Gavan Edmund Rosman (1934–2022)

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Abstract: Gavan Rosman was valued at the Telecom (later Telstra) Research Laboratories, Australia, for his expertise as a research engineer in radio and coaxial cable technologies and, in particular, for his pioneering work on optical fibre technologies. He was also valued for his wide-ranging intellect and gentle, satirical sense of humour. His fluency in speaking Japanese was appreciated by visiting Japanese researchers. In retirement from TRL, he worked at Optiscan Imaging in Melbourne on developing an optical endoscope.

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Figure 1. Gavan and Beth Rosman

Gavan Rosman was born on 16 October 1934 in Fairfield, Melbourne. He was the eldest of five sons and spent much of his early life in the suburb of Malvern. His father worked for a catering firm; then, from 1950, both parents ran several mixed businesses (milk bars) in Waverley Road, Malvern Road and in Mordialloc, finally moving to Burke Road, Caulfield. All five boys attended De La Salle College in Malvern. During his childhood, Gavan became fascinated with radios and with radio transmission, which led to the start of a splendid career.

After matriculating in 1952, he won a cadetship with the Postmaster General's Department (PMG), enabling him to study electrical engineering at the University of Melbourne, beginning in 1953. He graduated in 1956 as a Bachelor of Engineering (Electrical). That same year, he built a small 5" (12.7 cm) television so that his family could watch the Melbourne Olympic Games.

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Early Research and Family Life

In 1957, the PMG assigned him to work in their Research Laboratories (later Telecom Research Labs, and even later Telstra Research Labs), initially on radio transmission and aerial design. His initial work was to assess the performance of point-to-point microwave radio systems, via a mix of measurement and analysis. This included investigating the effect of ground-wave interference for different antenna heights, and the refraction of microwave beams due to the atmospheric temperature and humidity gradients. Such complex problems were analysed with the crude computation tools of the day: a desktop mechanical calculator and a slide rule.

As a diversion, for the Royal Visit in 1963, a need arose to transmit TV signals between Melbourne and Adelaide. This was made possible by arranging for an aircraft, carrying a pair of VHF TV receivers and transmitters, to position itself between the two cities for some hours each day. Gavan was involved with propagation and interference calculations to determine the optimal flight altitude profiles for the aircraft carrying the airborne repeater to fly each day.

In 1963, he won a scholarship from the Japanese government to spend a year in the Electrical Communications Laboratory of the Nippon Telephone and Telegraph (NTT) company, where he contributed to developing radio links between the southern island of Kyushu and Okinawa. He was particularly impressed that Japanese researchers and their projects of the day had a long-term focus, with application horizons of 10 years and more, rather than the more immediate one-to-three-year focus common in Australia. Keeping in mind longer term trends and their benefits were to become a feature of his own work, and his guidance to his teams, throughout his career. This period of Gavan's life also led to an enduring interest in Japanese culture, especially in the Japanese language in which he became very proficient.

Upon returning to Melbourne in 1964, he resumed his career with the PMG Research Labs. In 1969, he married Beth Clover who had come over from Perth, and they settled in a flat in St Kilda, which he had already purchased, known as Rocklea Gardens.

At this time, Gavan was also developing a keen interest in another mode of electromagnetic transmission, long-range coaxial cable. It became the dominant mode of broadband cable transmission from about 1960 until 1980. In 1970, he submitted several of his research papers on coaxial cable performance to the University of Melbourne, for which he was awarded the degree of Master of Engineering. The outcome of this work (for what became Telcom Australia in 1975 and Telstra in 1991) was improved cable design, installation precautions, and termination methods.

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In 1970, Gavan took leave from the PMG to broaden his industrial experience. He and Beth moved to England where he continued his work on cable transmission with the British Post Office. Their first son, Carl, was born in England in 1971. Later that year, the family returned to Melbourne where their second son, Stephen, was born in 1972. Soon afterwards, the family moved to Upwey in the Dandenong ranges where both sons attended community schools. It was quite a joyful time in their lives. The next and final move was back to Melbourne, settling down in Camberwell.

The Advent of Optical Fibre

In the 1970s a new form of cable transmission had emerged from many early investigations into the production of light beams and their propagation through glass fibres. However, fibre losses in the early 1970s were prohibitive at 100 db and more per km. CSIRO developed a liquid-filled fibre with vastly lower losses, and Gavan put together a demonstration of TV transmission over this fibre. This involved a few hundred metres of the fibre, an analog TV transmitter using an infrared light emitting diode source, and a low noise optical receiver. This created considerable excitement at the time.

By the early 1970s, Gavan was leading the Visual Communications Section at TRL, looking at new techniques for the efficient transmission and processing of TV images, and wider applications of TV beyond "just entertainment". Digital coding of a TV signal to compress its transmission requirements was one such activity. However, the digital circuit technology of the day meant that the Section's coding demonstration system involved many hundred TTL logic ICs (integrated circuits) spread across about two dozen circuit boards, and a 30 kB memory that occupied most of a two-metre-tall equipment rack. Nonetheless, a signal compressed to less than ¼ of its initial transmission requirement showed a quality indiscernible from its source. A celebration was held when the price of memory fell to just $1 per bit: it was seen as a milestone on the road to feasibility. Nobody could foresee how far electronic technology and digital processor power would evolve to what we take for granted today.

It quickly became apparent that optical fibre cable would soon supersede coaxial cable. The transmission capacity of electromagnetic waves through glass fibres is enormously greater than along copper tubes. A new era in transmission technology had arrived!

Over the next few years, as solid core fibre achieved lower losses and became viable, the discrete core structure gave way to a multi-mode graded-refractive-index structure. However, Gavan took the longer view and always maintained, against 'classic wisdom' from a number of sources, that the future would centre on single-mode fibre, with laser diode sources, and

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digital transmission of all signals — none of which were feasible at the time. By the 1990s, Gavan was proven right.

On the TV application side, Gavan's Visual Communications Section designed and operated Telecom Australia's original TV conference facility, which went on to provide services for business users between studios in Melbourne and Sydney. A number of experimental conference calls were also made between Australia and the UK, but the cost and propagation delay associated with satellite transmission forestalled work in that area at the time.

Video telephony was an exciting possibility, but initial demonstrations involving bulky TV cameras and studio monitors were unconvincing. However, as the Visual Communications team returned from a group lunch, Gavan and a couple of the group spotted in a store window a cute plastic pyramid marketed as a desktop TV receiver. Somewhat futuristic in appearance, the top of the pyramid unfolded to reveal a 20 cm TV screen. Gavan immediately recognised its potential for a videophone demonstration. With some surgery to partially recess a small TV camera into the pyramid case, and with a few other mechanical and electronic modifications, the 'Camel Phone' was born. Several were made for various displays and to stimulate interest, and in research trials to gauge user reaction as to how such a service could evolve in the future.

Figure 2. Gavan Rosman with the Federal Minister for Science, Barry Jones, on a visit to TRL in the early 1980s

Following a restructure of TRL in 1979, Gavan was able to relieve himself of his roles in management and to resume full-time work on optical technologies. He continued to study the problems that would arise as more optical carriers were transmitted on the same fibre, or higher optical signal power was employed to lengthen repeater spacings. Single-mode fibre systems (as he had predicted) were now considered to be the dominant future transmission technology, but silica-based fibres would face a performance limit in terms of fibre attenuation.

Gavan thus turned his attention to different fibre materials, in particular fluoride fibres fabricated from zirconium tetra fluoride and related compounds. If fluoride fibres could be made with the same purity as silica glass, and operated at wavelengths in the mid-infrared, they offered transparencies at least one hundred times greater, and hence a similar increase in distance could be achieved without repeaters.

Fluoride glasses had been discovered by French researchers trying to create crystal materials, only to find they had made a glass. TRL, Monash University Chemistry Department and CSIRO Materials Science combined their expertise to create fluoride fibres. Despite all the

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promise, these materials preferred to form crystals rather than glass and thwarted attempts to produce long defect-free fibres. Nevertheless, techniques were developed that allowed the construction of highly effective lenses and small instrument windows at these wavelengths, which are critical in defence applications and thermal engineering.

Gavan could be a thorn in the side of senior management. But he was well-read, and an astute predictor of technological change and the evolution of telecommunications. He recognised the achievements of his young engineers and technical staff, and was always prepared to share his insights on developments. He was highly capable in both theory and practical experimentation, and able to apply these skills across a range of technologies and tasks.

Gavan continued his work in the development of fluoride glass for optical fibres until he retired from TRL and Telstra in 1996.

In Retirement

According to Beth, Gavan was appalled at the prospect of Telstra's privatisation, planned to begin in 1997, and chose to retire in 1996 at age 62, after 39 years with the PMG, Telecom Australia and Telstra. He then continued his work in optics with Optiscan Imaging, a local company founded in 1994, where he devoted himself to developing an optical endoscope, a device used in medical investigations of the body. He also lectured in optical technology at the Swinburne Institute of Technology, completing a long and productive career in 2012.

Gavan's self-assessment of his work was that he was primarily an inventor, skilled in both electronics and photonics.

The last few years of his life were quite difficult with continuing health problems, which he tackled scientifically until the end. Bicycle riding with Barry, and flute playing with Thad, former colleagues from the Labs, were important parts of his efforts to stay healthy. He passed away on 4 February 2022.

On Gavan's Sense of Humour

Peter Gerrand writes:

> "My first encounter with Gavan was memorable. He was one of a panel of engineering graduates asked to address my cohort of final-year electrical engineering students in 1966 on the opportunities to work in their fields of engineering. He had a much lighter touch than his co-panellists. Gavan began his talk by invoking biblical authority for his field of radio transmission: 'Go forth and propagate!'
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> "Later, when I too had joined the PMG Research Laboratories (later TRL), I took part in the Public Open Day held in 1973 to celebrate the 50th anniversary of the Labs. I was

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amused to find that Gavan had organised his own 'exhibit', not on the approved official list. He had produced a detailed flowchart showing the sequence of approvals required in the PMG in order to purchase test equipment needed for his research. From memory, the decision chart required fourteen signatures, most of them by clerks in an ascending order, from very junior to very senior, in the staff-overweight Purchasing Division of the PMG. Gavan was very happy to explain this bureaucratic nightmare to any interested visitors.

"During his career within TRL, Gavan frequently used humour to stimulate interest in his technical talks and papers. In 1985 he delivered a paper at the annual convention of the Institute of Radio and Electronic Engineers (IREECON) with the arresting title "Fleet Footed Photons Flatten Faltering Fermions" (Rosman, 1985). When this novel title drew one in to read his paper, one found that it carefully explained the theoretical reasons for optical fibre's superiority over telephone cables for transferring information at high speeds.

"His love of satire was given play when invited to contribute to the 'Eye on the Future' column of the *Telecommunication Journal of Australia* (TJA) in the 1990s. The first, 'Your Future in the Stars (Incorporating Lifestyle Tips)', uses the format of a weekly astrology column to gently mock management fashions such as Best Practice and Matrix Management, as well as the excessive use of emails (Rosman, 1996a). His second column, 'Computer Assisted Living', satirises the way in which personal computers were starting to dominate our lives (Rosman, 1996b).

"Gavan was a delightful colleague whose playful and sceptical manner complemented a deep, wide-ranging intellect and a commitment to excellence in engineering research."

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