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# Two Lives Out of Nine

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This author, when writing in another context, has divided his years into *nine lives*, the number a cat is reputed to have. In this article, the author will principally cover some of two of those *lives*, the two in which engineering education was received and given, and will *inter alia* touch on other *lives* and explain the reason for selecting *nine* for the number of *lives* and its suspected relationship to the author's receiving and giving education. *Receiving* began with a trades course, and continued from that with the old-time Associateship (Diploma) from the Sydney Technical College, which led to a Bachelor of Engineering via the conversion course made available by the University of New South Wales. *Giving* began with lecturing engineering subjects at the Sydney Technical College, interrupted by attending the Master of Business Administration programme at Macquarie University, which led to lecturing management subjects to undergraduate engineering students at the University of Technology, Sydney, plus a postgraduate subject, and, in parallel with those teaching activities, the author gained a PhD at the University of New South Wales. Reflections on those experiences, and their relationship to professional work and life generally, complete the content of this article.

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## INTRODUCTION

Engineering education, at the professional level, in the Sydney region in Australia has a history of extensive development over the last 50-or-so years, extensive in that the number of opportunities has increased and the content of courses has broadened.

Looking back to the mid-1940s, there was only *one* university in Sydney, which was, appropriately, the University of Sydney. That situation continued until well into the 1950s, so anyone wanting to study law or medicine had to go there. Those who wanted to study engineering could choose between Sydney University for a Bachelor of Engineering degree in four years full-time, or the Sydney Technical College for an Associateship Diploma over five years part-time. Although the BE was recognised as a better qualification than the diploma, industry seemed to accept diplomates as being as good, in an employable sense, as BE graduates.

That period, 1940s, 1950s, 1960s, is all ancient history now, not known by the current generation, but remembered by those who went through it. What follows here covers some of that history and a comparison between it and today shows the differences and their significance.

Sydney now has six universities: the University of Sydney, the University of New South Wales (UNSW), University of Technology, Sydney (UTS), Macquarie University, Western Sydney University, with all except Macquarie offering engineering. There are more sub-disciplines and more variety of subjects from which students may choose.

But this personal record starts back in those dark ages of only one university and actually begins well before any contact with a university. As well as a personal record, it provides some history of engineering education over 56 years.

## BEFORE PROFESSIONAL STUDIES

The author's engineering education did not begin at the professional level; it started at the trades level after having completed the Leaving Certificate (now the Higher School Certificate) when he went to work as an apprentice on a five-year indenture at the Commonwealth Aircraft Corporation (CAC) engine factory at Lidcombe and was automatically enrolled in the Commonwealth Aircraft Corporation Apprentices School (CACATS) located at the factory. This resulted, quite frankly, from a combination of family circumstances (losing both parents before high school

age and misunderstanding what support guardian-grandparents could provide) and was, in retrospect, probably the wrong choice, but it led to an interesting life. Or interesting lives.

The CACATS makes a curious item of history in itself, as recorded in the personal memoir by Bill Craggs, who was CAC's Superintendent of Apprentices for most of the School's life [1]. It began during the World War II to provide training for the factory's apprentices, who were in a difficult situation because the factory operated three shifts working 12 hours through six days, then three days off, and no arrangements had been made for apprentices to attend trades classes. In 1942, Bill was given the task of investigating how to train the apprentices in metal machining and, when he found Sydney Technical College could not take them for a variety of reasons, he set about opening a trades school in the factory.

By the time the author arrived in 1946, the war had finished. In the few years since 1942, Bill had set up three classrooms and a machine shop, four teachers, a syllabus at least equal to that of the Sydney Technical College, and that College's acceptance that a certificate from the CACATS was as good as the College's own Trades Certificate. During the war, the apprentices worked two weeks in the factory and attended the school full-time in the third, by the time this author arrived the war was over, so shift work had ended, and apprentices worked alternate weeks in the factory and in the school for three years.

That brief review gives a lead-up to a significant feature of Bill's education policy. He had, before going to the CAC, taught at the Technical College at Wollongong and, among the reasons why he left, there was his disagreement with being told to teach the boys *how to do their job*; he believed they had to be told also *why they were doing it that way*, and he could not convince his seniors that was necessary. At the CACATS, he made sure *why* was given as well as *how*, and the author believes that philosophy was impressed strongly as part of the education process he received.

In addition to having the teachers present all the normal trades subjects, Bill gave a series of lectures on management, which became very useful years later. As a further example of using a different approach to trades education, he provided an hour in the school week for playing chess – he believed that helped as a mental exercise, paralleling the half hour of physical exercise that started every school day.

Did that early basic-engineering education have a later value? The author suspects it was a valuable lead-up to professional life by providing insight into

how physical engineering work is performed, but he is unable to find a definitive and satisfying answer to that question.

## EARLY PROFESSIONAL EDUCATION TO ASTC

For some reason now beyond identification, the author decided in 1946 to enrol in the Associateship Diploma at the Sydney Technical College, to work through that at the same time as doing the Trades Course at the CACATS. There was logic in that; he was attending the CACATS every second week for only three years, working in the factory between those weeks, and, therefore, he should be able to cover both, even though the Diploma was a part-time course requiring up to four nights lecture attendance per week. The result was disastrous, he found the logic did not apply; he was unable to cope with the combined learning load coupled with the evening lectures, which was a serious disappointment because at least two other apprentices succeeded where he could not. So he dropped out of the Diploma programme, finished the Trades Course in 1948, and went back to re-enrol at the Sydney Technical College in early 1949.

However, in the meantime, the author had made a change in his travel arrangements. Getting from his home to the CAC by public transport was long, slow, tedious and time-consuming for a 7:00 am start in the factory weeks and equally, although on a different time base, for an 8:30 am start in the school weeks. The problem was the lack of combination of geography and public transport connections, so he began travelling by pushbike, a few miles of effort but much quicker than by public transport. By 1947, he had had enough of the physical effort and decided to buy a motorcycle, which many other apprentices had, with the added advantage of greater mobility for other travel, as well as to and from work.

In September 1949, while repeating Stage 1 of the Diploma programme, he met a drunk driver, who was at the wheel of a prime-mover, and who turned right while the author was overtaking. He saw the vehicle's right front wheel turn towards him, he accelerated to get past, and nearly cleared the front of his vehicle. But nearly was not enough, and the end of the vehicle's front fender clipped his left leg as he passed, breaking both bones. He had six weeks in hospital, came out three weeks before the final examinations, sat for them all, and passed every one (probably, he is prepared to confess, because he had six weeks of rest, being waited on in hospital and three undisturbed weeks at home to study).

Now we come to the *nine lives* to which the

author referred to earlier. He considers that accident *used up one life*, just as a cat is said to have *used up* a life when caught in a difficult and threatening position and, like a cat after receiving a warning, he made some attitude changes. He is much more careful now, avoiding events such as getting the tail caught in the door – or his leg hit by a truck fender. Or any other similar experience.

The connection between that accident and the life (parts) in which he has received and given education is more difficult to explain, but he believes it goes like this: first, if he had not been injured he would, he thinks, looking back, have very probably failed the examinations at the end of 1949, and would then, also very probably or more so, not have continued with the Diploma course. Second, he believes the experience of being nearly run over by a large vehicle has had the trauma-effect often described by many others after a life-threatening experience, life is now much more valuable and a much more serious business, and has resulted in an urge to keep pushing himself onward, which led to further education.

That change of attitude showed in 1950 by his re-enrolling in the second year, walking with crutches and travelling by public transport. But, after a few weeks of lectures, he was put back into hospital for eight weeks, then another six weeks, before the doctors were satisfied the broken bones were joining together, so that cancelled progress for that year. He re-enrolled in second year again in 1951 after about a week of re-learning to walk and continued through to finish the Associateship Diploma at the end of 1955. The five-year programme took six years, a not uncommon figure for College Diplomates, if one does not count the false start in 1946 and the lost 1950 year.

During that conversion course period, he left the CAC in 1954 to take a position as a draftsman with a moderately large chemical manufacturing firm, starting the pattern of employment for the next 30 years.

## PROGRESS TO BE

By 1953, the University of New South Wales existed and all Diploma students were nominally enrolled in the UNSW to add up enough numbers to make the new University legal. At that time, the UNSW was also offering a three-year conversion course to take ASTC graduates through to a BE, and it seemed eminently logical to take that course, particularly as he was able to start it in the same year, 1955, as he was finishing a hangover subject from the Diploma. There was, also, an uneasy feeling in the minds of some diplomates that the now-easy access to a BE would diminish and depreciate the value of the ASTC, so

quite a few enrolled in 1955 for the conversion course.

The author finished the BE conversion-course lecture series in 1957, then had a three-year struggle with a project, first drawing a dud, then trying to find one, then succeeding, getting equipment (some donated by industry) in a period of reduced funding, then doing the work. It all finished in 1961, and he graduated in 1962. Providing proof that there is life outside education, his wife and two children attended graduation with him.

## FIRST POSTGRADUATE PROGRAMME: MBA

Through the final years of the BE programme, the author was working with a small chemical company and left there after graduation, going to another small firm for two years, then another for four years, in positions that included projects and maintenance, all firms using batch processes. After that, in 1966, he hit an employment jackpot, a position with Imperial Chemical Industries Australia and New Zealand (ICI ANZ), which introduced him to continuous processing, a lot of very interesting engineering and many management systems unheard of in small firms. The four years with the ICI ANZ were a really valuable learning experience in industry.

He enjoyed the ICI ANZ engineering experience very much, but what caught his attention was the management systems, particularly what he picked up from the occasional courses the company ran internally. The information from those courses made him want to know more about *how* management worked and, thinking back to that very early post-high-school education, *why* management worked as it did. Where could he go?

He had heard of Macquarie University, which had opened its Master of Business Administration in the early 1970s. He investigated the programme of study, it looked interesting and worthwhile, and it would be only three years (merely a trivial period after having put 12 years into getting a BE), so he sat for the Princeton Test, passed it and enrolled to start in 1973.

That was right at the time that the ICI ANZ had run into some operating problems, related, he now assumes, to cash flow or similar, and the firm reduced staff numbers vigorously. In 1972-1973, he went through a couple of short-term employments, one as a plant operator on shift in a chemical factory, finally becoming engineering manager of a medium-sized chemical manufacturer.

The MBA turned out to be a very hard programme, with a 50% dropout rate, most during the first year. He came close to failing more than once, had to

repeat one subject (*Financial Management*) and, as an example of how some subjects have been retained (or otherwise), he must say that, although he has a vague feel for what is involved in statistics, he still has no idea how to work statistical mathematics; if he wants a standard deviation, he uses a calculator. Other aspects of management appealed much more strongly and he understands them much better.

Macquarie was very concerned about quality of graduates, and in addition to those who dropped out, some students were *persuaded* to finish at the end of the second year, with a diploma, rather than a Master's degree. He finished in the standard three years (amazing, after his earlier performance, he thinks he had finally learned how to learn). His wife and two (now teen-aged) children were with him at graduation in 1976.

An unfortunate effect followed from graduating with an MBA: he was keen to apply as much as possible of what he had learned, and being at that time the engineering manager of a medium-sized chemical company, he introduced systems into his department to improve recording, and hence understanding, of what was happening in the department's work, generally maintenance and projects. One aspect of this was introducing an *efficiency competition* between the engineering sections at the two separate sites the company operated in Sydney.

But he became both cynically critical and critically cynical, plus very dissatisfied, with the management behaviour of senior managers above him. Looking back, he thinks that was visible to some, and he thinks they did not like it. In addition to that, he had become weary of *being a manager*, having to direct, push, persuade and wheedle people into doing what they should know they should do. This lack of work-related satisfaction was a factor leading to his leaving positions in industry in 1979, ending *one life*, to take up consulting work (another *life*) for four or five years, which led to becoming an academic (yet another *life*), more of which here in due course.

## SECOND POSTGRADUATE PROGRAMME: PHD

Having moved into full-time academic life in 1985 at what has become the University of Technology, Sydney, after a part-time period in 1984 (detailed in a later section), he came to realise the importance of having the honorific *Doctor*. That impression was emphasised by the department secretary telling him in a hushed voice that Doctor Werner (naming the President of the Institute, as it was in those days) *has a thing about PhDs*, and there was no hope of getting

promoted without that qualification. So he went looking for a topic for a thesis, and thought up a topic that had something to do with engineers as managers, but by now details of that unsuccessful topic have faded into obscurity.

His attempt to enrol in a PhD programme at Macquarie, with that now-forgotten topic, was equally unsuccessful, but he learned a few things from trying to get Macquarie interested. One came from being asked: *What is your thesis?* In a flash of rarely-experienced inspiration, he realised what the document termed *a thesis* really is: it is built on a *thesis*, which is a proposition to be proved or disproved and, in parallel, he realised what he was proposing was really an investigative *project*, which is not the same. The other item learned was that a PhD should be about something no-one else has done, the finally-written thesis should be about something *novel*.

So more thought went into the problem of getting enrolled in a programme, which led to another inspiration, a sudden thought that he had never come across anything relating management to accident occurrences. He spent a few hours skimming through management literature and became convinced he was onto something new, so he dashed off a proposal based on this relationship. He restricted it to the chemical industry because he knew it well from working in it for so many years, and because that industry has had some serious accidents caused by the materials and processes used.

He had found out that the UNSW had a Centre for Safety Science and, as his new idea seemed to fit into that name, he contacted the Centre with the proposal, which was accepted in 1988 with a slight hitch: the Head of the Centre was keen on ergonomics and wanted his work to slant in that direction, which did not suit the author at all, so he ignored the hint and the Head of the Centre forgot it. Also, conveniently, he retired. However, his appointed research supervisor was also strong on ergonomics, with no background in engineering and management, which introduced some difficulties in explaining details, but that supervisor did teach how to write in the classic academic style.

Regarding ergonomics, the author must add here that he does not regard that subject as unimportant, in fact he believes it is a very vital component of the general occupational health and safety (OHS) regime. But his interest, in relation to the chemical industry, was with what is termed *process safety*, keeping the materials and processes under control, not allowing those dangerous *beasts* to escape from their cages to injure people and damage property. The more *ordinary* and *normal* OHS problems do occur in industry, and are much more frequent than the

process safety incidents (which is just as well), but occur less often than in some other industries.

The work involved designing a survey to test the relationship between management practices and the possibility (and probability) of process safety accidents, then taking it to over 60 firms, about half of which replied. He found, summing up briefly, that large firms had the potential for serious events, but had adequate management systems; however, in small firms there was a low potential for serious accidents, but relatively poor management systems. He admits to a sense of pleasurable justification when one small firm that distilled solvents, which he had classed as an extreme risk, was destroyed by a major fire soon after his graduation. Just to show how process safety is ridden by chance, a larger firm, which he classified as reasonably low risk from its materials and processes, also had a major fire, but that had started in, and grew from, packaging materials.

He finished the work in autumn 1994 and delivered the copies to the office in the Chancellery in June, and waited months for the overseas people he nominated as examiners to reply. They did, with reasonably favourable comments. Then he had a sabbatical semester in autumn 1995, which took him to work in an English university, but he came back for the graduation ceremony at the UNSW in April 1995, then returned to England to complete work there. Illustrating the march of time, his son was on the platform, with other members of staff, at the graduation.

A summary note must be made here. All those professional-level courses were taken part-time, ASTC, BE, MBA and PhD, a total of nearly 20 years of coursework, while working through about 45 years of full-time employment. A totally ridiculous effort, more than twice the number of years of full-time study. Why? He can only refer back to his remarks about the effect of nearly getting killed in that road accident, which seems to *have done something*. The irony of that personal education history is, it now seems, that he may be indebted to that drunk truck driver for the impetus to carry on after early failure.

That completes the process of receiving education. What follows next is the author's experiences in giving education to others.

## THERMODYNAMICS WITH THE TECHNICAL COLLEGE

Going back a few years to 1962, when after graduating from the BE conversion course at the UNSW, the author was working in a small chemical company and faced a dual problem: he needed more income and wanted a new world to conquer. This duality was

solved by his responding to an advertisement by Sydney Technical College for part-time teachers in the Engineering Certificate programme and being accepted to teach first-level thermodynamics (they titled the subject *Applied Heat 1*) at the North Sydney campus, which provided extra income and opened that new world (or life). The location suited him geographically and the one-night-per-week outing disturbed family life very little.

So began some ten years of part-time teaching, growing into taking on the follow-on subject, *Applied Heat 2*, as well as *Applied Heat 1*, and only stopping when he enrolled at Macquarie for the MBA. The subject, and the later one, suited the author very well, he had developed a good understanding of the similar but more advanced BE subjects, and working in the chemical industry gave him insights into how heat can be used, how it flows downhill and can be pushed uphill, and so on.

So he enjoyed teaching these subjects, only displeased by the rather high failure rate he had in the first couple of years. He discussed that with the senior member of the staff to whom he reported, and the senior lecturer said that such figures were *not unusual*, they reflected the difficulties part-time students have attending lectures and trying to study while near dead beat after a working day, with many having a family. Was that familiar? The author knew what he was talking about and resolved to get more students through the subject, so he told the senior lecturer what different teaching method he wanted to use and received approval to try it.

The following year, he changed the way he managed the subject. He began the year by telling the class how he was going to cover the subject; instead of spreading the content over the whole year, he would run through the whole syllabus in the first half year, then spend the second half working problems, typical examination-style problems, with them. The result was astonishing (and very gratifying), the pass level rose from somewhere in around 60% to well over 90%, perhaps demonstrating the adage that *practice makes perfect*.

Soon after that first year of the new system, he collected the subject's examination papers from the previous 10 years or more and analysed the way questions appeared. This showed there was, generally, a cycle of questions and question styles, and he became fairly good at predicting more than half of what would appear in the year-end final paper. Needless to say, this also helped students, but the most significant factor in the improved pass rate was the teaching method.

This became an even more enjoyable period, for several reasons; there was success in what he was

doing, he had a real feel for the subject, he liked what he was teaching and he believed he was giving something to the next generation of engineers. It could have continued for longer, but he succumbed to the temptation to learn more and something different: management, as noted above by his enrolling at Macquarie in 1972, to start in 1973.

Near the end of 1972, he had been warned, by a new senior lecturer, there was a budget-tightening in the College and he might not be wanted in 1973. However, in 1973, he was invited to take a class for one subject at Ultimo, and he did a few weeks while also attending classes at Macquarie. Could he have kept up this double act? Frankly, he now doubts it, and he was modestly grateful (although almost too tired to register any feeling) when he was told his class was too small and would be combined with another under a different full-time teacher, so he was not wanted.

In 1982, quite a few years after finishing the MBA, he had a phone call from the senior lecturer with whom he had worked in the 1960s and 1970s; the senior lecturer invited him to come back to the same subjects, which he took for three years.

He was not conscious, through those years of teaching, of applying Bill Craggs' *why* in parallel with *how*, but looking back, the author believes he applied that in his coverage of the concept of entropy, which is a devilishly-constructed figment of imagination able to confuse students. In the revised method of teaching, he gave students the definition, then went straight on to how it is used in a temperature-entropy diagram, in parallel with the pressure-volume diagram, to analyse engine thermodynamic cycles. He explained to students that to understand what is going on in each cycle, there is no need to calculate entropy values, only to sketch the two diagrams beside each other. He found the engineering minds responded readily to this pictorial presentation, confirming his long-held belief that we engineers think in pictures, particularly mechanical (whom he was teaching) and civil engineers.

## ENGINEERING MANAGEMENT WITH THE UTS

In early 1984, he saw an advertisement for part-time lecturers in the Faculty of Engineering at the Institute of Technology. This was significant because consulting work, taken up in 1979, was becoming thin, so he phoned the School of Mechanical Engineering, conversed with a fellow with a very deliberate, careful, way of speaking, who seemed to hedge for several minutes before he finally asked if the author could teach management. He assured the fellow he could, was invited to come in, and he was immediately thrust

into a classroom to assist a visiting American lecturer with a subject titled *Engineering Management*. His part became adding a bit to the lecturer's talking, running around with the audiovisual equipment, grading papers, and so on. These activities, plus the part-time teaching at the College and some miscellaneous consulting work, maintained income for six months or so.

In the middle of the year, the visiting American decided to go home, and the author was dropped into teaching that subject personally through the second half of the year, the spring semester. During this time, he followed, substantially, the programme he had observed while assisting the American during the autumn semester.

Two realisation-events, unrelated, marked that half-year. The first was his own realisation that students were getting nothing more than information from his teaching, which displeased him because he had become addicted to feeling students were enjoying his subjects. The second was someone realising there would be some advantage in moving him to a full-time position. That second item led to an advertisement being placed, replies (including from the author) being assessed, interviews being held and, for the second time, he was appointed to a position in a manner on which bookies would have placed very short odds (the other occasion was his appointment as plant manager of a factory, years earlier).

Observing the first item above led to his concluding that the way he had been taught management in the MBA programme, and the way management is presented in the general management texts, does not suit the *engineering mind* (however one might describe that, in left-brain/right-brain terms, or any other quality), particularly the minds of undergraduate engineers. So he set about reshaping a subject, second time for that action, too. He decided that, as engineering was founded, to a great extent, on mathematics, so teaching engineering management should follow a similar path, and these classes should get *management mathematics* early in the subject, rather than later, as it had been. And what are those mathematics? About money, of course.

He began the next semester with a general introduction to the subject, followed by a lecture about people, then two lectures on decisions separated by a lecture on money, that is, financial management. All the *usual* management material about planning, organising, leading and controlling followed. In framing the subject, he fell back on some of what was in Bill Craggs' lectures on management, remembered after over 30 years, that management is to do with *resources*, men, materials and machines, to which he added money, so that the lecture on money was titled

*The Wealth Resource*, and so on.

Having found the general management texts did not suit the students, he began writing and distributing notes based on the week's lecture, but did a final revision of the week *after* the lecture and handed out the copies during the *next* week, a scheme that made sure students listened instead of just reading the notes. After a couple of years, he suddenly realised *he was writing a book*, so he cleaned up all the notes, put them together and had it run off by the printing department. Hundreds of students bought that first edition through the years up to when he took a sabbatical semester and revised it into a second edition, which also sold very well.

The other feature he introduced was a weekly decision-making assignment, based on the case study handed out at the end of each lecture. Case studies are an essential part of any MBA-style management programme, so he decided they should be introduced into engineering management too. In the first year, he used cases out of texts from his MBA years, but he found they, too, did not suit engineering students, so he tried writing what developed into *engineering management short stories*. These developed further into each semester's serial cases forming a continuing short-novel story, each case following from the previous one. After using the first of these, a student asked at the end of the semester: *What happens next?* The author told him to come back next semester and find out (the student said that as much as he had enjoyed the subject, he preferred to accept his grade and move on). But that conversation committed the author to write a sequel series of serial cases, then another, and more; 11 series in all.

This was the most enormous fun for the author. Engineering management became *his* subject, attracting students from other schools including nursing. It eclipsed the tedium of teaching the subject *Communication*, exceeded what came from *Technological Change* (a Master's level subject), gave material for several conference papers, and became the source of a future development.

## OTHER SUBJECTS AT THE UTS

Some of the other subjects taught at the UTS have been mentioned above, but there were actually more. The first was *Communication*, which he taught for 10 years. This was given to mechanical engineering students to improve their writing and speaking, generally necessary, particularly with younger students. The work was reasonably successful; students appeared to come out of the subject more able to write a sensible report and an attractive application letter, and they

showed more confidence in standing up and talking to an audience about anything.

Then there was *Thermodynamics*, which was not as successful as at the College, but that was only for one semester.

*Technological Change* was an intriguing subject in the Master of Engineering Management programme, he was given no syllabus or course outline, and developed a series of themes centred on the causes and effects of invention and innovation, and how and why social and economic change follows technological change.

*Literature and Society* was actually a humanities subject, which he picked up after returning from the 1995 sabbatical. When he returned from England, he found the lecturer with whom he had developed the *Communication* subject, had frozen him out of it, so he looked for something to fill the gap, and a chat with the Dean of Humanities resulted in that Faculty becoming interested in making a branch-subject, *Literature and Society (Science Fiction)*. All engineering students had to take at least one humanities subject, and this one became sufficiently popular to run for several semesters. Some emphasis, of course, was given to technology aspects, to suit the engineering minds, but many of the short stories written as assignments were not based on a technical feature – he recalls with delight, for example, an outrageously humorous satire about a towering university written by an engineering student.

The *Project* subject, in the final year, gave opportunities to have students explore management issues, for example *management ethics* by one, and to carry on some extension of his own research, for example, one student checked over all the hazardous sites in the Sydney region, and a duo of students compared the regulations in three countries, Australia, the USA and England, which (intended to) control process safety.

## OVERSEAS TEACHING

The 1995 autumn semester sabbatical was based with the Department of Chemical Engineering at the University of Bradford in Yorkshire, where he assisted a lecturer in process safety and took a series of classes on industrial safety management.

On the way home for graduation, he visited the University of Southern California, which, at the time, had a department similar to the UNSW's *Safety Science*, and presented a lecture based on his research work to a Master's class.

In the late 1990s, the UTS developed an engineering course in Singapore through an education facility there,

and he went to that city three times to teach engineering management as a three-week intensive subject. He had given that subject as an intensive course three times in Sydney, covering everything in two weeks, so he knew how to get through everything, but there was sufficient of a language problem in Singapore (even though English is spoken) to make teaching difficult.

## WORKING AS A CONSULTANT

The author has mentioned above that he left industry in 1979. He became a one-person consulting firm, although with the looser taxation system of the time, he was able to make his wife and children fellow directors and to split the company income four ways. There were some four years of good income, but he had no holidays while moving from one job to another, doing interesting work but finding it very demanding.

There were several jobs he would describe as the highlights of the time. One was working on one of the Kingfish platforms in Bass Strait; it was being strengthened to make sure (or surer) that it could withstand the worst Bass Strait weather after a wave 33-metre crest-to-trough came over the platform, and a lot of piping had to be moved to allow drilling down through the corner legs. Another was designing and supervising the building of a small chemical plant out in the southwest suburbs. This was all engineering work, a mixture of the design of certain items, such as structures and pipe layouts, investigation, filling in for others, all sorts of jobs.

Then, in late 1983, the economy seemed to cool down and job opportunities reduced considerably, giving a break over the New Year. That had much to do with the author joining the UTS in 1984.

The really interesting consulting work came after joining the UTS, where he met the people who ran Insearch, a UTS internal section that hired out staff to outside organisations requiring particular expertise. He told them of his interest, which was related to his research in accidents, and was hired out to law firms as an expert witness, usually defending a firm being sued by someone injured, most of them negligence cases, for example, one was when a worker in a wood-working firm was injured using a planer. But he also covered some prosecution cases, such as when a young girl was injured by a machine, for which he wrote the report when the firm was sued for damages. He wrote two notable fire reports, one caused by static electricity and one in which a vegetable oil self-ignited; in both of those he drew on knowledge from having worked in the chemical industry. He also did some similar work for Unisearch, a similar section in the UNSW, for example, an LPG fire in which the

occupant of a flat was severely injured.

This class of work also cooled down in about 2003 when the State Government under Carr limited what could be claimed in negligence cases. By now, it has just about faded out.

There was experience value in both types of consulting work. The engineering work exposed him to the commercial side of engineering, as well as to types of engineering work not previously encountered. The expert witness work exposed him to the legal system, incidentally making use of a subject in the MBA programme of years before, and of knowledge picked up during the author's doctoral research.

## PUBLICATIONS

The author discovered the phrase *publish or perish!* very early and, in fact, he had three short articles printed in the McGraw-Hill publication *Power*, and had presented two papers on engineering maintenance before he became an academic. But once at the UTS, he found many ideas he could develop into scholarly (well, *reasonably* scholarly) papers.

How these ideas arrived is a mystery and, as an interesting example, he cites the mental connection he made between an item in general reading and an investigation he performed. There was a brief note in the media of the *Port Chicago Mutiny*, which followed a munitions explosion in the 1940s, mentioning a lack of adequate training as a contributing factor for what happened. His investigation was about the fire in a prison paint store, for which lack of training (or complete ignorance) was similarly a factor. How the mind suddenly put these two together cannot be explained, but that happened and the paper developed by relating the two incidents to each other, one historic overseas and one recent local, pointing out the similarities, and using those features to stress that training in hazardous situations is vitally important.

By now, the author can add up 119 papers, which he divided into five groups: education (42), safety, accidents and risk (27), professional engineering practice (14), management (11) and fun and games (15). The process of selecting a category is, actually, quite difficult; there is considerable overlap between the categories. He must point out that the last group has been given that odd title because it is used to hold some critical, explorative and speculative papers that, in some cases, attack established dogma, some seriously, some humorously (which can be more scathing than a straightforward attack).

Among his publications, he also lists his engineering management case studies, written as assignments for

students through the 1990s, each used more than once, with some revision and improvement, 11 series altogether (some improvements in plot and details have come from student comments). One reason for developing so many was to prevent students from borrowing assignment answers from the prior semester's students, a practice well-established in other, more numerical subjects. Such handing-down did not work in his management subject because the next semester's students would find events in his fictitious factory had moved on from last semester and a completely different scenario was delivered to them.

The author has questioned and pondered over why he has written so much and enjoys writing as he does. The reason may be related to broad experience, including that period as a tradesman. It may be due to a desire to be creative. It may be just being *lucky* in getting the ideas. Another factor is his physical disability, not a serious one, from the injury years ago, but one which makes running, walking up and down stairs, and similar mobile activities difficult, and, as such, has limited his being involved in many of the usual sports. Perhaps, therefore, he has taken up writing, papers and fiction, as a *desktop sport*?

Summing up the publication game, he has enjoyed every word churned out, it is another *fun*, this one in academic and retirement *lives*.

## FUTURE PLANS

There seems to be a measure of impudence for someone approaching the end of the eighth decade of life to write, or talk, about future plans, intentions, proposals, even hopes, but given such an invitation, the temptation to respond is just irresistible.

The author plans to continue writing for as long as the ideas come to him. For example, he has five ideas for conference and journal papers available for this year, and thoughts are already floating in the back of his mind of what he might write next year.

He also plans to publish the novelised versions of his management case studies, one of which is very nearly ready to go and one half-ready. Many novels have been published about doctors and lawyers, why not one about engineers?

He would like, he stresses *like*, to find the means or opportunity to apply his research linking management practices to the propensity for process safety accidents. But no-one seems to be interested. There have been very few serious events in Australia, nowhere near as many or as serious as those that have happened in England and the USA. When Esso had the major fire at the Longford gas plant, he thought interest would be awakened, but Australians seem to

have settled back in the *lucky country*, *she'll be right* attitude.

Otherwise, a fairly quiet life.

## SUMMARY AND CONCLUSIONS

The author has said many times in the past that he has enjoyed most of his work, and what has always seemed wrong about it is he has actually been paid for the jobs he has been filling. There have been bad patches in the time in industry, he has been retrenched once, he once left a firm intentionally but left behind a very upset managing director (who vindictively tried to make trouble for the author at his next place of employment) and he has manipulated a boss to fire him once because that gave a higher payout than if he had just resigned. But the work in industry was interesting and often exciting, and now the sad observation is that several of the factories in which he has worked, in which he has built working sections, have been demolished.

University life has much to recommend it, and although there was much to enjoy, he must say there were disagreeable features; he was left on contract for a long time before getting tenure, the lecturer who set the thermodynamics examination paper did not tell him what to cover in lectures, which meant his students were faced with an examination paper with one or two incomprehensible questions, one Head of School tried to force him and two others out, another lecturer failed a promise made when he went on sabbatical in 1995, nine applications for promotion to senior lecturer were unsuccessful, even though every imposed criteria were met, the new Dean tried to bribe him into retiring, there was evidence that other lecturers at another School were jealous of his success with management and wanted to take over the subject, there was a general ducking for cover and denying certain remarks had been made about him during his last half year and, through 2000, he had very little teaching to do. Finally, in 2001, he asked himself: *What am I doing here?* and he retired. The last straw was the Faculty's neglect of a very personal matter in 2003, and he has not been back to the UTS since that happened.

The sense of achievement has come from several directions. One has been going through positions in industry from apprentice, the bottom level in engineering, to factory management. Another has been going through the engineering education process from a similar low level to a doctorate. There is the pleasure of knowing that there are some hundreds of graduates *out there* to whose education he has contributed. And there is the further pleasurable sense of achievement

that comes from finding ideas that, when put into words and coupled with an expenditure of time and energy, make a contribution to engineering, management and engineering management.

## REFERENCE

1. Craggs, W.T., *My Life Story*. Self-published by W.T. Craggs.

## BIOGRAPHY



Ronald Bentley Ward was born in Sydney, New South Wales, Australia, on 6 October 1928. He attended early schools in the inner suburbs, then Sydney Technical High School, still recognised as the one for engineers and scientists, which was in the 1940s located close to the city, now in a southern

suburb. After passing the Leaving Certificate in 1945, he worked as an apprentice, then as a tradesman toolmaker, at Commonwealth Aircraft Corporation from 1946 to 1954, then moved from aircraft engine manufacture to chemicals and working with several firms in engineering positions up to 1979, when he opened his own consulting firm, specialising in project management. In 1984, he became a lecturer at the

New South Wales Institute of Technology, which became the University of Technology, Sydney (UTS). He retired from that position in 2001.

While working in industry, he completed a trades course in fitting and machining, the Associateship Diploma (Mechanical Engineering) at the Sydney Technical College, a Bachelor of Engineering at the University of New South Wales (UNSW), and a Master of Business Administration at Macquarie University. During his years at the UTS, he returned to the UNSW to research a thesis on the relationship between hazards and management practices in the chemical industry and was awarded the degree of Doctor of Philosophy in 1995.

He has published two textbooks, one on communication, the other on engineering management, and well over 100 papers on education, engineering, accidents, management and speculative topics, over 100 expert witness reports, a series of fictional case studies and two as-yet-unpublished novels. All of these exemplify his interest in engineering as a profession, and the need for a broad education at the undergraduate level, where management topics should be included and presented in a manner to suit those students.

He has lived in Sydney suburbs all his life, and travelled interstate and overseas many times to conferences.

He has maintained his connection with engineering education by continuing to write and publish, and by having been accepted in 1998 as a Visiting Fellow in the Faculty of Engineering of the UNSW.