

UnIChe



University Industry Linkages in Chemistry

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The Committee Secretary
House of Representatives
Standing Committee on Science and Innovation
R1 Suite 116
Parliament House
CANBERRA ACT 2600

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Dear Ms Cornish

**REVIEW OF THE DEPARTMENT OF EDUCATION, SCIENCE AND TRAINING ANNUAL
REPORT 2002-03
ENCOURAGING STUDENT PARTICIPATION IN THE ENABLING SCIENCES**

On behalf of the UnIChe management committee we enclose a submission addressing three issues raised in the terms of reference:

- Encouraging student participation in the enabling sciences
- Strengthening the ability of universities to generate and transfer new knowledge
- Assisting people to make effective transitions and well-informed choices about their careers

We would be glad to provide further information if requested.

Yours sincerely

Professor John White
Chairman
UnIChe Management Committee

Dr Philip Reynolds
Coordinator, UnIChe

EXECUTIVE SUMMARY

The UniCHe program (University, Industry, Chemistry) was established in response to falling student participation in the enabling sciences by the chemistry and chemical engineering departments at the Australian National University and the Universities of Newcastle and Melbourne together with an industry partner, Orica, Australia's largest chemical company, and partly funded by DEST's Science Lectureship Initiative in 2000.

In 2004, the program has new partners – the University of Queensland and more industries as well as further funding from DEST (under the Higher Education Innovation Program), industry and universities to continue and expand the successful program.

Objectives of the program:

- Attract and train the undergraduates and graduates in a way that gives them an awareness of the short and long term goals of the Australian chemical industry and an interest in a career in industrial chemistry;
- Produce able graduates with an understanding of the financial and interpersonal skills used in successful industrial management complemented by extended “field work”;
- Develop stronger links between the Australian chemical industry and sources of innovation in universities

Five key areas of activity:

1. Outreach to chemistry undergraduates including certificated summer schools, winter field trips to concentrated industrial sites, and credited advanced study courses, to provide a mechanism by which undergraduates are more likely to continue in chemistry, biotechnology and chemical engineering as well as consider careers in industry upon graduation;
2. Close involvement of Honours and postgraduate students with industry via research projects of direct economic relevance, but nevertheless of academic value. This differs from conventional graduate courses in that there are opportunities for “field work”; courses relevant to a career in industry; and a real involvement of industry staff in all aspects of the work;
3. Summer vacation employment and summer scholarships with the industrial partners;
4. The interaction of academic and industry staff for mutual benefit and national advantage.
5. School outreach to Year 11 and 12 students to promote the uptake of chemistry at university level in Victoria, regional NSW, ACT and Queensland.

With our industry partner we have established cohorts of distinction level students in the three universities, provided vacation courses in business principles, commercial and industrial practice; and identified, with the industry partner, academically exciting but, also importantly, industrially valuable research projects at Honours and PhD level. By school visits and lectures we have reached to more than 6,000 young Australians in NSW, ACT and Victoria over the last three years.

Attraction and retention of these students into and throughout undergraduate and graduate studies and the development of an “employment pipeline” to Orica and other companies is our strategic goal. We use highly targetted “top-up” scholarships and industrial placements in the long vacation as part of this strategy.

This program has been successful in recruiting bright chemistry and chemical engineering graduates into industrially-relevant research and development both within universities and the company. Enrolments in chemistry have increased at all three participating universities over the last three years. We hope to expand this program to both Western Australia and South Australia in the next phase.

ENCOURAGING STUDENT PARTICIPATION IN THE ENABLING SCIENCES

Secondary students

In two years, UniChe reached over 6,000 Year 11 and 12 chemistry students in parts of regional and suburban Australia to raise awareness and value of the many interesting career options in science, in particular chemistry, in Australia.

The mode of delivery varies according to the needs of each state, managed by a part-time school outreach coordinator based in each university.



Demonstrating the length of DNA, Dr Edie Sevick at Lake Ginnindera College, ACT

ACT and regional NSW

School outreach is achieved through school visits, presentations and dissemination of literature by young science graduates partnered with a research chemist from the Research School of Chemistry at ANU.

Victoria

UniChe funds a 'transition teaching fellow' - a qualified teacher employed by the Chemistry Department to run a program of liaison with selected high schools and related tasks.

Newcastle

UniChe augments the science faculty outreach program, which visits every school in the catchment area. UniChe provides funds to employ an assistant for the major chemistry component - 'The Magic Show'.

Queensland

UniChe links with the University of Queensland's *Bright Minds* outreach project, to strengthen the chemistry and biotechnology content of school outreach materials and resources.

Tertiary students

Honours, PhD and summer research scholarships program

In three years, an industry relevant research program of PhD and Honours students has created a more effective R & D program promoting Australian initiative and future leadership in industrial chemical development. It has become clear that Orica and academic staff between them can generate more projects than there are available students.

The Summer Research Scholarships have also been a useful and successful stepping stone for those later year undergraduate students looking for more hands-on experience in the laboratory and industry.

Undergraduate students

UnIChe's undergraduate program is targetted at high distinction students and is designed to provide them with an understanding of the different careers in chemistry in industry and chemistry as well as new skills in project management. The two main components include:

- An annual *Business of Chemical Innovation* Summer School held at Australian National University and the University of Melbourne:
- *Industrial Chemistry In Action* winter field trips to Orica's industrial sites in Newcastle



Summer School 2004, University of Melbourne

Entry to these activities is voluntary and highly competitive; based upon achieving outstanding academic results. The students are self-selected and thus highly motivated with an interest in industrial chemistry.

Over the last four years, UnIChe has run four summer schools lasting 2-3 weeks introducing business skills to 160 of the best chemistry undergraduates in the country. There have been seven winter field trips to introduce 140 undergraduates in depth to the chemical industry and an undergraduate enrichment programs at three universities for 140 elite students.

These programs have increased the links to industry from all of the universities giving the opportunity for the increased flow of high quality chemistry graduates to industry and the universities.

The research orientation in the three universities has been more closely connected to that of the industrial partner and a relationship of trust developed. Students who participate in these activities are given the opportunity to apply for vacation work as well as permanent careers with the industry partner.



*Winter field trip
Stratford coal mine, Hunter Valley, July 2004*

With the inclusion of biotechnology industry partners and the University of Queensland, UnIChe will extend both the focus, content and awareness of different industrial

technologies of the summer schools and field trips, including site visits to a new growth industry - biotechnology.

STRENGTHENING THE ABILITY OF UNIVERSITIES TO GENERATE AND TRANSFER NEW KNOWLEDGE

This project has developed a successful model for industry-academic cooperation in the chemical sector. We have developed new research directions in academic programs and product development at Orica through working closely with Orica staff. Unlike the CRCs, the absence of commercial competitors in the process enables a much more open relationship between industry and academics.

Before UniChe, academic research contacts from the three universities were only with the two Orica businesses 'Explosives' and 'Consumer Products'. They now have involved all eight Orica core businesses with 16 out of the 24 projects proposed for 2003 not involving the original two businesses. At Newcastle, in particular, the Honours program has blossomed. This is partly because of the psychological effect on the students - relevance, connection to the outside world etc., as well as the direct financial input. In 2001, 2002 and 2003, conferences of over 38 Orica technical staff and up to 19 University staff and students were held to showcase to industry the UniChe results.

With the inclusion of other industries in this interactive model, other opportunities will grow and can be directly measured through publications, student recruitment to the workforce, academic joint patents and other research innovations.

ASSISTING PEOPLE TO MAKE EFFECTIVE TRANSITIONS AND WELL-INFORMED CHOICES ABOUT THEIR CAREERS

One of UniChe's objectives is to introduce both secondary and tertiary students to the different career possibilities in chemistry.



Winter field trip 2003

Before UniChe, few university science students had the opportunity to visit research laboratories, chemical plants or understand a company's balance sheet. These opportunities allow students to meet other young professional chemists, R & D managers, plant operators, technicians and project managers and work alongside them in summer vacation work. Such experience is enormously valuable when making effective career choices.

At the secondary level, UniChe brings real-world chemistry to the schools through demonstrations, presentations and "meet the chemist" activities.