THE TRAINING AND EMPLOYMENT OF CHEMISTS

Learning of chemistry starts in the primary school and continues for life. Where the practice of aspects of chemistry is part of one's occupation some tertiary education in the subject is required.

Chemists are employed by a wide range of organisations in both the public and private sectors Many are to be found in teaching and research, but analytical chemists are probably the biggest single group. They are required for quality control in production, for environmental monitoring, for testing biological sample in medicine, agriculture and horticulture.

Chemists in chemist shops are better called pharmacists, but chemistry is the basis of their training.

INTRODUCTION

As chemistry is the basis of all the molecular sciences it is not surprising that people who have been educated in the discipline of chemistry are found in a wide variety of occupations. By turning to the list of contributors of this book and looking at the affiliations of the more than one hundred and twenty people listed there you will see how varied the occupations are.

After discussing the training of chemists a classification of where chemists are employed is attempted in this article.

THE TRAINING OF CHEMISTS

School

Until recently there has been very little science taught in our primary school curriculum, but this deficiency has now been recognised and action taken. At this level it is important that children become aware phenomena which we would regard as chemistry and that a spirit of enquiry is developed.

In most secondary schools chemistry is not taught as a separate subject until the 6th form (15-17 year old students), it being a component of general science until then. Any real understanding of chemistry is based on the concepts of atoms, molecules and ions and students need to be of a certain age before they are ready for these more abstract ideas. However a small number of schools do offer it as a separate subject at 5th form level, and students who do this course are much more likely to achieve at the bursary level because they get a foundation of some factual and practical chemistry for which there is not time in the 6th and 7th form. The range of achievement of our 7th form chemistry students is wide and the current bursary examination does not offer a real intellectual challenge to the very best students who are so important to the future of New Zealand science and technology. The Institute of Chemistry did not support the abolition of the separate scholarship chemistry examination some years ago and strongly supports the scholarship examination run by the New Zealand Education Foundation. It is so important to stimulate, challenge and extend our students so that they develop their full potential.

Tertiary
Traditionally students could choose between a polytechnic and a university for tertiary training in chemistry. Those at the polytechnics studied for a Certificate in Science, often part time, already being in employment as trainee technicians. The polytechnics had strong ties with chemical industry and their courses were designed to give students the basic knowledge and skills required to be technicians in those industries. Analytical chemistry was the major focus. Those going to University were taught by people actively involved in chemical research, and encountered a broader range of chemical topics and ideas. Those who did post graduate degrees were actively involved in research and thus learned something of research culture.

In addition to training technicians the polytechnics also kept up to date with advances in chemical technology and ran diploma courses for both technicians and graduate employees in areas such as modern analytical techniques, surface coating and polymer technology.

In recent times things have changed markedly, with the distinction between the prime functions of the two types of institutions becoming blurred. The normal qualification from a polytechnic is now a degree rather than a certificate with relatively few students opting for straight chemistry, but choosing areas such as health or food science where basic chemistry is an important component of the curriculum. Some institutes are developing research programmes and teaching masters degrees in applied sciences. There is considerable concern that the "market forces" philosophy with open competition between the two types of institution is not in the national interest.

There has long been vigorous debate amongst industrial employers of chemisty graduates as to what they would like the universities to teach. It has been the general view of university chemists is that it is their job to give a sound training in the basic principles of chemistry at the undergraduate level, an introduction to and some experience in research at the post graduate level, and it is up to employers to train their graduates in the special areas of their industries.
Many employers concur with this approach, but some would like to see more emphasis on workplace skills.

CHEMISTS IN TEACHING

Unfortunately relatively few primary school teachers are trained in chemistry, or even science, and this has now ben recognised as a weakness in the New Zealand education system. More emphasis is now being placed on science in the curriculum for primary teacher trainees.

Until recent times those planning to be secondary teachers spent a year at a college of education (training college for an earlier generation) after graduating from a university to obtain a recognised teacher qualification. However over the last few years universities and institutes of technology have entered into teacher training in their own right, and some colleges of education have merged with universities. There is now uninhibited competion between institutions for the "teaching EFTS", i.e. students intending to be teachers.

Many secondary school teachers have a BSc or MSc with a major in chemistry, and now some with PhD's are also teaching in our secondary schools. This can only enhance the standard of chemical education in our schools, because to be a first class teacher teacher in

any subject one must have a sound understanding of the discipline one is teaching. However because teachers with degrees in chemistry usually also have considerable knowledge of physics and mathematics they are often the senior teachers of these subjects and chemistry is taught by those who have majored in biology with possibly only first year chemistry. This is not a very satisfactory situation, and the more chemistry graduates that enter into primary or secondary teaching the better it will be for this country.

Academic staff of tertiary institutions are of course also chemistry teachers.

CHEMISTS IN RESEARCH

Because many chemical industries are owned by international companies who do their development and research overseas there are few research chemists in the private sector in New Zealand. Where the private sector requires research for problems particular to New Zealand they contract it out to universities or to research institutes. Thus research chemists are mainly found in the universities or research institutes.

In universities and polytechnics

All academic staff of universities are involved in research. University chemists are not only in departments of chemistry, but in schools of biological sciences, medicine and engineering. The university chemistry departments are where most pure (blue skies) research, research undertaken for its own intellectual and curiosity value and without a recognised end use, is done in New Zealand. But the majority of the chemical research done is strategic or applied with some specific outcome in mind. Some staff in the polytechnics are also developing research activities, usually in close association with industry.

In research institutions

Until the early 1990's the Department of Scientific and Industrial Research (DSIR), comprising several research institutes, was fully financed by the government, as were research laboratories run by the Ministies of Agriculture and Fisheries, and of Forests. In addition there were other research organisations, set up and partly financed by producers or organisations.

The first of the fully government institutions was the Colonial Laboratory attached to the New Zealand Institute and Museum in the 1860's. It developed into the Dominion Laboratory in 1907 and this was a major part of the Department of Scientific and Industrial Research (DSIR) when it was established in 1926. When the DSIR was disestablished in the early 1990's the majority of chemists within the organisation were part of Chemistry Division which was centred in Lower Hutt, but which included analytical, forensic and industrial research laboratories in other centres. On disestablishment chemistry lost its individual identity and the chemists were spread amongst the newly created Crown Research Institutes (CRI's): Crop and Food Research Ltd, Institute of Environmental Science and Research Ltd (ESR), which include forensics; Institute of Geological and Nuclear Sciences Ltd; Horticulture and Food Research Institute of NZ Ltd (Hort Research); Industrial Research Ltd (IRL); Landcare Research Ltd; National Institute of Water and Atmospheric Research Ltd (NIWA); New Zealand Pastoral Agriciultural Research Ltd (AgResearch); Forest Research Institute Ltd (formally FRI, now Forest Research). Many of these have several laboratories at various locations.

Some of the research institutes outside the old DSIR such as Wheat, Meat and Forestry are now also incorporated into the new CRI's. But several others continue with control by the producers or industry: Wool Research Organisation of NZ (WRONZ); Dairy Research Institute (DRI); NZ Leather and Shoe Research Association (Inc) (Lasra); Building Research Association of New Zealand (BRANZ); Coal Research Ltd.

IN THE PRIVATE SECTOR

The majority working as practicing chemists in the private industry are involved in supervision of chemical production, analysis and quality control. Others have gone into marketing, sales and management. They give a far better quality of service than others who do not understand the products they are marketing or do not understand the science or technology of what they are managing. The private sector involves chemical industry, food industry, agriculture, horticulture, energy and service industries.

Public analysts provide a major service to many diverse organisations and people, and obviouly those employed by these companies and those in the private health sector are mainly analysts.

Chemists in chemist shops

To many of the public a chemist means the person in the dispensary of a chemist shop. These people are properly called pharmacists, pharmacy being the science of drugs. It could be argued that pharmacy is just one branch of applied chemistry, and chemistry is the basic discipline in the pharmaceutical curriculum.

IN THE PUBLIC SECTOR

Chemists are employed by government ministries and local bodies. Some are involved in research as described above, but again the majority would be involved with analysis and quality control, or would have gone on into management. This sector includes public hospitals, public water supplies, waste water and sewage, and environmental monitoring.

CONCLUSION

Chemists play an indispensable role in society, often little appreciated by the public because they are not very visible. But somewhere in the production of a processed food or manufactured article, in the provision of clean water and disposal of waste, or in the medical test for an illness a chemist has played a vital role.

People with a degree in chemistry are to be found in numerous occupations other than science and technology because they have found the education and training they received doing chemistry has endowed them with skills which can be applied to many many disciplines.

The Ministry of Research, Science and Technology has recently produced a booklet on Chemical Sciences, compiled by Professor Neil Curtis, as one of a twelve volume series on the New Zealand Knowledge Base.

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