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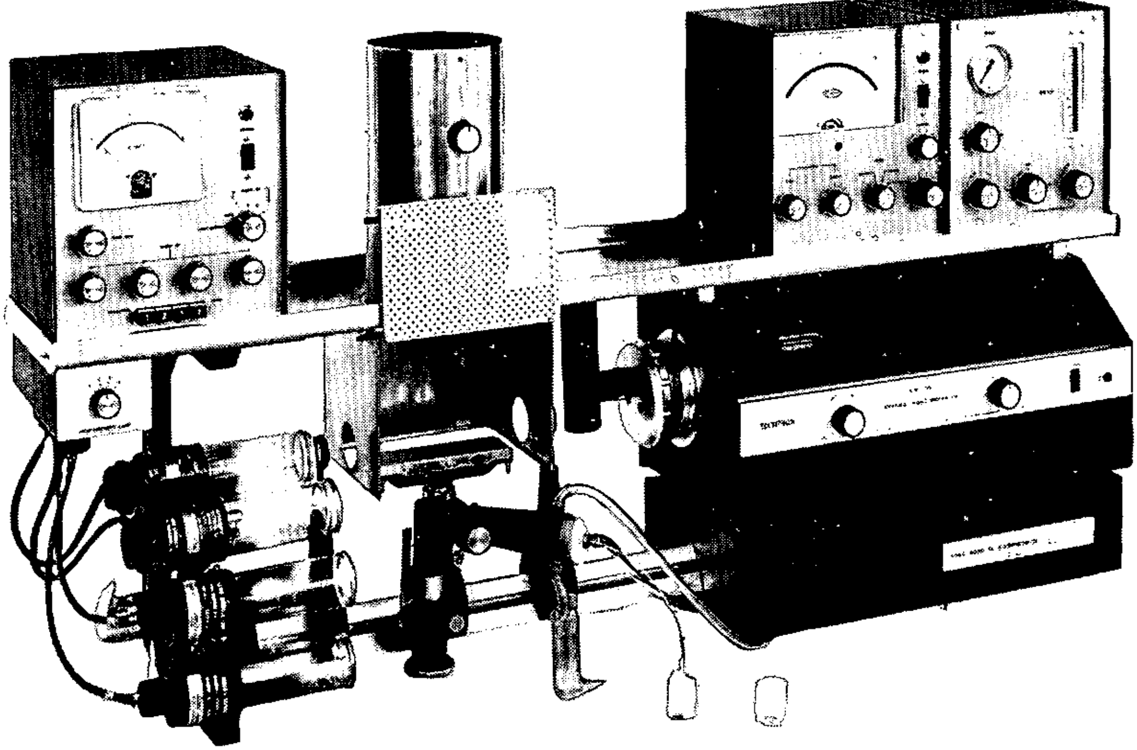

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PRESIDENTAL ADDRESS . . .

INDUSTRY FOR CHEMISTS

Max Carrie, M.Sc., F.R.I.C., A.M.I.Chem.E.

OVER the past few years talks and articles on the subject of chemists in industry have dealt mainly with the contribution of chemists to industry and the failure of the universities to give students an adequate training for industry. No-one, however, has yet discussed what the chemist can expect to get from industry, and this is what I propose to deal with here. About one-third of our Institute members are employed in industry and this proportion is likely to increase as the country becomes more industrialised. This matter therefore should be of interest to us.

My knowledge of conditions in industry overseas is very limited, so I am concerned mainly with New Zealand. I am going to concentrate on industries connected with primary production, partly because the N.Z. economy will depend on them for a considerable time to come and partly because they are the only ones of which I have had any first-hand experience. And I am going to deal with only certain aspects—the ones which I think are generally overlooked. I must of necessity generalise and this means that you will all be able to think of examples which refute every statement I make. However, I will still maintain that my statements are generally true and that your examples will be the exceptions. I begin by exploding two myths.

The First Myth

The first myth deals with the material rewards received by chemists in the various types of employment. Let us look at each of these in turn and examine the image which they conjure up in the minds of most people, even of people who are relatively well educated and presumably intelligent.

University

The university teacher is paid far less than his talents would earn him in other walks of life. He is poorly-dressed, under-nourished and either walks or rides a bicycle because a car is beyond his means. The popular picture is summed up by the well-known cartoon of the two shabby professors standing on the footpath, watching the bloated capitalist going past in his chauffer-driven car. One says to the other, "Perhaps we'd have been in that position too, if we'd failed Economics I." These two professors have stepped slightly out of character because the true university teacher is so unworldly that he is quite unaware of his poverty. We can justify our paying him so poorly, firstly because he wouldn't know what to do with more money if we gave it to him, but, more importantly, because he is so richly rewarded by the only thing that he lives for—his scientific achievement (preferably in a field which could never be of any possible use to anyone). His only desire is to finish his career with a world-wide reputation in his own particular subject and with a few reactions named after him. If he collects some honorary degrees, an FRS or a Nobel Prize in the process, it's very nice, but these things don't really matter to him. He lives only for his science.

Government

The government, on the other hand, is the haven of refuge for the slow, methodical, conscientious plodder who lacks the spark of genius which marks the university teacher. The government servant makes his way steadily upwards by seniority, keeping a vigilant eye on the numbers of those above him and judiciously transferring to another department if the path ahead looks a little crowded. He's not asked to work hard (the term "government stroke" has become a part of our language) but he is asked to be punctual and to be regular in his attendance. So long as he keeps his nose clean and never makes a decision which is not strictly in accordance with the Regulations, his upward progress will be unhindered. His salary is not very good because the government is a notoriously poor payer. But to offset this there is security of employment (except in the past few years. This has always been an important consideration in any job, and it looks as though it will be again) and he gets his "super". If luck is with him and he gets right to the top, he might also get a decoration.

School teaching

School teaching is simply the rubbish heap in which all the failures are deposited. No chemist ever sets out to make a career of school teaching—he simply drifts into it. As the old saying goes, "He who can does, he who cannot, teaches. He who cannot teach, teaches teachers. And he who cannot teach teachers does educational research." He gets miserable pay, but what else can he expect when you consider his failure as a chemist, his short working hours and his long vacations.

Industry

Industry is the place for the ambitious man who has confidence in his own ability and whose conscience is elastic enough not to be troubled because he is prostituting his science for money. (Industrial chemists are the only ones coarse enough to talk about "money" instead of "emoluments" or "financial rewards". This shows how far down the social scale they have slipped). In industry progress depends entitrely on yourself and on your ability and drive. You have no security of employment of course, but as far as money is concerned "the sky's the limit." If you're really ambitious you'll move as rapidly as possible into management where the pay isn't even limited by the sky. If you go into industry you'll become a scientific outcast but your exile will be a luxurious one.

The Reality

So much for the myth. Now let us have a look at the reality. The 1965 salary survey conducted by the Institute tells us most of the story. Industry pays slightly higher initial salaries but this advantage disappears after the first few years. From then on the university leads the field with government and industry in second place. If the chemists in management positions in industry are eliminated, the government chemists were ahead of the industrial chemists. With recent rises in government salaries I would be reasonably certain that government are now ahead of industry, even if those in management are included. Strangely enough, the R.I.C. Survey in 1965 showed a similar situation. The phenomenon is therefore not a purely New Zealand one. Both here and in the United Kingdom school teaching tails the field. Why this is so is beyond comprehension. Only in Russia, it seems, teaching enjoys both the high salary and the high social standing that it should—and this is apparently not so much because of the ideas of the communist regime but as a carry-over from Czarist Russia.

The higher starting salary in industry is largely due to the practice in most firms of evaluating the job in comparison with other jobs in the firm and then setting the salary accordingly. If the appointee does the job satisfactorily, he will be kept on; but if the job does not increase in relative importance, the tendency is to leave the salary the same (apart from cost-of-living increases to take care of inflation). The idea of annual increments, except in the case of very junior staff, is foreign to most industrial concerns. Most New Zealand laboratories are not big enough to allow promotion through various grades of more senior positions. The smart question for the applicant to ask is not, "What will my starting salary be?", but, "What will I be getting in 10 years time?" The answer he will usually get is, "That depends entirely on you", which doesn't help him very much. If he is really smart, he will find out by one means or another what the top salaries in the firm are and, particularly, what the chief chemist is paid. This will give him an idea of the height of the sky in the stock answer, "The sky's the limit."

Superannuation

But the salary survey does not tell the whole story. There is also the very important matter of superannuation. Most firms operate a superannuation scheme for their staff, but the government, by its taxation laws, is very careful to ensure that these schemes cannot compete with its own. Usually the firm subsidises the employee's contribution to an endowment insurance policy, a typical arrangement being 5 percent of the employee's salary subsidised by an equal contribution from the firm. In some cases, the firm's contribution increases with years of service and may reach 10 percent of the salary after, say, 25 years. The firm's contribution is, however, limited by the Government to £250 per year. For a young chemist starting out at the age of 25, and assuming that both he and his firm pay in 5 percent of his salary, every £100 of salary will give him an annuity of roughly £90 at the age of 65. This sounds very good indeed, and so it would be if it were not for inflation. Judging by what has happened over the last 40 years, his £90 will have a purchasing power of about £30 when he collects it. Of course, his salary will presumably have increased over the years to compensate for inflation and probably also with a certain amount of promotion, but the extra contributions based on his increases will produce smaller and smaller annuities as he gets older. If he gets a £100 rise, at the age of 60 for instance, five years before he retires, his superannuation will be increased by only about £7 per year. Even if the employer's contribution has risen to 10 percent by this time, the increase will still only be about £10 per year. Compare this with the government scheme, where a £100 increase will give about an extra £60 per year. The fact is that inflation affects the superannuation of the industrial chemist right from the moment he starts work. The government superannuitant is affected only after he retires. There is yet a further point. If the industrial chemist changes his job, he may quite possibly find that his new firm's scheme is with a different insurance company. He will then have to surrender his old policy and start all over again with a new one. This will set him back quite considerably. Even if the insurance company is the same in both cases and he can transfer his policy, he will probably go back to a lower rate of subsidy from his new employer. Superannuation is a thing that the young chemist scarcely considers when he applies for a job. It is so far away in the future that it doesn't enter his head, but it looms large as he approaches retiring age. By then it is too late.

Mobility

A career in industry has another disadvantage. There is less mobility than in most other types of employment. The university teacher has, within limits, the whole of the English-speaking world at his disposal and, again within limits, he can take his own particular interest with him no matter where he goes. He also has overseas salaries to compare with his own, as a bargaining point. The government chemist, too, has considerable freedom of movement within the service although this freedom does not usually extend beyond New Zealand. Quite apart from the superannuation question the industrial chemist, on the other hand, is much more restricted in his movements, especially as he becomes older and has to sell only his experience in a narrow field as compared with the younger man.

Lack of Organisation

Another disadvantage from which the industrial chemist suffers is that he has no organisation to look after his interests. University and government chemists and even school teachers have such organisations, no matter how ineffective their members may think they are. The industrial chemist, in most cases, must approach his employer on a personal basis if he thinks he is underpaid. This can be difficult and embarrassing. Considering the multiplicity of employers and the wide variations in the work, it is difficult to imagine just what type of organisation could be set up. Apparently exactly the same situation exists in the U.K. It has often been suggested that the R.I.C. should function in some manner as a trade union, especially now that its examining and qualifying role has largely disappeared. So far, the R.I.C. has taken no action in the matter—whether on principle or because of the difficulties, I don't know. If anyone can devise a workable scheme here, he would certainly get a great deal of support from the chemists in industry.

Management

It is said that the ambitious industrial chemist is not going to stay in the laboratory —he will move into management where the really big money is. He can do this, it is true, but in the first place, the captains of industry in this country do not get the high salaries that their overseas counterparts do. We live in an extremely egalitarian society. Top salaries in the Government service are very much on a par with top salaries in industry. [I'm not saying that they shouldn't be, but most people imagine that the situation is quite otherwise.] Secondly, the chances of a chemist, or of any specialist, getting to the top in industry are not very good. The all-rounder who started as an office boy and who has never specialised at all has the inside running all the way, especially in the food and allied industries which have a very large labour force. Consequently for a works manager, the ability to handle men and to deal with unions is more important than technical knowledge. Although chemists have filled management positions very successfully, their training tends to be a handicap rather than a help. Inanimate things which the chemist is trained to deal with cannot be bluffed, flattered, cajoled or threatened into doing what is wanted. Men can be, and frequently are. Often the chemist puts forward a scheme backed by clear, sound, logical arguments which any righ-minded person would accept without hesitation. He is bewildered and dismayed when it is turned down flat by the workers on grounds which are often largely emotional. The accountant too, suffers from the wrong type of training, possibly even more than the chemist does, and, contrary to popular belief, seldom reaches top management positions. The business man's motto is, "Accountants and technical men on tap but never on top." When it comes to really top management business acumen is a quality which is of the utmost importance, especially in the export food industries where prices are determined by world market conditions and not by costs of production. The company which makes the profits is very often not the one which is technically efficient, but the one whose manager is a shrewd and clever trader. [I'm not suggesting that you have to be a John Wilder to succeed as a general manager, but some of his qualities certainly would not be a disadvantage.] Overall, I would say that the chemist has a better chance of reaching the top administrative positions in the government service than he has in industry and that the financial rewards would be as great.

"Fringe benefits"

On the credit side, the "fringe benefits", other than superannuation, are likely to be better in industry than in other branches of the profession. Most firms take the view that when their staff travel, they should stay at good hotels and that their allowances should be sufficient to enable them to dispense and return a reasonable amount of hospitality. This is part of the business of projecting a favourable image of the firm. Also, a senior member of the staff may be given the use of a car. In most firms, too, the company's products may be bought at a discount. [Whether this is as valuable as the discounts obtainable by members of the P.S.A., I am not in a position to judge.] I am sure that these fringe benefits do not fully compensate the industrial chemist for the financial disadvantages he suffers in other directions.

To sum up, if money is your chief concern, you should try for a university post first, a position in the government service second, a job in industry third and school teaching fouth. Except for the school teacher, this was not the case 20 years ago and it may not be the position 20 years hence, but it is certainly the position today.

Since this is the case, you may well ask why anyone would, of his own free will, enter industry today. This brings me to the second myth, one which has much less basis of truth than the first one. But it is much more widely believed, and believed by people who should know better.

The Second Myth

This is the belief that applied science, or technology, consists simply of exploiting the discoveries of pure science in the practical field and that if the answer to the technologist's problem is not available from pure science, he must simply sit back and wait until it is. Therefore, if pure research is curtailed or hampered in any way, technology will no longer be able to advance and the whole of mankind will suffer. In certain fields, and in certain instances, technology has been based on the discoveries of science in this way. Faraday's work on electricity is the classical and most widely quoted example. But to say, as a local professor was recently quoted (in a local newspaper) as saying, "that all real advances are made in the universities and that technology merely exploits them" is nonsense. It is not even completely true in that professor's own subject of physics. Engineering, which is usually considered to be applied physics, is still largely empirical. The research being done in this field is still as much technological as purely scientific. And when it comes to any field which is really complicated, e.g. any field with a large biological, biophysical or biochemical content, technology can expect little or no help from pure science. In fact, the boot is usually on the other foot.

Technology advances Science

The situation was neatly summarised in an address given at the 23rd International Conference of IUPAC in which it was stated "Technology is no longer content to apply scientific discoveries, as in the classical scheme. It goes ahead, taking advantage of facts before they are theoretically understood and, by means of the research which it carries out for its own needs, in certain fields it opens up new pathways for science." If I had been making that statement, I would have changed the first sentence. I would not have said that technology was *no longer* content merely to apply scientific discoveries, but that it *never had been.* Historically, all science is based on technology, and science has as yet, only in certain restricted and relatively simple fields, progressed sufficiently to be able to repay its debts. In a talk on meat pigments which I gave recently to two of our Branches, I called attention to the fact that the remarkable work of Kendrew and Perutz on the structures of myoglobin and haemoglobin (work which gained them the Nobel Prize for chemistry in 1962 and which has given us a more complete knowledge of these substances than of any other protein) has so far contributed nothing whatever of value to physiology or meat technology, both of which are vitally interested in the behaviour of these two compounds. What we know of their reactions has been derived from research on the technological level. I was interested to hear Dr Carter, Director of Research for the International Wool Secretariat, say at a recent conference that the very considerable technological advances which had been made in the wool industry owed nothing whatever to the large amount of fundamental research on wool which has been and is being carried out or sponsored by the Secretariat.

Let me hasten to assure you that I am not decrying fundamental research. Sooner or later it must pay off, or our whole philosophy of science is at fault. But in very wide fields of economic importance, this time has not arrived and in these fields at the present time, the technologist is the path-finder in the forefront of scientific exploration. That is one of the reasons why a career in applied science can offer a greater challenge than an academic one.

Unreliable publication

Not only is the technologist given little help by the pure scientist, but he must learn to be highly suspicious of anything the academic publishes. The best example of this which has come my way is a method which was published a few years ago for the dewooling of sheepskins. This followed the classical pattern in every detail—some fundamental work on the structure and physiology of the skin, most of it on human skin and carried out in a university medical school using the latest and most fashionable methods, including electron microscopy, had shown that the mucoids in the skin played a much more important role than had previously been thought. The mucoids were the cementing substances of the skin and served, among other things, to hold the wool fibres firmly in place. The susceptibility of mucoids to attack by alkali now explained for the first time why the traditional processes of fellmongering (including depilation) were successful, since these processes employed strongly alkaline reagents. But, still in the classical manner, this new fundamental knowledge suggested a fresh approach to the technological problems of fellmongering. Mucoids could be broken down, not only by alkali, but also by enzymes working under neutral or slightly acid conditions and thus avoiding the undesirable effects of strong alkali. A few experiments showed that pectinase at pH4 acted as a depilatory and the sequence was complete—fundamental discovery leading to an explanation of known facts, followed by prediction of new phenomena which were experimentally verified. Nothing could be more satisfactory or satisfying. With unacademic business acumen, the authors patented the process and sold it for a goodly sum which they shared between themselves and the university.

It so happened that we had been doing quite a bit of work on enzyme depilation, but we had been using enzymes of the trypsin type which attack the immature wool at the wool roots and loosen the fibre. We were naturally interested in the new process and carried out some tests. It gave reasonable depilation, not good enough for commercial use under New Zealand conditions, but about on a par with the results we had obtained with the proteolytic enzymes. But we did a thing which apparently the authors had omitted to do. We ran a blank. And the acetate buffer which was used to maintain the pH at 4.0 was just as effective *without* the enzyme. When a phosphate buffer was used instead of acetate, the enzyme had no depilatory effect whatever. I should add that the depilatory action of acetic acid had been known for a long time. This work simply faded out although, as far as I know, there was no published refutation of it.

Problems must be solved

This brings me to another point about applied science. It is much more exacting than pure science. In the first place, the technologist cannot choose his problems. The problems choose him. I have the feeling, possibly mistakenly, that the pure scientist in many cases is careful to avoid any problem which appears unlikely to yield results (and, incidentally, a paper or two) in a reasonably short time. And if he does run into real difficulties he can always exercise the academic freedom he is always insisting on and can find that for some reason or another his interest now lies in another direction. I don't say that he does, but he can. The technologist has no such escape. The problem must be solved in one way or another, if not by respectable scientific methods, then by plain empiricism ("Let's poke it here and see what it does")—and it must usually be solved against time. The solution may not be the best one and the reason why it works may be quite obscure, but as long as it works, the technologist has achieved his immediate objective. He may carry on the investigation further when he gets the opportunity or he may leave it for the more academically inclined to carry on where he left off. But whatever his solution lacks in scientific elegance, it really must *work*.

This is the second reason why applied research is more exacting than pure research. An engineer once said "The academic needs only to think he's right. The applied man must know he's right." This is an ideal which the technologist doesn't always achieve, but the idea behind it is sound. Publication of scientific work is supposed to ensure validity by the fact that it can be checked by anyone. But how often is it actually checked? Of the mass of published work, how much of it is of sufficient interest to anybody for it to be checked at all? I asked some overseas chemists in the meat industry how they kept pace with the huge amount of material which is published in journals. They said that, for a start, they never read anything published by universities. It was never worth their while reading. If something worthwhile was discovered in a university, they would soon hear about it. But the technologist has his results checked day after day, year after year under all sorts of conditions. If there are any flaws, they will be found and he won't be left in ignorance of them. In many cases, his solution to a problem will involve the expenditure of considerable sums of money, and no business firm likes to spend money on something which turns out to be useless. The applied scientist must, as far as is humanly possible, make absolutely sure he is right.

Contribution of the practical man

The technologist's attitude towards the practical man, the man who has had years of experience in the industry, must be almost exactly the opposite of his attitude towards the academic. Science, as I have said, was founded on technology, and technology was developed by practical men who had no scientific training—whose knowledge consisted of what they had been taught by their predecessors and of what they had learned from their own experience. One of the hardest lessons the young, scientifically-trained technologist has to learn is that, even today, the practical man often has a great deal to offer and that it is worth while gaining his friendship, confidence and co-operation. What usually fools the young technologist is the fact that the practical man almost always has a theory to account for his facts and that this theory is in most cases obviously absurd. The facts can all too easily be thrown out with the theory.

Since I have given an example which shows the academic in a poor light, it is fair that I should choose a similar example for the technologist. From time immemorial it has been considered essential to hold carcases for about 24 hours at ambient temperatures before submitting the meat to further processing. The practical man had a theory about this—unless the "animal heat" was allowed to escape from the carcase, dire consequences would result. This "animal heat" was very coy and would come out only under "natural" conditions. Any attempt to hasten its removal by artificial refrigeration would only lock it firmly in place and there it would sit, exerting its malign influence. For both bacteriological and economic reasons, however, it was highly desirable to cool the carcases as rapidly as possible. The chemist said that calories were calories, and the engineer said that B.T.U's were B.T.U's, no matter whether their origin was animal, vegetable or mineral, and both agreed that the practical man was talking through his hat. So they went their own way only to run into trouble exactly as the practical man had predicted. It finally turned out that the initial hanging period was necessary, not for the removal of "animal heat", but to allow certain biochemical and biophysical post-mortem changes to take place. These take place more rapidly at elevated temperatures, so that too-rapid cooling of the carcase immediately after slaughter causes troubles later. Our knowledge of these changes is very incomplete, and our control of them by adjusting temperature, and in some cases pH, is almost entirely empirical. By and large, we're almost back to what the practical man had done for many years. If you are a chemist in industry, you must never brush aside lightly the ideas of the experienced workman. He may have the solution to your problem or his suggestions may give you a valuable lead for a worth-while piece of research. As Dr Callow of the Cambridge Low Temperature Research Station said, "The practical man does the right thing for the wrong reason." (personal communication).

The rewards of technology

In the fields with which I have been dealing, the technologist is thus the spearhead in the advance of scientific knowledge. It is he who is in a position to gather facts from the experienced worker, sift the wheat from the chaff, and in the facts which he himself has determined, correlate them all when he can and, if necessary, present to the pure scientist a firm basis for research of a more fundamental nature and for theoretical advances. Far from being the follower, the technologist is the leader and the trail-breaker. From this point of view, therefore, a career in industry presents a greater challenge to the chemist than does an academic one.

The technologist, too, frequently has the reward of seeing his discoveries and ideas actually put in to practice. He gets a real feeling of achievement from this, especially when his ideas contribute something of concrete value to the firm which employs him and, in many cases, to the prosperity of the country as a whole. And this feeling of achievement is, I imagine, just as deep and as satisfying as that of the "pure" chemist who has finally established the position of the last methyl group in a compound.

There are many more things I could say about the joys of a career in industry and about its trials and tribulations, too. But I will leave it at that.

As I said at the beginning, I have approached my subject from a different angle than is usual. Unlike most previous speakers on this subject I have been critical of industry and I have been most careful to avoid criticism of the universities. What I hope I have impressed on you is that the very factors which traditionally attract the chemist to an academic career are now the ones which should attract him to industry. The mantle of poverty has passed from the university to industry. Perhaps, in time, the mantle of scientific nobility will follow it. Somehow, I doubt this very much.

ANZAAS 40th CONGRESS — CHRISTCHURCH

24 - 31 JANUARY, 1968

Circular No. 2, which contains full details of Section programmes and other Congress activities, has now been issued and will be sent to all those who have enrolled.

Additional copies and enrolment forms may be obtained from Mr G. M. Harris, c/o Chemistry Department, University of Canterbury. All intending participants are urged to enrol without delay.

SULPHURIC ACID PLANT AT HORNBY

D. J. Higgins, B.Sc., A.M.I.Chem.E.
Chief Production Officer, Kempthorne Prosser Ltd.

RECENTLY Kempthorne Prosser & Co's New Zealand Drug Company Limited commissioned at their Hornby Works a Simon-Carves Monsanto Contact Sulphuric Acid Plant of nominal 250 tons per day capacity. It is a sulphur-burning plant. The sulphur is melted, its moisture content eliminated and its solid impurities removed by filtration. It is then burned in a stream of air which has been previously dried in a sulphuric acid irrigated drying tower. The hot combustion gases are cooled in a fire-tube waste-heat boiler where steam is raised for process use within the plant and for electrical power generation.

The steam supplies a turbo-alternator capable of 2100 KVA production at the present stage of development. This power supplies the acid plant and the whole works complex. Excess is fed into the national grid. The combustion gases are filtered in a hot gas filter filled with graded quartz before entering the catalytic converter which contains five beds of vanadium catalyst arranged in four passes. About 70 percent conversion occurs in the first pass. The heat rise associated with the strongly exothermic reaction is removed in a heat exchanger which also acts as a superheater for the steam from the waste heat boiler. Intercooling between subsequent passes is achieved by the admission of dried dilution air.

A very high level of conversion (around 99 percent) is achieved by generous catalyst provision which is far better than usual in plants of this type. The gas from the converter is then cooled in a second heat exchanger to a temperature suitable for the absorption of its sulphur trioxide content. This exchanger also acts as an economiser or boiler feed water heater, thus improving overall heat economy. The cooled gas then enters a packed absorbing tower where the sulphur trioxide is absorbed in sulphuric acid. Complete absorption takes place.

The tail gas is filtered in a Brink mist eliminator to remove spray and sulphuric acid aerosols before discharge through a tall stack to the atmosphere. The Brink eliminator, the first in this country, consists of stainless steel elements packed with fibre glass. It produces a very low level of visible discharge. The acid produced is stored in two one thousand ton tanks before export or works use.

Acid for fertiliser production is produced by dilution and cooling in carbon cascade heat exchangers and is handled thereafter in polyethylene pipes. Both drying and absorbing acids require cooling and large banks of cascade cast iron coolers are installed. The water from these and from the condenser on the turbo-alternator is cooled in an induced draft cooling tower and re-used, thus conserving water usage. The whole plant is highly instrumented, largely automatic and is operated by two men per shift.

The unit has been designed for subsequent conversion to the newly developed inter-absorption system in which advantage is taken of the fact that if sulphur trioxide is removed from the reaction gases, the thermodynamic equilibrium is improved when further catalytic conversion is effected.

The converter gases will be removed from the convertor after the second pass with approximately 90 percent converted and will be cooled before entering a second absorption tower. Here substantially all of the sulphur trioxide will be removed by absorption in sulphuric acid. The gases leaving this tower will pass through a Brink mist eliminator before being reheated to reaction temperature in the heat exchanger. They will then re-enter the convertor for passage through the final passes of catalyst. The conversion efficiency will be increased to over 99.5 per cent and the plant capacity increased to 350 tons per day. Steam production will also be greatly increased. The ultimate capacity of the alternator is in excess of four megawatts.

The possibilities of this type of technique have long been understood but the corrosion problems associated with it have only recently been overcome. The Hornby plant is one of the first in the world to have been designed for the interabsorption process.

RETIREMENT OF Dr C. R. BARNICOAT, D.Sc., Ph.D., F.R.S.N.Z., F.R.I.C., F.N.Z.I.C.

Dr C. R. Barnicoat, Director of the Cawthron Institute, Nelson, retired on the 22nd September 1967 after a long and distinguished career in the service of science in New Zealand.

Dr Barnicoat was born and educated in Palmerston North. He graduated B.Sc. in 1924 from Victoria University College, where he was a Senior Scholar in Chemistry and was awarded the Sir George Grey Scholarship in Chemistry and Geology. He was awarded M.Sc. and a Jacob Joseph Scholarship in 1925. After a year in England Dr Barnicoat was on the staff of the Dairy Research Institute until 1936 when he was awarded the coveted Harkness Fellowship for study in the U.S.A. where he gained his Ph.D. from the University of Minnesota. In 1940 he joined the staff of Massey College where he became Associate Professor of Biochemistry and where he built up a strong research unit investigating problems in plant and animal nutrition. His work on factors influencing wear in sheep's teeth was of great importance to New Zealand. In 1952 he was awarded a D.Sc. by the University of New Zealand. Dr Barnicoat is a Fellow of both the Royal Institute of Chemistry and the New Zealand Institute of Chemistry; he is a past President of both associations and this year was elected an Honorary Fellow of the N.Z.I.C. The Royal Society of New Zealand elected Dr Barnicoat a Fellow in 1961.

In April 1959, Dr Barnicoat took over the Directorship of the Cawthron Institute. During his tenure of this office he brought about a number of major changes and innovations in the Institute's research policy transforming it into a modern, well-equipped research unit. Dr Barnicoat initiated the scheme for Thomas Cawthron Research Fellowships to attract overseas scientists to the staff. He was instrumental in obtaining, in 1964, a generous grant from the Golden Kiwi Fund to aid in the Institute's re-equipment programme. As Director, Dr Barnicoat never failed to do all in his power to help his staff, despite many outside obstacles, and he will long be remembered with respect and affection by all those who worked with him. Dr Barnicoat is a man of wide interests, and we wish him and Mrs Barnicoat a happy and rewarding retirement.

INSTITUTE PRIZEWINNERS FOR 1967

Dr J. C. Dacre

Photo: A. Tilbury

Dr H. P. Rothbaum

Photo: J. Brownlie

Mr G. Schafer

The Chemical Essay Prize

This was awarded to Dr J. C. Dacre.

Dr J. C. Dacre is head of the Toxicology Dept., Otago University Medical School. This department studies chemical additives (both intentional and accidental) in food. Dr Dacre is particularly interested in anti-oxidants, synthetic organic food colours and pesticide residues.

He has studied the metabolism and chronic toxicity of the antioxidants BHA (butylated hydroxy anisole) and BHT (butylated hydroxy toluene). This work has been published. At present he is completing studies on the chronic toxicity (two year tests) of propyl gallate.

Two year tests on the chronic toxicity of the food colours Citrus Red No. 2, Orange R.N., Violet BNP, and Red FB are being done with both rats and mice.

These food colours are permitted in many countries including New Zealand but are classified by both the WHO-FAO Expert Committee on Food Additives and by British Food Standards as part of a group for which insufficient toxicological information is available to evaluate safety of use.

The I.C.I. Prize

Dr H. P. Rothbaum was awarded the I.C.I. Prize for 1967 for his work on the spontaneous combustion of wool and the use of phosphorus and sulphur in fertilisers. Dr Rothbaum is on the staff of Chemistry Division where he is continuing his research on fertilisers.

The Morcam Green, Edwards Prize

Mr G. Schafer was awarded the 1967 prize for his work on the corrosion of copper and its alloys. Mr Schafer was particularly concerned with corrosion in plumbing installations such as water pipes, hot water cylinders and elements, cisterns, etc. He is now Industrial Liaison Officer at Physics and Engineering Laboratory.

Summaries of the work which gained these prizes are overleaf.

FIRE, WATER, EARTH AND AIR

IT IS curious to reflect on the way in which one's interest in specific research problems arises, and how one investigation almost inevitably leads on to others.

Work at Chemistry Division into the causes of spontaneous combustion of wool had shown that fires frequently started in pie wool which contains an easily oxidisable form of body fat. Elimination of pie wool from commerce cured this particular problem. I was then asked to study microbiological heating of wet wool, which is necessarily limited to the maximum metabolic temperature of 76°C and therefore cannot start fires on its own.

For years we studied fungal and bacterial heat outputs (showing previous values to be too low by a factor of 100) and devised practical solutions to the problem of controlling the moisture content of exported scoured wool. One necessarily learns a judicious mixture of physical chemistry, bacteriology and organic chemistry and always wonders why no investigator had ever proposed a plausible mechanism for the chief problem in this field—how the temperature of haystacks can rise from 76°C up to ignition.

I happened to read a paper which showed that at elevated temperatures the thermal conductivity of wet concrete was very much larger than that of concrete at a relative humidity below 100 percent, because of continued water vapour transfer in the pores. Suddenly the haystack problem seemed simple. While excess moisture in hay aids microbiological growth and heating, relatively dry hay, which has a far lower thermal conductivity, is more likely to heat from 76°C to firing, provided that an exothermic chemical reaction occurred. I had previously shown that wet sugars and amino acids, if strongly aerated, can oxidise with much heat evolution at temperatures well below 90°C. As thermophilic bacteria will not grow at all below 95 percent relative humidity, evidently the region just above 95 percent relative humidity is most likely to lead to fires in haystacks.

Precision adiabatic heating equipment was available at Chemistry Division and the Physics and Engineering Laboratory allowed us the use of their controlled humidity cabinets. This biological-chemical heating mechanism was then rapidly verified for hay, tropical grasses (which absorb particularly low amounts of moisture) and greasy wools; it probably is a general mechanism for spontaneous combustion, but particularly applies to haystacks.

Perhaps because I was "playing with fire", I was then asked to study the explosion and combustion hazards of elemental sulphur in fertilisers. New Zealand and Australia have pioneered the aerial application of elemental sulphur but topdressers had perhaps been a little too enthusiastic in dropping this very useful, but relatively inflammable, material. After an investigation into explosion hazards of sulphur we set acceptable limits for this material in fertilisers.

If elemental sulphur is used as a fertiliser, why not elemental phosphorus? Obviously yellow phosphorus is too poisonous and inflammable, but curiously, red phosphorus had never been seriously considered. On closer inspection it turned out to be potentially economic. We put considerable effort into investigating the effect of catalysts on oxidation rates and products of red phosphorus mixed with soil. Plant trials gave the expected responses, but red phosphorus alone was found to be too slow-acting for use as a practical fertiliser. However, copper catalysts which were shown to improve the storage properties of red phosphorus when dry, on wetting greatly increased oxidation rates to produce almost pure phosphates. Such mixtures are potentially useful fertilisers in copper-deficient areas. Their study naturally leads to work on heterogeneous catalysts and generally to problems of relatively insoluble fertilisers such as their solubility and pelletising properties. I think that carefully chosen "classical" physico-chemical investigations of practical systems often give results which are not only intensely interesting in themselves but potentially useful at the same time.

H. P. Rothbaum

COPPER CORROSION

My work on copper corrosion in domestic equipment originated in an apparently isolated problem, but it became apparent that similar problems were quite common.

New Zealand potable water supplies can be divided into two broad groups, surface and underground.

Surface waters are relatively non-corrosive to copper and its alloys, and unless materials are defective there is usually no trouble. Films of oily contaminants on the inside surfaces of pipes and on the surfaces of sheets used for making cisterns and tanks are a common defect. In cold systems using surface water, such films sometimes cause accelerated pitting. The remedy seems simple—clean the metal surface. But some cleaning methods work better than others and every cleaning method costs money.

Underground waters from wells or artesian bores are often corrosive. Attack may result in fairly uniform thinning of the metal. This is the most acceptable form of deterioration because most of the metal in, say, a pipe has to be dissolved before a leak occurs. Sometimes attack results in pitting, in which case leaking can start very rapidly—the removal of only a small quantity of metal dissolved from one place is enough to make a hole. It is important to be able to distinguish between pitting caused by corrosive water and pitting caused by defective materials. Corrosive underground waters can generally be improved by aeration or addition of alkali.

Hot water storage tanks usually have long lives with surface supplies, but short ones with some underground waters. Oddly, even when a cylinder is severely corroded, the hot water pipes leading from it are rarely affected. In hot water pipes contaminant films do not appear to cause accelerated pitting.

Copper-sheathed electric immersion elements which heat the water in tanks containing certain underground waters have short lives. This occasionally happens with surface waters. Adverse water characteristics include scale forming propensity and high conductivity. Waters which attack immersion elements do not always affect other parts of the system. Cathodic protection with an aluminium rod is, in some conditions, a cheap way of increasing element life. Large surface area and low wattage are universally beneficial.

In an investigation of this type one is very dependent on samples, information and facilities supplied by laymen.

Absence of complaints does not necessarily mean absence of trouble. Unless stirred up by publicity, Joe Bloggs will generally not complain about his plumbing system falling to bits if Henry Crun next door has the same trouble. This makes it unexpectedly difficult to locate corrosive water supplies.

I found that most laymen will go to great lengths and put up with endless inconvenience to let an investigator do an experiment, so long as reasonable explanations are given. But the investigator must explain and must be prepared to modify his actions if co-operation is required.

A surprising number of people believe that analysis is the solution to all problems. But the aspiring corrosion chemist will find that unless he has a clear idea of what an analysis is likely to show, the results will often merely lengthen an inconclusive report.

I enjoyed doing this work because it was interesting, but more important because I could explain at least some of what I was doing to a layman without at the same time wondering whether he secretly considered me an ass in an ivory tower. In other words, because it was potentially useful. This is not to say that I consider research without forseeable applications to be useless. Far from it. It just isn't for me.

G. J. Schafer

THIRTY-SEVENTH ANNUAL REPORT

for the year ended 31 July 1967

Officers for the year: President: M. S. Carrie; First Vice-president: Dr D. R. Llewellyn; Second Vice-president: Professor J. Vaughan; Delegates: Auckland, G. R. White; Waikato, Dr R. H. Locker; Manawatu, Dr W. A. McGillivray; Wellington, Dr P. K. Foster; Canterbury, D. J. Hogan; Otago, Dr J. C. Dacre; Immediate Past President: Dr A. T. Johns; Editor: Miss J. M. Mattingley; Honorary Librarian: S. G. Brooker; Registrar: D. J. Hogan; General Secretary: Dr W. E. Harvey (W. G. Hughson acted until 1.2.67 while Dr Harvey was overseas).

Membership: During the past year membership of the Institute has changed as follows:

Associates elected to Fellowship	11
New Fellows	3
New Associates	57
Resignations	6
Deaths	4
Deletions from Membership List	4

Dr F. J. Llewellyn, now Vice-Chancellor of the University of Exeter, was elected a Life Member.

Consolidated membership figures for the last three years are as follows:

	1965	1966	1967
Auckland	170	182	199
Waikato	44	47	49
Manawatu	87	100	98
Wellington	215	229	246
Canterbury	109	120	128
Otago	94	91	89
Overseas	78	91	92
TOTAL	797	860	901

Obituary: It is with regret that we record the death of the following members: Dr J. K. Dixon, Dr J. C. Andrews, Dr Roy Gardner and Mr I. C. Forsyth, all closely associated with the Institute since its formation.

Institute Prizes: Prizes for 1966 were awarded as follows:

I.C.I. Prize	Dr R. Hodges
Morcom Green & Edwards Prize	Mr W. A. J. Mahon
Chemical Essay Prize	No award

Conferences: The 1966 Conference was held in Wellington and showed a small surplus of income over expenditure.

No Conference is being held in 1967, but the Institute will play a full part in the activities of the A.N.Z.A.A.S. Conference to be held in Christchurch in January 1968, and planning has already begun for a special conference in Dunedin in August 1969.

Overseas Visitors: Professor Sir Ewart Jones visited New Zealand from 8-24 April during which time he lectured to all the Branches and also saw something of the Government institutions, the universities and the countryside. Sir Ewart, who was accompanied by Lady Jones, expressed himself as well satisfied with the arrangements which were made for his stay.

As well as being guest speaker at the 1966 Conference, Professor R. D. Brown spent two weeks visiting and lecturing to branches and universities.

Financial assistance from the universities, and in the case of Professor Brown, from the Chemical Society, for these visits, is gratefully acknowledged.

R.I.C. Publications: The Institute has continued to make bulk purchases of R.I.C. publications (Education in Chemistry and Monographs for Teachers) for distribution in New Zealand and the co-operation we receive from the R.I.C. in this way gives us a small surplus from this activity although the work involved in the distribution is by no means negligible.

Journal: Miss Joan Mattingley has continued to edit the Journal and Miss Annette Dollimore has continued as Advertising Manager. With the first issue for 1967 the Journal appeared in a new format having an increased page size which it is considered will, amongst other things, make it more attractive to potential advertisers. It is still difficult, as it always has been, to obtain sufficient advertising revenue to offset the cost of the Journal and in the last financial year the net cost of the Journal to the Institute was £585, which was less than for the preceding year. The new format has been well received and co-operation with the printer, David Jones Ltd., has resulted in the Journal appearing regularly on time.

Examinations: The first candidates to qualify for the Associateship by examination, Messrs. D. R. St. John and N. G. Thom, have been admitted during the year under review, thereby justifying the very considerable amount of time spent by the Examinations Committee under the chairmanship of Professor Odell in establishing procedures and regulations for candidates wishing to qualify for Associateship in this manner. Attention is now being directed to a possible form of association with the Institute for those with lesser qualifications such as those obtained from the Technicians' Certification Authority.

Royal Society Members: Miss Mattingley has continued to represent the Institute, and as one of the Member Bodies Committee members elected to the Fellows Council, is clearly in a position to present the Institute's views to the Society at the highest level. Professor J. Vaughan is also a member of the Member Bodies' Committee and the Institute is therefore in a position to play a major role in Royal Society matters.

The Royal Society is shortly to embark on its appeal for funds for a Royal Society building, a development which in the long run should materially benefit this Institute.

Taxation: In the past the Institute has had to pay income tax on Journal advertising revenue even though the Journal was run at a net loss. Now, however, the Institute has been exempted from payment of this tax and indeed we have received a refund of tax previously paid. This exemption which was obtained with the assistance of the National Research Advisory Council, is clearly of considerable importance, especially if advertising revenue increases.

Finance: The Balance Sheet for the year ended 30th April 1967 reveals an excess of income over expenditure of £104 as compared with a deficit of £516 in the preceding year. The more satisfactory position reflects decreases in travelling expenses, the net cost of the Journal and the net cost of "Chemistry in Action" together with a slightly increased income from subscriptions.

For and on behalf of the Council.

W. E. Harvey, General Secretary
M. S. Carrie, President.

SEMINAR IN EXPERIMENTAL CHEMISTRY

On 21st and 22nd August a group of 10 chemistry teachers from schools in and near Christchurch gathered in the Chemistry Department, University of Canterbury, to work, in association with several members of the department's staff, on the development and testing of experiments for use in schools.

Electrode potentials, the chemistry of some co-ordination compounds, and a simple Grignard synthesis were among the topics that produced useful results. After there has been some further testing of the procedures used it is intended that some record of this work will be circulated through the Canterbury Science Teachers' Association.

Report of the National Commitee for Chemistry, 1966-1967

THE National Committee for Chemistry met once during the year, in Wellington on 16th March, 1967. An earlier meeting, called for 16th August, 1966, during the New Zealand Institute of Chemistry Conference in Wellington, lapsed owing to more than half the members being ill or absent overseas at the time. Minor alterations to the Constitution and Rules of the Committee, to make them consistent with the R.S.N.Z. rules as gazetted in December, 1965, have been submitted to Council.

A. International Activities

Because of the Chairman's inability to attend the XXIVth Conference of IUPAC to be held in Prague from 28th August to 3rd September, 1967, Professor L. H. Briggs was nominated, and has been appointed by Council, as first delegate. He will also attend the associated XXIst Congress there. As no other New Zealand scientist has indicated his intention of attending the Conference and Congress, a second delegate (to which New Zealand is entitled in Category C) has not been appointed.

With the object of increasing its income and of fostering closer association with chemical industry, IUPAC in 1966 established a new Category of Adherence "Company Associates of IUPAC" to which industrial organisations employing chemists can belong by paying an annual subscription on a unit basis, each unit being $U.S.250 and the number of units to be paid being determined by the size of the organisation. The Reserve Bank of New Zealand has agreed to the transmission of such subscriptions overseas by the Royal Society of New Zealand on behalf of the subscribing company or trade institute. It is hoped that the Minister of Finance will agree to IUPAC being classified as a "research institution" for purposes of taxation concessions in New Zealand. When further details of the scheme are learned at the XXIVth IUPAC Conference, the Committee proposes to approach a number of New Zealand companies on this matter.

IUPAC has undertaken to co-operate with the European Economic Community (EEC), Brussels, in the elaboration of definitions and standards, criteria of purity, and quantitative analytical methods for food additives, in particular for colouring matters, preservatives, anti-oxidants, emulsifiers, stabilisers, etc., and has appointed a small Consultative Committee for this purpose. IUPAC has asked National Adhering Organisations to give their help in every way possible. The National Committee for Chemistry has therefore asked Council to approve collaboration and to appoint Dr F. B. Shorland (Food Chemistry Division) and Mr P. J. Clark (Chemistry Division), D.S.I.R., as the New Zealand Correspondents with IUPAC's Consultative Committee in these matters.

Notices and information concerning forthcoming international meetings (congresses, symposia, etc.) in chemistry are being received regularly from IUPAC. Lists of these meetings are being passed on to the Editor of the Journal of the New Zealand Institute of Chemistry (now called "Chemistry in New Zealand") for publication bi-monthly therein. In this way most chemists in New Zealand are being kept informed without undue delay.

IUPAC's official journal "Pure and Applied Chemistry" (from Vol. 10, 1964) is now being received and is being placed in the R.S.N.Z. library.

B. National Activities

Pending the receipt of the first report of N.R.A.C.'s Manpower Working Committee, the National Committee has no recommendations to make concerning the supply of chemists in New Zealand.

J. PACKER, Chairman.

The National Committee for Chemistry consists of: Professor J. Packer (Chairman), Professor L. H. Briggs, Mr S. G. Brooker, Mr M. S. Carrie, Professor J. F. Duncan, Dr A. T. Johns, Professor H. N. Parton, Dr F. B. Shorland.

N.Z. GEOCHEMICAL GROUP

On July 18th many of the Group members participated in a symposium arranged by the Australasian Institute of Mining and Metallurgy, at the N.Z. Fertiliser Manufacturers' Research Association at Otara, Auckland. The symposium, concerned with "Sulphate Mineralization in the Coromandel-Thames-Waihi area," was attended by 80 people. The meeting provided further evidence of the increasing rise of interest in mineral search and development in New Zealand.

Dr D. Skinner of Auckland University outlined the history of mining in the Coromandel area and reviewed the changes in geological thought which had occurred over the years concerning the origin of the mineralization.

Two aspects of work at the Tui Lead-zinc mine, Te Aroha, were presented by Dr A. Wodzicki of the N.Z. Geological Survey and Mr D. M. Hazard of Norpac Mines Ltd. The former speaker described his work with Dr Weissberg of Chemistry Division on mineralogy and element distribution in the mine, while Mr Hazard outlined the flow sheet of the Tui mine milling and processing equipment.

D.S.I.R. work at Copper Mine Island was summarised by Dr Wodzicki and Mr B. N. Thomson who compared this porphyry type copper deposit with other copper prospects in New Zealand and overseas. Mr P. L. Walker of Carpentaria Exploration Co. and Mr P. Riley of Lime and Marble Ltd. outlined the geological, geochemical and geophysical methods used by their organisations in mineral search work in the Coromandel and in N.W. Nelson respectively.

R.I.C. Monographs for Teachers. Nos. 12, 13.

The theoretical tenor of sixth form chemistry today makes teachers feel more acutely the need for suitable background reading.

The two most recent Royal Institute of Chemistry Monographs for Teachers:

No. 12, 'Elements of Chemical Thermodynamics' by E. A. Guggenheim, 70 cents;

The Registrar now has copies of the Monographs for Teachers, Numbers 1-13, in stock. The following is a full list of titles and prices—

1. Principles of Electrolysis. C. W. Davies ... 35c
2. Principles of Oxidation and Reduction. A. G. Sharpe 35c
3. Principles of the Extraction of Metals. D. J. G. Ives 60c
4. Principles of Metallic Corrosion. J. P. Chilton 60c
5. Principles of Chemical Equilibrium. P. G. Ashmore 45c
6. Principles of Titrimetric Analysis. E. E. Aynsley and A. B. Littlewood 45c
7. Principles of Catalysis. G. C. Bond ... 60c
8. Principles of Atomic Orbitals. N. N. Greenwood 60c
9. Principles of Reaction Kinetics. P. G. Ashmore 75c
10. Industrial Chemistry—Inorganic. D. M. Samuel 75c
11. Industrial Chemistry—Organic. D. M. Samuel 60c
12. Elements of Chemical Thermodynamics. E. A. Guggenheim 70c
13. Principles of Osmotic Phenomena. J. F. Thain 80c

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Dr R. R. Brooks has recently returned to Massey University after spending a year working on marine geochemistry at U.C.L.A. His research involved the distribution of phosphate and a wide range of cations in ocean water and interstitial water of sediments off the coast of S. California.

NOTICES . . .

CONFERENCE 1968

Planning has begun for the 1968 Conference to be held in Auckland from Monday, 19th August (Registration 6 p.m.) to Friday, 23rd August.

Under the chairmanship of Mr K. E. Seal the committee has planned a conference which should have a strong appeal to industrial members. It includes a session devoted to Analytical Chemistry in which members will be invited to carry out work at the laboratory bench using a variety of modern analytical methods. Other sessions include Management; Liaison between University, Government and Industry; Chemical Engineering; Biological Chemistry; Mineral Resources; etc. Each of these sessions will be organised by a Theme Chairman and it is intended that most of the papers will be given by specific invitation.

To cater for M.Sc. and Ph.D. students each University Chemistry or Biochemistry Department will be asked to select a student to present a paper in a Student Session. These papers will be judged by a panel and a prize awarded.

LIST OF MEMBERS 1968

The list of members, correct as at December 1967, will be re-issued in February 1968.

As in the past, each member of the Institute will receive a card showing the current listing, asking for revisions. In addition, each member will be asked to indicate the category of chemistry in which he or she wishes to be listed.

This information will be used to compile an additional section which will list members (names only) in their particular category. This will enable quick reference to be made to all members working in any of these fields. In addition it will eliminate some of the ambiguity of professional titles such as 'scientist', 'development engineer', and 'adviser to the manager'.

The proposed categories are:

- Agricultural Chemistry
- Analytical Chemistry
- Applied Chemistry
- Biochemistry
- Chemical Engineering
- Consultant Chemist
- Dairy Chemistry
- Food Chemistry
- Fuel Chemistry
- Geochemistry
- Industrial Chemistry
- Inorganic Chemistry
- Organic Chemistry
- Pharmaceutical Chemistry
- Physical Chemistry
- Radiochemistry
- Soil Chemistry
- Teacher
- University Lecturer.

Each member may assign himself to two categories at the most. This enables University people to also list their particular subjects.

It would not be advisable to have too many categories, and it is thought that those listed should cover essentials. However, comment on this list will be welcomed. Please send comments and suggestions directly to:

J. S. Pollard,
Convenor, List of Members,
76 Hackthorne Road,
Christchurch 2.

BRANCH NOTES

Auckland

The Auckland Branch have arranged three "Chemistry in Action" lectures for sixth formers for the 1967 series. The lecturers this year are Mr H. Longden, Chief Metallurgist, Pacific Steel Ltd., Dr B. R. Davis, Chemistry Department, Auckland University, and Dr D. Kear, Director of Geological Survey, D.S.I.R.

When Professor R. S. Nyholm visits Auckland, the meeting on 21st September will be held in conjunction with the Auckland Technical Institute. Professor Nyholm will speak on recent developments in chemical education with special reference to the United Kingdom.

Mr Waddell, at present Head of the Science Department, Auckland Technical Institute, has been appointed Principal of the new Hamilton Technical Institute.

Dr John Rogers, Director of the New Zealand Fertilizer Manufacturers Research Association, left in mid-August for Australia to attend the Australasian Mining and Metallurgy Conference at Mount Isa and Townsville from 17th-25th August. He will spend four weeks in Australia visiting Brisbane, Newcastle, Sydney, Melbourne and Adelaide.

Mr Donald Bradwell joined the Forensic Section of the Auckland Branch of Chemistry Division, D.S.I.R., on 22nd August. Mr Bradwell was formerly in the Colonial Service and spent ten years in Cyprus and seven years in Kenya. From 1964 he was working for Midland Silicones Ltd.

Professor L. H. Briggs will attend the 21st Congress and the 24th Conference of the International Union of Pure and Applied Chemistry in Prague. Next year he will be taking sabbatical leave.

Mr Graham White, Lecturer in the Chemistry Department, Auckland University, has been appointed Senior Lecturer in Physico-Chemistry at the new Medical School in Auckland. Only fifty students of the two hundred and sixty applicants can be accepted for the initial class of the Medical School next year.

Professor de la Marc leaves England in October and will take up his appointment as Head of the Chemistry Department, Auckland University, towards the end of the year.

Professor David Hall, formerly Head of the Chemistry Department, Auckland University, who left to take up an appointment in the University of Alberta, will be returning next year to fill the third Chair of Chemistry at Auckland University.

The Chemistry Department, Auckland University, hope to complete their move into the new building early in 1968.

Waikato

Mr N. T. Clare has returned to his position at the Ruakura Agricultural Research Centre. He was on an F.A.O. assignment in Turkey for the last two years.

A recent visitor to the Branch was Dr S. M. Partridge of the Low Temperature Research Station, Cambridge. He spoke to the branch on "Elastin, structure and biosynthesis."

Manawatu

Miss M. Wilson of the Poultry Research Centre went to the Australasian Poultry Science Convention in Surfer's Paradise, Queensland, and also visited some Australian research centres recently.

Dr R. C. Lawrence has been appointed to the position of Senior Biochemist at the New Zealand Dairy Reesearch Institute.

Dr R. Brooks has recently returned from a year's leave, spent at the Geology Department, U.C.L.A., to resume his position at Massey University.

Mr L. P. J. Chapman of the New Zealand Dairy Research Institute recently went to Japan to examine present and future uses for a variety of milk products.

Dr G. B. Russell has returned to Plant Chemistry Division, D.S.I.R., after two years at the Applied Chemistry Division of CSIRO in Melbourne. He was working under an N.I.H. contract, isolating and identifying anti-tumour compounds from Australian and New Guinea plants.

Wellington

Dr D. Suuring has recently taken up the post of Head Chemistry Teacher at Tawa College.

Dr L. Porter, formerly a Junior Lecturer at Victoria University has joined Chemistry Division.

Mr K. R. Tate has joined the staff of Soil Bureau. He is on leave for a year at Victoria University to complete his doctorate.

Mr H. M. Stone left Chemistry Division in August to spend a year in Britain at the Home Office Central Research Establishment at Aldermaston. Mr Stone has a study award from the D.S.I.R.

Dr R. Goguel has recently returned to Chemistry Division after spending two years at the Geophysics Department of the University of Hawaii.

Mr W. R. Strang recently transferred to Christchurch.

An introductory workshop on Electron Spin Resonance was held at Physics and Engineering Laboratory from 22-25 August and was attended by 30 people from all over the country. The course was organised by Physics and Engineering Laboratory staff, in particular Mr M. Collins and Mr A. Ward, and centred on the Varian V4502/15 e.s.r. spectrometer which has recently been installed. The theory and interpretation of e.s.r. were covered in a series of morning lectures. Practical demonstrations of the spectrometer and ancillary equipment occupied the afternoons. Lecturers at the course were: Dr E. Sullivan (V.U.W.), Mr M. A. Collins (P.E.L.), Dr T. Seed (C.U.), Dr R. Claridge (C.U.), Mr G. Gower (Varian Associates) and Dr J. A. Weil (Argonne National Laboratory, U.S.A.). The workshop was particularly fortunate to have Dr Weil as a lecturer as he has wide experience and knowledge of e.s.r.

Canterbury

Mr T. R. Hitchings, at present an inspector of secondary schools, Christchurch, has been appointed Headmaster of Riccarton High School, where he was previously head of the science department.

Mr W. R. Strang has transferred from Wellington to be Consumer Market Service Supervisor for the South Island for Shell Oil (N.Z.) Ltd.

During the August vacation a group of chemistry teachers combined with chemistry department staff in a two-day symposium on the design of practical chemistry exercises suitable for use with sixth form classes. The results of this symposium will be made available to other teachers.

Canterbury Junior Chemical Society

The third lecture for this year was given by Dr H. P. Rothbaum of Chemistry Division, D.S.I.R., Wellington. The next morning members of the Society were the guests of the Chemistry Dept., University of Canterbury, and spent the time seeing something of the work of the department. The final item of the 1967 programme was a visit to the Department of Chemical Engineering, University of Canterbury. Prizewinners for 1967 were announced recently. The Shell Essay Prize was awarded to J. Cleary of St. Thomas of Canterbury's College and the four Unilever Awards went to R. W. Platts and J. J. Smalley of Christchurch Boys' High School, J. E. Newman of Christ's College, and B. G. Currie of St. Bede's College. These members paid rewarding visits to Wellington during the August vacation.

Otago

Dr J. C. Dacre left recently for an extended visit to several overseas research institutions and industrial concerns. He attended the 7th International Congress on Biochemistry in Tokyo, and the 21st International Congress of I.U.P.A.C. in Prague where he delivered a paper. He will spend some time at the Department of Preventitive Medicine and Toxicology of the San Francisco Medical Centre, University of California where he will lecture and give tutorials in toxicology. His tour includes visits to Moscow, Vienna, London and Georgia, U.S.A. He will return early in 1968.

Mr A. J. D. Robb of Fletcher Industries Ltd. has returned from a month's visit to the U.S.A., where he was observing current developments in the agricultural scene. He also attended the annual convention of the American Soyabean Association in Peoria, Illinois.

Mr J. Robb of Fur Dressers and Dyers (N.Z.) Ltd., has just returned from a seven week visit to Europe, London and New York which he made to assess the recent developments which have taken place in the fur and sheepskin processing industries. During his tour Mr Robb visited the World Fur Fair at Frankfurt where there were major displays of processed furs, processing equipment, dyes and chemicals. He was also able to visit many important processing factories and equipment and chemical supply houses.

Dr I. D. Watson of the Chemistry Department, University of Otago has just left for 18 months leave of absence. He will work for about a year in London with Professor J. S. Rowlinson at the Chemical Engineering Department of Imperial College, then spend six months studying current teaching methods and curricula at Harvey Mudd College, Claremont, California.

LIBRARY OF THE NEW ZEALAND INSTITUTE OF CHEMISTRY

The Institute Library has now been running for 15 years. Many of its journals are not received elsewhere in New Zealand. The following is a list of Journals now being received and housed at the Auckland Museum, Private Bag, Auckland 1.

Acta Chemica Scandinavica. Copenhagen.
Anaies da Associacao Brasileira de Quimica. Rio de Janiero.
Anales de la Asociacion quimica Argentina. Buenos Aires.
Archivos de Bioquimica, Quimica y Farmacia, Tucuman (Argentina).
Buletinul Institutului Politechnic "Gheorghe Gheorghiu-Dej". Bucharest.
Bulletin of the Institute for Chemical Research, Kyoto University, (in English), Kyoto.
Canadian Journal of Chemical Engineering. Ottawa.
Chalmers Teknika Hogskolas Handlingar (Transactions of the Chalmers University of Technology). Gothenburg.
Chemistry. Washington.
Chemistry in Britain. London.
Chemistry in Canada. Ottawa.
Collection of Czechoslovak Chemical Communications (in English, German and Russian). Prague.
Croatia Chemica Acta. Zagreb.
Deutche Akadamie der Wissenschaften zu Berlin Monographs and Reports. Berlin.
Education in Chemistry. London.
Endeavour. London.
Journal of the Franklin Institute. Philadelphia.
Journal of the South African Chemical Institute. Johannesburg.
Kemija u Industriji. Zagreb.
Monatshefte den Deutche Akademie der Wissenschaften zu Berlin.
New Zealand Patent Office Journal. Wellington.
New Zealand Standards Institute Bulletin. Wellington.
Polish Technical Abstracts (in English). Warsaw.
Proceedings of the Khazakstan Institute of Chemical Science (in Russian), Alma-Ata.
Proceedings of the Royal Australian Chemical Institute. Melbourne.
Revista Portuguese de Farmacia. Lisbon.
Revue Roumaine de Chimie (in English and French). Bucharest.
Roczniki Chemii (Annales Societatis Chemicae Polonorum). Warsaw.
Royal Institute of Chemistry Lectures, Monographs and Reports. London.
South African Chemical Processing (formerly the South African Industrial Chemist). Johannesburg.
Studii si cercetari de Chimi. Cluj. (Roumania).
Svensk Kemisk Tidskrift. Stockholm.
Tidskrift for Kjemi, Bergvesen og Metallurgi. Oslo.
Uspekhi Khimiia (Chemical Reviews). Moscow.
Zhurnal Prikladnoy Khimii (Journal of Applied Chemistry). Moscow.

S. G. BROOKER,
Hon. Librarian

COUNCIL NOTES

Conference 1968 is being organised by the Auckland Branch. (A preliminary notice is elsewhere in this issue.)

Conference 1969 will be held in Dunedin. Professor H. N. Parton is Committee Chairman and Dr. P. K. Grant is Secretary.

A Careers in Chemistry booklet is in process of being organised.

List of Members—the current list is to be published in its existing format, to be issued with the February 1968 Journal.

Subscription Rates—Council resolved the following in regard to subscription rates:

1. That no reduction in subscription be made for husband and wife members.
2. That the subscription rate for members permanently domiciled overseas be half the normal rate.
3. That it be Council policy to grant remission of subscription to members on retirement at age 60 or over, provided that the member has paid subscriptions for not less than ten years immediately prior to retirement.

Ballot—The ballot for Second Vice-President resulted in the election of Mr. T. A. Rafter. Approximately 50 per cent of members voted.

Honorary Fellows—Dr. C. R. Barnicoat, Dr. H. E. Annett and Professor N. L. Edson were elected Honorary Fellows.

The death occurred recently of Mr. T. A. Glendinning of Nelson

"If you'd like to have it at cost, the research took $4,000,000."

THE REGISTRY

Elected 3 May 1967

Fellows

DAVIS, Brian Reeve, M.Sc., Ph.D., D.Phil., Chemistry Dept., Auckland University (Senior Lecturer).
THORP, John Martin, B.Sc.(Hons.), Ph.D. (Lond.), Chemistry Dept., Auckland University (Senior Lecturer).
WRIGHT, Graham Allen, M.Sc., D.Phil.(Oxon.), Chemistry Dept., Auckland University (Senior Lecturer).

Associates

COXON, James Morris, M.Sc., Ph.D.(Cantua.), Chemistry Dept., University of Canterbury (Lecturer).
LODGE, Norman, A.R.I.C., Dairy Division, Dept. of Agriculture, Auckland (Chemist).
McKINNON, Alan John, M.Sc.(Auck.), Ph.D. (Princeton), Wool Research Organisation of N.Z., Lincoln (Research Chemist).
MEDER, Athol Erskine, B.Sc.(Hons.)(Otago), Procter & Gamble Ltd., Cincinnati, Ohio (Development Chemist).
REANNEY, Darryl Chapple, B.A., M.Sc.(Auck.), Dept. of Biochemistry, Lincoln College (Lecturer).
RICHARDSON, John Baskerville, M.Sc.(Auck.), Chemistry Dept., Auckland University (Teaching Fellow).
SCOTT, Ronald James, B.Sc.(Hons.)(Cantua.), Kempthorne Prosser and Co. Ltd., Wanganui (Works Chemist).
STEPHENSON, Robert Perry, B.Sc., Morrison Printing Inks Ltd., Auckland (Chief Chemist).
THOM, Norman George, Dept. of Health, Auckland (Chemical Inspector).
WRIGHT, Geoffrey Richard Goddard, B.Sc., Shell Oil N.Z. Ltd., Wellington (Chemist).

Cancellation of Membership

The membership of R. B. Page and O. Summerville was cancelled for non-payment of subscriptions.

Members Incommunicando

The following names were deleted from the list of members: R. G. GIRVEN, R. G. JONES, D. A. MORRISON, H. C. PRICE, N. STANDISH.

Leave

Leave of absence with two years remission of subscription was granted to Dr J. M. ERSKINE, Dr B. H. ROBINSON, Mr P. O. WHIMP.

The following were elected 16th August 1967:

Fellows

EDWARDS, Gerald Harry, B.Sc.(Hons.) (Lond.), F.R.I.C., Standards Association of N.Z., Wellington (Director).
HANSEN, Roy Penrose, B.Sc., Food Chemistry Division, D.S.I.R., Wellington (Scientist).

Associates

ANDERSON, Martin Anderson, B.Sc.(Hons.) (Otago), W. Gregg and Son Ltd., Dunedin (Chemist).
LEWTHWAITE, David Evan, M.Sc., Christchurch Technical Institute (Tutor).
SALAMONSEN, Mrs Lois Adrienne, B.Sc.(Hons.) (Otago), Medical Unit, The Princess Margaret Hospital, Christchurch (Research Biochemist).
TAPPER, Brian Anthony, B.Sc. (Hons., Cantua.), Plant Chemistry Division, D.S.I.R., Palmerston North (Scientist).

Resignations

The following resignations were accepted with regret: D. M. CARTER, G. D. CORDNER, Mrs Y. CURTIS, L. G. GORDON, Father S. F. MARRIOTT, I. PALMER, Miss E. M. SAMPEY, E. J. SEARLE, Mrs J. B. SMITH, D. W. SPROTT, B. J. SWEETMAN.

Remission of Subscription

Remission of further subscriptions was granted to the following members who had all reached the qualifying age: E. B. DAVIES, F. J. T. GRIGG, Mrs M. LONSKA, Miss E. B. KIDSON, C. C. ROBERTS, G. R. SELFE, D. F. WATERS, H. J. WOOD.

Death

The death of Mr N. W. VERE-JONES was noted with regret.

NEWS ITEM

Recently Wellington College celebrated its Centenary. Among its celebrated Old Boys we noted the name of 'F. B. Shorland, Director, Rats Research Laboratory'. (Evening Post.)

BOOK REVIEWS . . .

Journal of Macromolecular Chemistry. Published by Marcel Dekker, Inc., New York. Vol. 1, No. 1. January 1966. Annual Subscription $NZ26.40.

What! *Another* new journal? What does this one propose to do? Hmm . . . That is odd! There is no statement here about the purpose of the Journal at all. Yet this is volume 1, number 1. A policy statement from the Editors would have been appropriate with the first issue.

Perhaps we can try the method of induction. What can be learnt by observation from the Journal itself? The Editorial Board at first sight appears to be geographically very representative; eight countries are included. But closer inspection reveals that eight of the members are from the U.S.A., six from Japan, and one each from Canada, England, France, Germany, Italy and Switzerland. Of the twelve papers in this first quarterly issue, seven are from the U.S.A. and five from Japan. We can all note these facts and draw our own "delusions". The format of the papers is identical with that adopted by the Journal of Polymer Science, even to the extent of including Synopsis, Resume and Zusammenfassung at the end of each paper. Ten of the twelve papers are concerned with the study of polymerisation processes, one with polymer degradation, and one with molecular structure. The Journal of Polymer Science uses the title Polymer Chemistry with reference to the topics of polymer synthesis, reaction mechanisms, kinetics and other areas of the organic and physical organic chemistry of macromolecules. It separates these topics from those of polymer chemical physics. It is difficult to judge from this first issue of Macromolecular Chemistry, which is almost wholly devoted to the topic of polymerisation, whether the word "Chemistry" in the title is to be interpreted in the usual broad sense or in the restricted sense adopted by the Journal of Polymer Science. Those whose interest is predominantly in polymer physics or physical chmistry will want further information on this point.

It might be possible to deetrmine more of the merits of this new journal by the process of deduction. Let us suppose in the first place that this journal will provide an outlet for papers related to a new and growing field of study. On examination of the papers, it is found that the first paper is the fourth in a series, the fourth is the seventh in a series, and the ninth paper is the seventh in a series. The first six papers in the last series were all published in the Journal of Polymer Science. We might well ask why these series of papers were continued in a new journal. Is it not true already that one cannot read all the articles of interest in a particular field, not only because they are so numerous, but also because they are scattered through too many journals?

As an alternative hypothesis, perhaps this new journal is necessary because the existing journals are too large or the publication delay is too long. In January 1966 the Editors of the J.Poly.Sc. wrote: "We are pleased to report that although the influx of manuscripts to the Journal has steadily increased during the 1964-65 period, the time lag between receipt of manuscript and actual publication has been substantially reduced. Whereas many articles appearing in the April 1964 issue had been received thirteen months previously, most manuscripts in the December 1965 issue had been received only five months before". The journal Polymer, which commenced in 1960, publishes papers four or five months after they have been received. Also this journal contains only three or four papers in each monthly issue, so that it could presumably cope with many more papers.

My conclusion is that it is not clear what special service this new journal is meant to render to the members of the scientific community. One hopes that the interests of these people, and not those of the publishing company have been the dominant reason for its production. But since the journal has commenced, the information it contains should be available in New Zealand. A research library which does not already contribute to the combined New Zealand resources in the field of polymer science could usefully take this journal for the benefit of the country as a whole. The cost, £13 per annum, is about one-sixth of the cost of the Journal of Polymer Science.

G. N. MALCOLM.

Principles of Polarography, 1966 revised and extended English Edition, by Jaroslav Heyrovsky and Jaroslav Kůta. Published by Czechoslovak Academy of Sciences Publishing House, Prague, and Academic Press, New York and London. US$19.00. 581 pages.

The name Heyrovsky is synonymous with polarography and this is a long overdue text in English written jointly by the Nobel prize winner and Dr Kůta, a colleague at Charles University, Prague. It will be welcomed by all electrochemists. Since the development of the polarographic method by Heyrovsky in the early 1920's the Prague school has contributed a sizeable proportion of the total literature on the subject. This revision of the 1962 Czech edition provides a well-developed and comprehensive survey of the principles of polarography and associated techniques, particularly the classical D.C. methods.

The book is not concerned with analytical polarography techniques although the theoretical developments are illustrated by well-chosen experimental results. It will be of interest mainly to the electrochemist concerned with electrode processes and the teacher, although the analyst will find polarography a more rewarding technique after obtaining satisfactory theory from a book of this type. The extensive tables of half-wave potentials for both inorganic and organic depolarizers will also assist the analyst.

The book covers approximately the field of Vol. I Kolthoff and Lingane in an up-to-date manner (references up into the 1960's), but is more extensive on electrode processes and kinetics, in line with modern advances in this direction. The classification of electrode processes and the development of theory to deal with specific cases are clear and concise. For teaching of classical polarography it is considered superior to earlier American texts. It has an uncommonly good section on the interpretation of polarographic maxima.

Surprisingly it deals only briefly with the oscillographic methods which have been promoted extensively by the Czech school. Short sections on the new developments in polarographic techniques such as rapid sweep, A.C., square-wave, pulse, etc., are inadequate. Schmidt and van Stackelberg's "Modern Polarographic Methods" provides a necessary extension to the book in this direction.
A criticism concerns the use of out-of-date illustrations of equipment. Photographic polarographs were stored away on top shelves a decade ago.

In summary, the book can be recommended as a thorough and comprehensive treatise on the theory of classical polarographic processes.

A. J. Ellis.

Beryllium: Its Industrial Hygiene Aspects, edited by Herbert E. Stokinger. Published by Academic Press, New York and London, 1966, 394 pages. Price US$11.60, NZ$11.00.

It is only since World War II that beryllium metal and its compounds have been shown to be highly toxic, whether in the form of a mist, vapour, dust or solution. The use of beryllium in lightweight alloy and fluorescent lamp and neon sign manufacture together with its extensive application in the field of atomic energy has greatly increased its production and hence the consequent recognition in man of beryllium disease or berylliosis.

As stated in the preface "The main purpose of this monograph is to provide a detailed account of the knowledge accumulated in the last twenty years on the industrial hygiene aspects and toxicology of beryllium and its commercially useful compounds". This has been admirably achieved by Dr Stokinger with the assistance of eleven expert contributors. Together they have written an extremely useful volume to which reference could profitably be made by those analysts, chemists and biochemists, toxicologists, industrial physicians and pathologists interested in the substance.

Only two of the eleven chapters will be of most interest to chemists. An excellent account of the chemistry of beryllium is presented in chapter 4 while a comprehensive and critical survey of the analytical determination of the metal is given in chapter 5. Other chapters deal mainly with the many aspects of beryllium disease and experimental beryllium toxicology, topics chiefly of interest to those working in the fields of toxicology and occupational health.

The monograph, the second in a series, was prepared under the direction of the American Industrial Hygiene Association for the Division of Technical Information, United States Atomic Energy Commission.

J. C. Dacre.

Oxyacids by M. W. Lister, Oldbourne Press, London (1965). N.Z. Agents: Whitcombe and Tombs Ltd. Price 43/6.

The sixth in the Oldbourne chemistry series, this book deals with inorganic oxyacids. This includes not only the more familiar oxyacids such as nitric, sulphuric etc. but also amphoteric compounds and aquo complex ions.

In content the book covers no more than any good, modern, general inorganic text on the subject. Its main value lies in the gathering of the properties etc. of oxyacids into one volume.

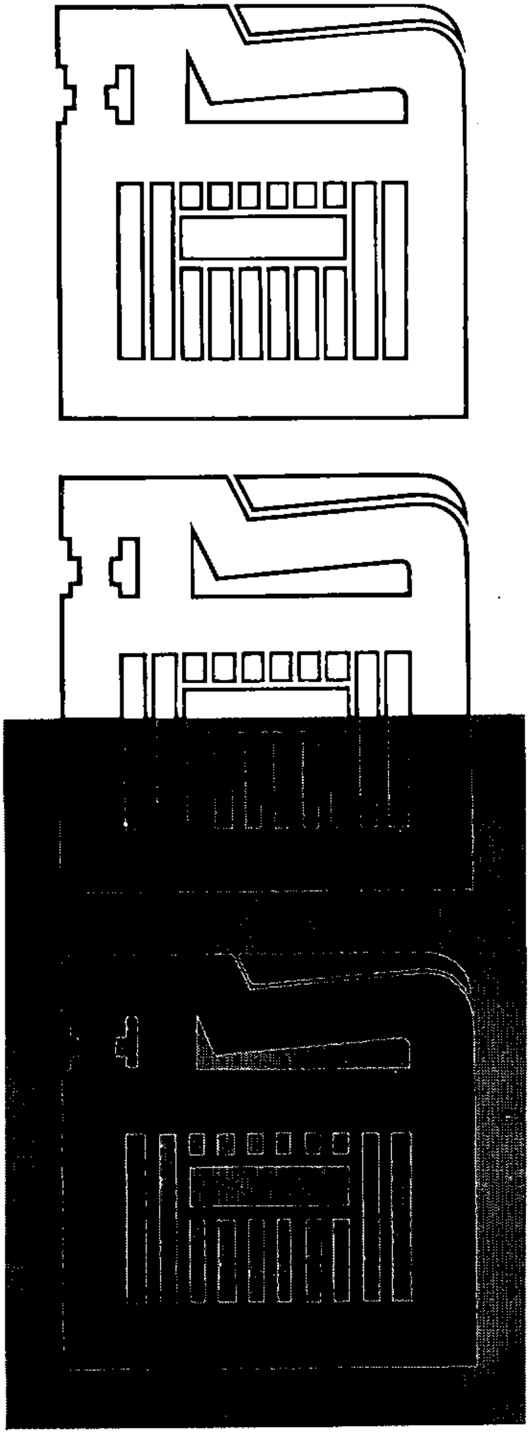
The major weakness of the book is perhaps its brevity as the sections which deal with the structure and properties of particular oxyacids tend to degenerate into a list of facts, whereas a more leisurely treatment would have made better reading.

Of more value are the last three chapters which include discussion of the polymerisation, ionisation, and stability of oxyacids.

The reviewer considers the book fulfils its purpose as a short, reasonably comprehensive review of the subject.

A number of unfortunate typographical errors were noticed in the formulae of compounds.

L. J. Porter.



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