-established to meet such a need. In 1930, the testing of explosives was separated from the laboratory and is to this day the Explosives Branch of the Department of Internal Affairs. Certain aspects of physics, assigned to the laboratory by the Department of Scientific and Industrial

Research, later formed part of the Physical Testing Laboratory established in 1940.

In 1945, to assist in the post-war development of the whitewares section of the clay industry, the ceramics work was separated from the laboratory and as a result of support from the clay industry became the New Zealand Pottery and Ceramics Research Association (Inc.) Initially, the members of the association were producers of tableware, electrical porcelain, refractories, sanitary ware, and chemical storeware.

The fats chemistry section of the laboratory, which carried out research on the fundamental nature of fats of animal, vegetable, and marine origin, was separated from Dominion Laboratory in 1946 to become the Fats Research Laboratory (now Fats Research Division, D.S.I.R.).

In 1955, the isotope section of Dominion Laboratory was transferred to the Physics and Engineering Laboratory (then Dominion Physical Laboratory) where it was combined with the nuclear physics section. Later, in 1957, these combined sections became the Division of Nuclear Sciences (now Institute of Nuclear Sciences).

The meat research section of Chemistry Division was, in 1955, established with appropriate industrial participation as the Meat Industry Research Institute of N.Z. (Inc.) to undertake research on behalf of the meat industry.

The formation of the Wool Research Organisation of N.Z. (Inc.), in 1961, was also fostered by Chemistry Division.

Chemistry Division has, for a long proportion of its hundred years, been the largest chemical laboratory in New Zealand, and is of a size that now permits considerable staff specialization. By using teams of collaborating specialists, it is thus possible to undertake chemical research not practicable in smaller laboratories.

Chemistry Division has four main functions:

- (1) To carry out long-term research, mainly in fields of economic value to New Zealand, so that knowledge for future technological development will be available when needed.
- (2) To carry out chosen investigations to raise the efficiency of New Zealand industry, both private and Government, and to promote new industries.
- (3) To serve as a central laboratory for the chemical, metallurgical, and chemical engineering needs of Government departments and other branches of D.S.I.R.

until their needs in these fields justify specialized facilities of their own.

- (4) To promote the launching and growth of research associations and other laboratories able to give a detailed service to industry.

Research is undertaken to promote the economic exploitation of New Zealand resources, and to develop new scientific techniques applicable to the study of local problems. Research of this type has assisted the development of the pozzolan, clay, perlite, cement, and limestone industries. Other and more diverse applications of this type of research include studies of corrosion in topdressing aircraft to assist the aerial topdressing industry; research on spontaneous combustion in wool to prevent shipboard and woolstore fires; investigation of alkali-aggregate reactions in concrete to promote sound construction of hydro-electric dams; studies of drying techniques to assist the tobacco industry; investigation of spray residues on fruit to assist fruit growers; and chemical engineering, corrosion, and geochemical studies to aid the economic development of geothermal steam power. During the past 10 years, over 300 papers have appeared in scientific journals detailing the results of research work of economic value to New Zealand.

Research policy is aimed at combining basic chemical research with investigation of problems of economic importance. For example, some projects involve the exploration of a specific field of chemistry such as X-ray crystallography or nuclear magnetic resonance by a group of specialists, so that these techniques can be applied to problems of economic significance to New Zealand. The techniques are also available to other organizations for research purposes. In this way Chemistry Division collaborates with scientists in other laboratories and in universities.

BRANCH NEWS AND NOTES**MANAWATU**

A highly successful Symposium in Inorganic Microchemistry was held on May 27 and 28, under the auspices of the Chemistry and Biochemistry Departments of Massey University. Contributors to the programme of lectures were from Massey University, Victoria University, and various sections of the D.S.I.R. The programme covered modern instrumental techniques.

WELLINGTON

Dr R. Golding of Chemistry Division, D.S.I.R., represented the Wellington Mossbauer group at an I.A.E.A. panel discussion on the Mossbauer effect held in Vienna in April.

Professor J. Smith, head of the Department of Biochemistry at Victoria University, will be the only representative from the Chemistry and Biochemistry Departments at the A.N.Z.A.A.S. conference to be held in Hobart during August.

Dr N. F. Curtis and Dr R. W. Hay of the Chemistry Department, Victoria University, each presented a paper at a conference on Co-ordination Chemistry and Metal-organic Chemistry at the University of New South Wales. The conference was held from May 24 to 26.

OTAGO

At the first branch meeting for the year, Professor H. N. Parton presented the N.Z.I.C. Otago Branch Prize for first year chemistry to Mr R. A. Smith, and the Inglis Memorial Prize for third year chemistry to Mr N. R. Thompson. The Soper Prize for second year chemistry has been awarded to Mr O. N. Williams, and the Mellor Prize for fourth year chemistry to Miss H. Chivers.

Dr G. N. Malcolm has returned from refresher leave at Imperial College, London, where he held a Nuffield Fellowship.

Dr R. M. Carr has returned from three years' overseas leave, spent partly at Imperial College, London, and partly at Pennsylvania State University.

Dr P. K. Grant is at present on refresher leave at the University of Cambridge where he holds a Nuffield Fellowship.

Dr A. G. Williamson has left for the University of California, Los Angeles, where he will stay for a short period en route to the University of Exeter where he will spend the rest of the year.

Dr C. G. Pope is at present on leave at the University of Belfast.

LABORATORY ASSISTANTS CERTIFICATE

Members concerned with possible candidates for the N.Z. Institute of Chemistry Laboratory Assistant's Certificate please note that, at the last meeting of Council, it was resolved that:

No examinations for the Laboratory Assistant's Certificate be held after 1965.

OBITUARY

L. P. Symes

The Institute lost one of its oldest and most highly regarded members when Mr L. P. Symes died quietly in his sleep on Saturday, April 17, at the age of 86. He was educated at Christchurch Boys' High School and then worked as a laboratory assistant in the Chemistry Department of Canterbury College, attending Professor Bickerton's lectures at the same time. He knew both Rutherford and Erskine during this period, and always maintained that Erskine was the more able of the two.

He joined the Canterbury Frozen Meat Co. Ltd. in 1896 and was appointed its first Chemist in 1899. Except for a year's absence in 1899-1900 when he served in the Boer War, he continued his connection with the company until the time of his death. He never really retired. Although the time he spent in the laboratory decreased progressively from 1955 onwards, he visited the works at least once a week right up to the last, and always maintained his interest in what was going on.

His interest in scientific matters outside the meat industry is shown by his membership of the Philosophical Institute of Canterbury (he was Secretary from 1916 to 1918 and President in 1920), of the Royal Society of N.Z. and of the Society of Chemical Industry. In matters concerning the meat industry as a whole, his experience and sound judgment were invaluable to the Management Committee of the N.Z. Leather & Shoe Research Association of which he was a member for many years, and to the Meat Trade Wastes Committee in which he retained a very active interest right up to the time of his death.

He was a foundation member of the Institute, served as Chairman of the Canterbury Branch in 1935, and was elected an Honorary Fellow in 1959. Up until the last two or three years, he was a regular attender at Branch meetings and at Annual Conferences.

The above chronicle of facts can convey nothing of the respect in which he was held and the affection with which he was regarded by all who knew him. His advice was widely sought and freely given on technical matters not only in the meat industry but also outside it, and his advice was invariably sound. He remained clear in mind and youthful in outlook until the very last, and was always interested in the latest developments both in the industry and in science generally. Many men 20 years his junior were older than he was. To those of us who knew him, his memory will remain alive as long as we do, and his influence will be felt long after that.

M.S.C.

"INDUSTRIAL ORGANIC ANALYSIS" SYMPOSIUM

"Industrial Organic Analysis" is the theme of a meeting to be held at the Drawbridge Inn, Sarnia, Ontario, October 4 to 16, 1965. Sponsored by the Analytical Chemistry Division, Chemical Institute of Canada, sessions are being planned on such topics as:

- (1) Trends in industrial analysis.
- (2) Are classical analytical methods obsolete?
- (3) Advances in analytical spectroscopy.
- (4) Characterization of polymers.

There will be three additional general sessions, one of which will be devoted to gas chromatography.

BOOK REVIEWS

ORGANIC NAME REACTIONS, by Helmut Krauch and Werner Kunz. Trans. from 2nd German edn. by John M. Harkin. John Wiley & Sons, New York, 1964. 620 pages. Price in N.Z. £7 4s. 0d.

In chemistry men who have made notable contributions to its advancement have been remembered by having their names attached to laws, reactions and principles. This idea has its merits but as far as organic reactions are concerned this custom has proliferated into a forest which in places has become wellnigh impenetrable to those not well versed in the literature, since on the one hand the same name has often been given to several reactions and, conversely, the same reaction has sometimes been attributed to different authors. (It should be made clear at this point that we are discussing only reactions used in organic syntheses and degradations and not the vast number of diagnostic and analytical tests used in chemistry and biochemistry of which the 5th edition of the *Merck Index* lists 4,510 by names of the workers responsible!). The first ray of light in this gloom was a small booklet by Wheeler and Gowan of Dublin, published by the Society of Chemical Industry in 1950, which listed about 300 reactions by name with very brief details. This was expanded by the same authors into the *Name Index of Organic Reactions* published in 1960 which included 739 reactions. A year later, Krauch and Kunz published their work in German, and the present book is a translation of the second edition with a large number of additional references. It contains about 500 named reactions, many of which are not in Wheeler and Gowan, and a few reactions like the acetoacetic ester synthesis with descriptive rather than proper names. It also includes a few rules and things like the Mills-Nixon effect which are not true reactions. For each reaction there is a short discussion and selected references. It is interesting to find that in some cases the original reaction was discovered by an earlier worker whose name has been overlooked so that the reaction is named after a later scientist in the same field.

This book is very well set out with indexes to subjects and to authors of all the references cited and the production reflects credit on the publishers. The high price may unfortunately restrict its sale to individuals.

S. G. B

THE COLLISION THEORY OF CHEMICAL REACTIONS IN LIQUIDS, by Alastair M. North. Methuen, London, 1964. 145 + viii pages. English price 21s.

One of the foremost difficulties in chemical kinetics springs from the fact that, although the vast majority of known chemical reactions take place in the liquid phase, our understanding of the nature of liquids is still in a rudimentary state and, consequently, theoretical interpretation of rate data in liquids is typically much less certain than the interpretation of data obtained from the study of gas reactions. The usual solution, whose severe limitations must constantly be stressed, is to interpret solution reactions as if they were gas reactions with little or no modification of the assumptions underlying gas reaction theory. This Methuen monograph is an

attempt to interpret solution kinetic data on a more rational basis. A major difference between reactions in the two phases is that the rapid collision between gas molecules is replaced by a relatively slow "encounter" in a liquid. The principal aim of the book is to suggest how commonly used kinetic rate expressions may be modified to take account of the encounter phenomena peculiar to liquids. As such, therefore, it is more of a guide for the practical chemist than a complete theoretical discourse on liquid state phenomena. The phrase "collision theory of reactions in liquids" is taken to mean any treatment of chemical reactions as a two-stage process involving transport and chemical reaction and it is around these processes that the book is written.

The book summarizes much modern work, particularly that of R. M. Noyes, and will be sought out by all those who wish to obtain a deeper understanding of the meaning of experimental observations on the rates of reactions in solution.

B.D.E.

CHEMICAL KINETICS, by B. Stevens. Chapman and Hall, London, 1961. 108 + viii pages. English price 12s. 6d.

This book is described as the first of a series of monographs on physico-chemical topics written especially for the student reading Chemistry (in a British university) as a subsidiary subject. It starts from scratch in kinetics and the scope of the book is approximately that of a Stage III Chemistry course in the topic in New Zealand. It deals a little with the measurement of reaction rates and with the setting up of mathematical expressions for rates in terms of concentrations, but more particularly and usefully with the significance to be attached to data on rates and reaction orders. There is a short chapter on the theoretical treatment of reaction rates, two on catalysis which include an introduction to enzyme catalysed reactions. The book concludes with a short treatment of photochemistry and radiation chemistry and of chain reactions. The treatment throughout is illustrated by examples from the literature, but, rather surprisingly, only the author and year of the references are given.

The book can be recommended with confidence to any student beginning his first serious study of reaction kinetics. It is particularly notable for the fact that it frequently emphasizes important fundamental points which authors of the standard textbooks are sometimes inclined to gloss over, but which are none the less important for the beginner.

B.D.E.

ALUMINIUM: ITS APPLICATIONS IN THE CHEMICAL AND FOOD INDUSTRIES, by P. Juniere and M. Sigwalt (Translated by Winifred Barnes). Published by Lockwood, London, 1964. 267 pages. Price 55s.

If all the published information on the resistance to corrosion of metals were to be published, with due regard to the effect of impurities in the medium and in the metal and including sufficient information on the occurrence of pitting and embrittlement, then the volumes would probably be of encyclopaedic size and, like

Beilstein and Gmelin, be a few decades out of date. At present, one can consult only Ritter, *Korrosionstabellen Metallischer Werkstoffe*, or start a search in *Chemical Abstracts*, the result of which is likely to be very incomplete owing to difficulties in indexing.

The author and translator of the monograph under review have done a useful service in bringing into one volume a wealth of information on the resistance of aluminium and its alloys to gases, aqueous solutions, organic liquids and food products.

The alloy compositions are defined with respect to U.K. and U.S. type numbers and this section is followed by a short discussion of corrosion theory so elementary as to have been better omitted. There follows, however, a very useful and extended table of inhibitors and thereafter the main body of information, some 200 pages, on the attack by a very wide range of media on aluminium and its alloys. The corrosion data here presented are qualitative rather than quantitative, although actual rates of corrosion are quoted in some cases. It is often more useful, as is done here, to emphasize under what conditions pitting occurs since in its presence loss of weight is no criterion of service life. Frequent reference to the effect of impurities in the medium is a good feature as also is the occasional warning on the possibly disastrous result of absence of impurity, one example being very dry alcohols. The corrosion media dealt with extend in many cases beyond those in Ritter, especially in the organic section, although some omissions were noted. A short final section on the effect of disinfectant and cleaning agents completes the volume and is very relevant to the food industries. The data should prove most useful to prospective users or makers of aluminium plant, but the volume would have been of much greater use had there been literature references to the sources of the data.

T.H.

THE SYSTEMATIC IDENTIFICATION OF ORGANIC COMPOUNDS, 5th Edition, by R. L. Shriner, R. C. Fuson, and D. Y. Curtin. Published by John Wiley & Sons, New York, 1964. Price £3 10s.

The first edition of this book was published twenty-eight years ago. To have survived for this long and have become a standard teaching volume at many universities, it must have contained much to recommend it as a textbook. However, it is now showing its age, and the inclusion of a very good chapter on spectroscopic methods for functional group determination does not conceal this fact. Most laboratories teaching organic chemistry now supply spectra with their samples of unknown compounds, chemical identification being guided by the initial spectral interpretation. An example of the lack of correlation between the older and newer chapters is in the identification of 2,4-dinitrophenylhydrazones — under classification tests there is a long discussion on the often misleading colour of dinitrophenylhydrazones, while under ultra-violet spectra only a brief reference is made to their really significant spectra.

A second major criticism is that, while the methods described for the preparation of derivatives undoubtedly work with the suggested 0.1 to 3.0 grams of pure "unknown", no indication is given to the student of how to handle smaller quantities, prepare

derivatives from a mixture, or of what he should do when his derivative does not conveniently crystallize. Surely chromatography is the logical way to separate esters from alcohols, or even to clean up a 2,4-dinitrophenylhydrazone.

To summarize, although there appears to be no satisfactory alternative text for universities continuing along the lines of this book, the approach for teaching purposes is outdated. For the more advanced worker the authors cover too much, too lightly. Its most valuable feature is the comprehensive collection of references throughout the text.

R.H.

COMPREHENSIVE ANALYTICAL CHEMISTRY. VOL. IIA: ELECTRICAL METHODS, edited by C. L. Wilson and D. W. Wilson in association with C. R. N. Strouts. Published by Elsevier Publishing Company, Amsterdam, London, New York, 1964. 268 pages. Price 60s. (50s. if purchased as part of series).

Analysts familiar with earlier volumes in this series will find the practical approach, combined with theoretical treatment sufficient to provide basic principles, well maintained in this volume. Consistent with the Wilsons' aim "to present *Comprehensive Analytical Chemistry* as a *working manual*" is the decision to publish these specialist volumes in smaller parts which are more convenient for laboratory use. Part IIA covers Electrodeposition (A. J. Lindsey), Potentiometric Titrations and Conductometric Titrations (D. G. Davis), and Impedimetric Titrations (T. S. Burhalter). A. J. Lindsey also contributes an introduction which discusses units, symbols, conventions and classification of electrochemical methods of analysis. The brief note on conventions is very useful for the occasional user of electroanalytical procedures who is unfamiliar with the differences in sign language followed by European and American journals prior to the 1953 IUPAC Stockholm Convention.

Although the editors have sought to provide a work which will enable non-specialist analysts to undertake these techniques without further recourse to other texts, most users will find it necessary to go to original papers for fuller details of specific methods; but they will turn to the bibliographies under authoritative guidance and with a much fuller appreciation of the principles behind particular methods and of their advantages and limitations. An especially valuable feature is the brief discussion of the merits of some of the common commercial apparatus available for each technique.

N.T.C.

CHEMISTRY

Chemistry, the American Chemical Society's publication for high school seniors, is an exciting journal in its new format. Clearly and attractively printed, with good illustrations, its appearance must help fulfil the Society's aim of stimulating interest in chemistry at school level. This high quality is maintained in the contents.

Articles cover a wide range of subjects, one recent issue containing a review of the properties of metals, an excellent introduction to gas chromatography, and an article on chemistry in Russian schools. Authors are generally well known in their field, and successfully accomplish the difficult task of presenting an up-to-date picture of their subject at a level suitable for sixth forms.

The regular features deserve special mention. The research reporter, presenting summaries of recent research, much of which is drawn from journals less than six months old, presents his material admirably. Experiments described in "Lab Bench" appear simple and instructive, although the materials used may not always be readily available in this country. Book reviews have so far, by careful selection of material, been much more up-to-date than is possible in most journals, and are particularly interesting because student reviewers are used extensively. The only disappointing feature is the quiz included in some numbers, presumably to test the reader's understanding of the articles; the standard is so low as to be an insult to the intelligence of the type of reader the journal caters for.

Chemistry should be available to all sixth-form pupils studying chemistry, and teachers will find it a valuable complement to *Education in Chemistry* and *Journal of Chemical Education*. It provides a refreshing and stimulating change from textbooks.

G.J.W.

THE STRUCTURE AND PROPERTIES OF BIOMOLECULES AND BIOLOGICAL SYSTEMS. *Advances in Chemical Physics*, Vol. VII, ed. J. Duchesne. Published by Interscience, Sydney. 754 pages. Price, £12 18s. 6d.

Biochemistry has grown up on the shoulders of classical chemistry and biochemists have always had to keep abreast of what their more theoretical chemical colleagues have been up to. Of course, the elegant theories developed by the chemists often fail to describe satisfactorily the enzymic reactions of the biochemist. But he has it as an article of faith that his molecules must be reacting according to some basic chemical principles even if these are ones not yet clear to the chemists themselves.

Up till quite recently, biochemists have relied heavily for their interpretation of biochemical reactions on the work of the organic and physical-organic chemists. In the last twenty years there has been a considerable increase in the ability of theoretical chemists to deal with complex molecules of interest to the biochemist and we now have to try to apply this quantum chemistry to biochemistry. Fortunately, there have always been theoretical chemists who wished to make their work intelligible to biochemists.

In the early days, as in Pullman's calculations on the polycyclic hydrocarbons, only hydrocarbons could be conveniently described but advances in technique have now given us electronic indices for a whole range of N and P compounds of biochemical interest. It still is not Quantum Biochemistry—as one of the articles in this volume is headed—it is the quantum chemistry of biochemical compounds. Many of the topics dealt with in this volume bear the same relationship to biochemistry as does the work of the natural

products chemist or the old fashioned "physiological" chemist. They give detailed descriptions of compounds isolated from their biochemical environment. It remains for the biochemists working with dynamic systems to take this newer way of looking at molecules and systems and turn it into quantum biochemistry.

The volume has an introductory section dealing with the electronic structures of DNA, hemoproteins and smaller biochemical molecules, then deals with the effect of heat, water and radiation on these molecules and describes their semi-conductor and magnetic properties. There is a section on the application of the spectroscopic alphabet — U.V., I.R., N.M.R., and E.P.R. — to the biomolecules and a chapter on the kinetic study of some of the more complex enzymic situations.

The book is part of an *Advances in Chemical Physics* series but this volume is either *Biophysics* or *Physical Biochemistry*. Certainly, all biochemists ought to read it and become familiar with its ideas and interpretations.

J.N.S.

GENERAL CHEMISTRY: A PROGRAMMED REVIEW. By Luciana Sacerdote. Published by John Wiley & Sons, New York. 325 pages.

The aim of this book is to provide university students with a text complementary to a lecture course and general chemistry textbooks. The subject is divided into topics and the student is expected to test his knowledge by working his way through a series of statements which contain omissions. When he correctly completes a statement he moves on to the next one, and so carries out a logical revision of the topic. The material contained in the book is remarkably compact yet generous. It would be an excellent method for conscientious review by a Stage 1 student, requiring only that he overcomes a desire to look ahead at the answers.

Two limitations to this method seem worth mentioning. First, most of the statements contain so much given information that the student is told the correct answer at the beginning of the statement and requested it at the end. "The mass of a substance does not change appreciably when the substance loses a very large number of electrons. Therefore the mass of an electron must be very (small)". This statement requires minimal effort to complete. Secondly, the method is unsuccessful when applied to sophisticated concepts. The author deals with the wave mechanical picture of atoms without once mentioning the wave nature of the electron and Heisenberg's Uncertainty Principle; so that orbitals are introduced without an adequate discussion of their difference from orbits. Similarly, resonance is briefly and inadequately covered. Presumably these concepts are best left to a complementary textbook.

Accepting these limitations, this is a concise and logical treatment presented in such a way that the reader can examine and revise his understanding of general chemistry.

M.D.C.

FUNDAMENTALS OF PHYSICAL CHEMISTRY. By H. D. Crockford and S. B. Knight. 2nd edn. Published by John Wiley and Son Inc., New York, 1964. 406 pages. Price £3 7s. 6d.

This text is a development of the authors' earlier book entitled *Physical Chemistry for Premedical Students* (Wiley, 1950). In this edition the contents have been left virtually unchanged, but the order of presentation of chapters has been wisely rearranged to enable the introduction of thermodynamics to come before chemical equilibrium and e.m.f.

In the chapter on chemical equilibrium, the authors have unfortunately retained the use of the Law of Mass Action to derive an expression for the equilibrium constant. This is not a general derivation and applies only when the system obeys first order kinetics. It would be more suitable in a text of this nature to discuss this subject without introducing kinetics, as in this instance this practice has led the authors into making a confusing statement of the Law of Mass Action. They state "the speed of a chemical reaction is proportional to the product of the activities of each reacting substance. . . ." In attempting to reconcile kinetics and equilibrium constants they forget that concentrations and not activities are used in kinetic expressions.

According to the authors, the material presented is intended for the use of premedical students, biological students and high school science teachers. This leads to the only general criticism. Instead of giving this diluted version of a rigorous mathematical treatment, it would have been better to have given a more qualitative discussion.

Because of the large number of worked examples and the clarity of most of the chapters, there are two spheres in which this book can be useful. First, it is suitable for secondary school science teachers who have University Entrance and Scholarship classes. Secondly, it can serve as a reference text for first-year university chemistry students and for pharmacy students.

G.R.B.

ANNOUNCEMENT OF NEW PUBLICATION

STANDARD CELLS, THEIR CONSTRUCTION, MAINTENANCE, AND CHARACTERISTICS, by Walter J. Hamer, *National Bureau of Standards Monograph 84*, January 15, 1965. 38 pages, 35 cents. (Order from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, or from local U.S. Department of Commerce Field Offices.)

The accurate measurement of electromotive force is important in many areas of science and technology. The basic physical standards for such measurements are provided by standards cells—long-lived electrochemical systems of highly stable electromotive force.

This publication describes the origin and derivation of the unit of electromotive force, and outlines the procedures by which the National Bureau of Standards maintains and disseminates this unit by means of standard cells. Then follows information on the construction, maintenance, and characteristics of standard cells. Em-

phasis is placed on the precision and accuracy of electromotive force measurements, the stability of standard cells, especially those of the National Reference Group, and on the efforts made to construct standard cells of high quality.

A brief history of the development of standard cells is included in the Monograph, going back to the Daniell cell of the early 19th century, the first cell seriously used as a standard of e.m.f. The Clark cell, devised by Latimer Clark in 1872, is described, as is the development of the Weston, or cadmium sulphate cell, which is the electrochemical system used almost exclusively today as a standard cell.

COURSES IN SPECTROSCOPIC METHODS OF ANALYSIS

Two courses in spectroscopic analysis will be held in the Chemistry Department of Victoria University of Wellington in association with D.S.I.R. at the end of third term. Both courses will include details of how spectroscopic methods may be used in industrial practice, how spectra may be interpreted, how experimental errors may be avoided, and what recent developments there have been in technique. The first course is concerned primarily with interpretation of spectra. Techniques to be included are infrared, U.V.-visible, emission, flame absorption, X-ray fluorescence, and diffraction, microwave methods, nuclear spectroscopy (activation, N.M.R., Mössbauer), and electron spin resonance. The visiting speaker will be Dr A. Walsh, of the C.S.I.R.O., Melbourne, who was involved in the early development of flame absorption spectroscopy.

The second course will be primarily concerned with experimental work on I.R., U.V.-visible, and other techniques, and with worked exercises for practice in interpretation.

The dates are:

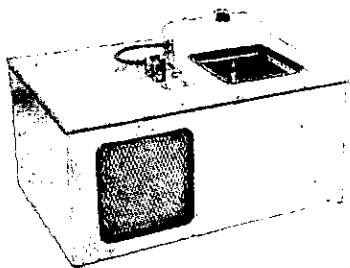
Course I: Thursday, October 21, to Saturday, October 23. (Lectures; numbers unlimited.)

Course II: Monday, October 25, to Friday, October 29. (Practical; limited to 12 people.)

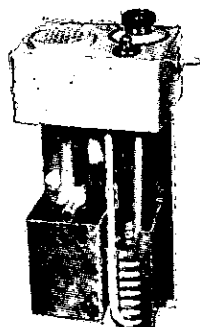
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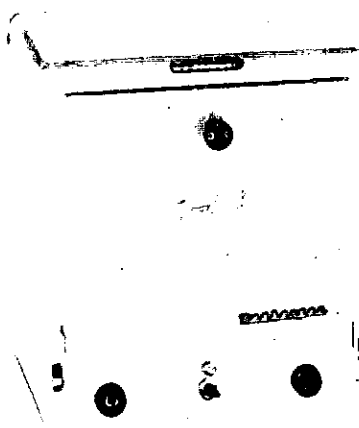


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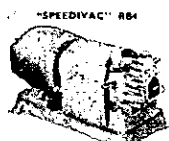
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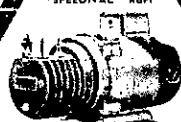
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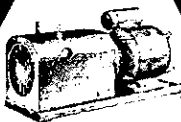
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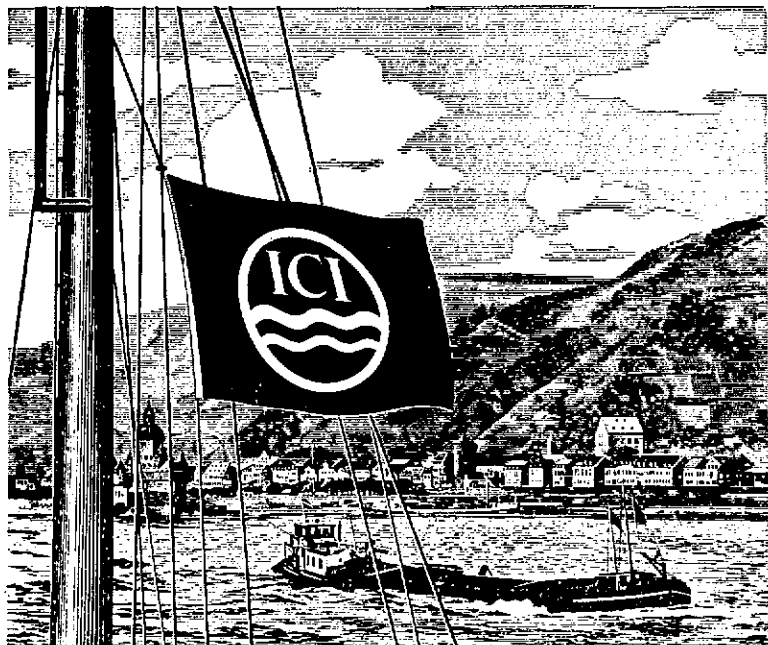
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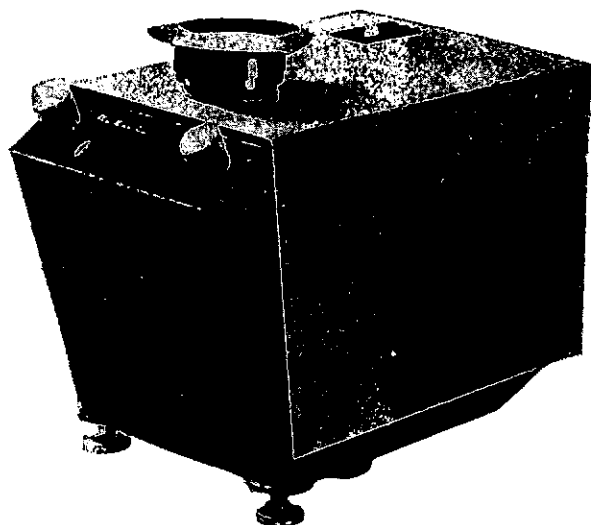
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