



When I Think Back...

by Neville Williams

Fritz Langford-Smith: Engineer, author, music lover

Fritz Langford-Smith was widely known and respected for many years as Chief Applications Engineer for the Amalgamated Wireless Valve Company and as Editor of its *Radiotronics* technical bulletins, plus all four editions of the world famous *Radiotron Designer's Handbook*. Yet he was a very private man, whom few got to know at a personal level. This is probably the most intimate glimpse of 'FLS' published to date.

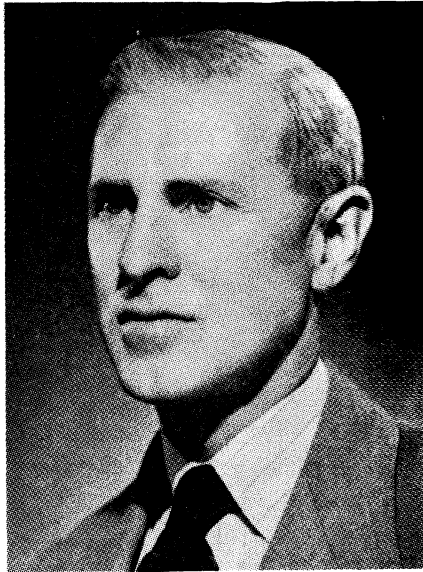
To better understand Fritz Langford Smith, it is helpful to know something of his family background. Fritz was the eldest of four sons born to Sydney Edgar and Charlotte Langford Smith, the former well known in Church of England circles as a long-serving Rector of St. Andrews C of E at Summer Hill, and Dean of St Andrews Cathedral and other charges in the Sydney Diocese.

If you noticed the missing hyphen in the above paragraph, it isn't a printer's error. That was the way that the family name was originally spelt, and how it still appears on Fritz Langford Smith's notable presentation to the IRE World Radio Convention in 1938. It was subsequently changed by deed poll to include the hyphen; so to avoid confusion, that's the spelling we'll use from this point on.

All four of the Langford-Smith brothers attended Trinity Grammar School at Summer Hill, in Sydney's inner west, each pursuing a different career:

FRITZ: Born 1904. Destined to be a prominent electronics engineer, editor and author. By way of private interests, a keen hifi enthusiast, yachtsman, hobby gardener and honorary office bearer for the Sydney Diocese of the Church of England. Now deceased.

KEITH: Born 1907 and affectionately regarded as the family 'maverick'. Keith's dominating ambition in life was to gain a pilot's licence and to minister to people in the remote areas of the Northern Territory,



Kindly made available to me by Mr Neil Bonney of Bundaberg, Qld, this picture of Fritz Langford-Smith is copied from the January 1951 issue of 'Radiotronics'. While still occupied with the production of the 4th edition of RDH, he had just handed responsibility for 'Radiotronics' to the new editor Ian Hansen.

using the only planes he could afford: (very) second-hand biplanes. A born extrovert, he will be remembered by many for his 'Sky Pilot's Log' broadcasts over Sydney's radio 2CH - an entertaining mix of fiction and fact. Now also deceased.

NEVILLE: Born 1910. 'Went bush' as a jackeroo for two years before return-

ing to the University of Sydney in 1929, where he gained a BA and later an MA in Education. He subsequently joined the C of E ministry and spent just on 45 years in overseas mission service, before retiring as the Anglican Bishop of Nakuru in Kenya. Having a lot in common with Fritz, he was my immediate family contact for this present article.

TREVOR: Born 1916. Formerly Professor of Geography at the University of Sydney. A very active man, he was keen on field work and, most years, led student groups on treks through central Australia. He is now retired but recently, at age 72, went trekking in the high Himalayas!

Fritz the schoolboy

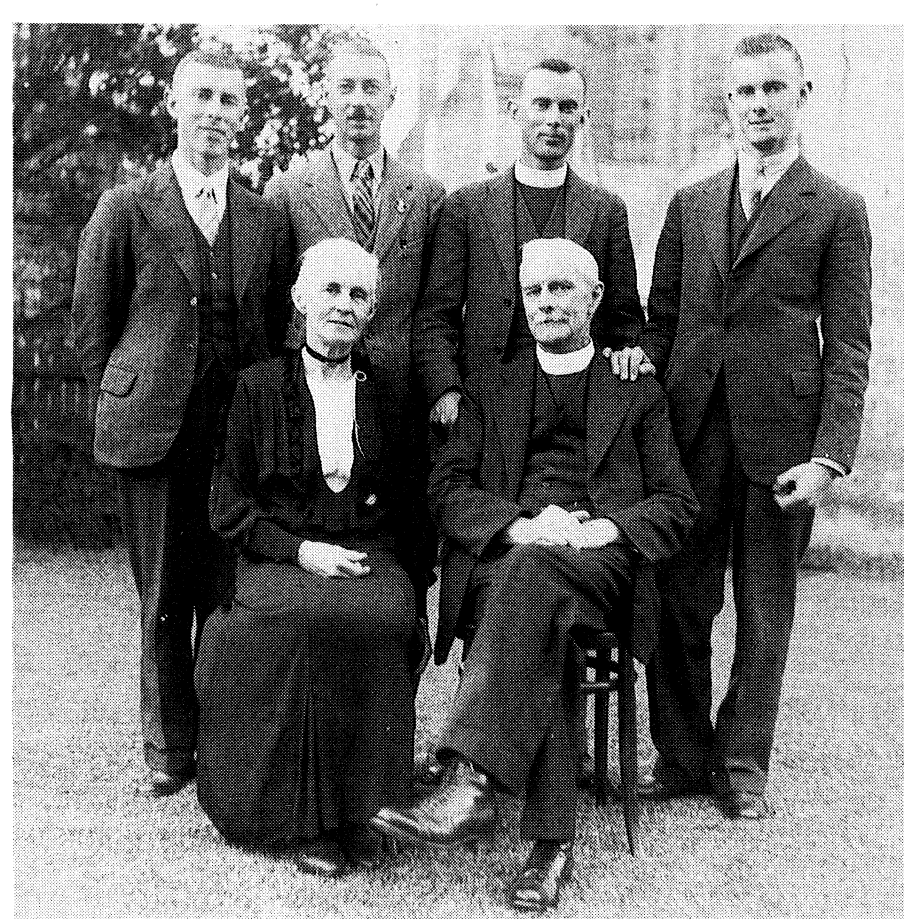
But why 'Fritz' - a given name that, at the time, could not have been easy to live with? The answer, according to Neville, is simple enough.

Fred (short for Frederick) had been a traditional family name for generations and, in the normal way, would have been selected by his parents for their eldest son. But there seemed to be so many Freds in the family already that, to avoid further confusion, they chose the short Germanic form, little realising that, ten years on, World War I would breed an intense dislike of all things German.

At college, young Fritz was subject to considerable ridicule but, according to his brother, he displayed the 'uncompromising determination' that characterised him in later life. He chose to put up with the jibes, rather than change the family name that had been given him at birth.

Whether it was a helpful decision is another matter. His reserved disposition, the prevailing conservatism ('stiffness') of the AWA Head Office and a given name that was still 'awkward' in the 1930s, were all barriers to familiarity. In the work situation, Fritz was rarely addressed by his christian name. To his face he was 'Mr'; in his absence by his initials 'FLS', or whatever else seemed appropriate at the time.

Like so many of his contemporaries,



Photographed at Summer Hill, the Rev. Canon Langford Smith, his wife Charlotte and their four sons (L to R): Fritz, Keith, Neville and Trevor.

young Fritz developed an interest in 'wireless' while still at school. To the intrigue of other occupants of the Summer Hill C of E rectory, he experimented with crystal – and later valve – sets on which he could listen to code transmissions from Pennant Hills, or voice and music broadcasts from Charles MacLurcan's amateur station at nearby Strathfield. This, before the commencement of official broadcasting in Australia.

Interested also in manual activities, he set up a workbench in the family garage, complete with lathe. By way of sport, his favourite pastime was canoeing and similar activities at Cabarita, on the nearby Parramatta River – an interest that, years later, led him to invest in a yacht on Sydney harbour.

Early career

From Trinity Grammar, Fritz matriculated to the University of Sydney where he later gained first class honours in Mechanical and Electrical Engineering, at the same time topping the Honours list in Electrical Engineering. In addition to his formal qualifications – BSc and BE with first class Honours, he subsequently became a Senior Member

of the IRE (USA) and Chartered Engineer, a member of the IRE (Aust), and an associate member of the IE (Aust) and IEE (Aust).

The post-graduate years 1928-32 were spent gaining work experience in the UK, initially with the Metropolitan-Vickers Electrical Co, later as valve factory engineer with an associated company – the Cosmos Lamp Works at Brimsdown. On the side, he was at hand for the birth of Baird-style mechanical television.

According to John W. Stokes (ref. *70 Years of Radio Tubes and Valves*) it was a particularly interesting and innovative period for a young engineer to be associated with Cosmos around 1930 – both commercially and technically.

Originally a valve maker in its own right, Cosmos had been part of a merger in 1927/28 between Met-Vick, BTH and Ediswan, which saw the formation of Associated Electrical Industries Ltd (AEI). In the following years, the various valve types produced by BTH, Ediswan and Cosmos were gradually rationalised via Cosmos, with the individual brands gradually giving way to 'Mazda', a brandname to which the new AEI group held regional rights.

In 1927, just prior to the merger, E. Yoeman Robinson of Met-Vick had lodged a revolutionary patent covering 'slip-coated' heater elements in indirectly heated valves. Applied very successfully by Cosmos, it involved coating the heater element with an insulating layer by dipping it into a porcelain slurry ('slip') – later a paste – made from powdered alumina.

By obviating the need for other, more bulky insulation, the process permitted the use of a smaller diameter cathode sleeve, and offered more rapid heat transfer, greatly reducing the tedious warm-up period that characterised early mains-type valves.

About the same time, Cosmos also pioneered the 'short-path' concept, involving closely-spaced valve electrodes and producing, for the period, unusually high figures of transconductance – typically up to 4mA/V (or 4 milliSiemens, in modern parlance).

In 1928/29 Cosmos produced a general-purpose screen-grid mains-type pentode, and two notable high-gain indirectly heated output triodes. These were followed in 1930 by the world's first indirectly heated output pentode, the AC/Pen, sold under the Mazda label.

Back to Australia

Having been exposed to the then-innovative British valve manufacturing scene, with its many connotations in mechanical, electrical and electronic engineering, it was fitting that Fritz Langford-Smith should seek – and gain – a key position with what was to be Australia's first full-scale valve manufacturing company.

AWA had been involved in valve manufacture in a small way since about 1920. In 1924, they reached agreement with RCA to produce selected RCA types in Australia, distinguished by an AWA prefix. In practice, however, they represented a very small proportion of Australian market requirements.

In 1932 AWA decided to set up a full-scale valve manufacturing operation which, became a reality in the following year: the Amalgamated Wireless Valve Co, commonly referred to thereafter as AWV. The factory was set up in the AWA complex in Ashfield (Sydney) with the marketing and sales-technical activities operating, in due course, from the then-new AWA building in York St, City.

If dates mean anything, Fritz Langford-Smith must have been one of the foundation employees, joining AWV in 1932. As engineer in charge of the com-

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pany laboratory, he visited Canada and the USA in 1935 to investigate the possible production of transmitting valves but, whereas in Britain his main American link would probably have been with Westinghouse, the Australian AWA connection was firmly with RCA.

As AWW expanded, FLS became progressively more involved in the sales-technical area, which led to his ultimate appointment as the company's chief applications engineer. It was in this role that I first met him personally and, at his subsequent invitation, joined the staff of the Ashfield Applications Laboratory in 1936.

Applications engineer

But what is the role of an applications engineer and, for that matter, what AWW later described as its 'Unified Sales-Engineering Service'?

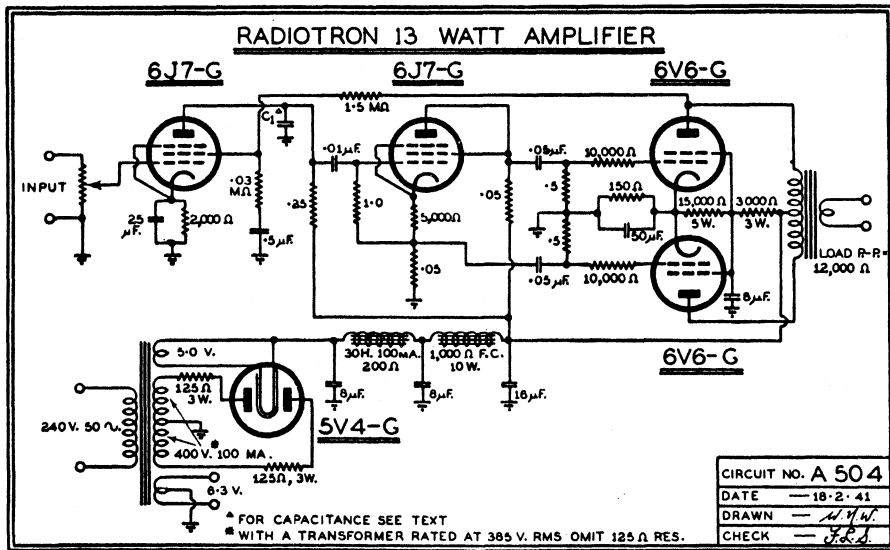
Even in those early days, AWW had men on the road full or part-time, some keeping in contact with equipment manufacturers, others with dealers and servicemen. Their job was to assure clients that Australian Radiotrons were the best valves, that AWW was the most reliable supplier, and that the company was well equipped to offer advice and assistance with any valve-related technical problems that they might encounter.

Problems brought to their notice were referred automatically to Fritz Langford-Smith, as Chief Applications Engineer. Matters to do with circuit design were handled by him personally, or by the Applications Laboratory staff; anything to do with valve quality or structure was referred to the appropriate factory personnel.

Perhaps I should add that other major suppliers like Philips and Mullard had also had their own sales-technical sections although, perhaps, somewhat less structured than the AWW team. And with good reason: in those days, equipment design, performance and reliability tended to centre around the valve complement.

By way of example – and I'm relying heavily on memory – my first contact with FLS had to do with early production samples of the all-metal 6L6 'beam' power tetrode, manufactured by RCA but distributed in this country by AWW; this, while I was still at Reliance Radio.

Attracted by the generous output ratings of the new valve, we had built up a couple of new-model prototypes featuring push-pull 6L6's, only to encounter a distinctly off-putting problem. Every now and again, when the volume was



Reprinted in our June 1941 issue, this amplifier circuit came originally from *Radiotronics Bulletin No.112*. Developed by AWW Applications Lab engineers in collaboration with Fritz Langford-Smith, it relies heavily for its performance on negative feedback. It was drawn by the writer (WNW) and checked by FLS.

advanced, one or other of the 6L6's would arc from anode to shell across the tiny glass insulating bead used in the original construction. Even if the receiver was switched off before the arc severed the anode lead, the track etched across the bead by the arc would still render the valve unuseable.

Personal service

FLS visited Reliance, then in nearby Barrack St, City, to hear our tale of woe at first hand. There seemed little doubt that the problem was due to the peak anode voltages being developed, at high output levels, across the highly reactive (loudspeaker) load. In theory, this would be true of any high impedance output tetrode or pentode; in the case of the new 6L6, the voltages were clearly reaching destructive proportions.

RCA's initial literature on the new valve concentrated on its unique configuration and characteristics, and on typical operating conditions ranging from single-ended class-A to push-pull class AB2. Load values were recommended for each mode but, as I recall, without any reference whatever to the vagaries of practical loudspeaker loads.

Faced with the problem, Fritz Langford-Smith suggested that there appeared to be three options open to us, if we wanted to use the new 6L6's:

1. Operate them at a lower voltage and power level; or
2. Place a selected – and adequate – R/C network across the output transformer primary winding; or
3. Apply negative feedback around the output stage – at the time a relatively unfamiliar technique.

We offered a supplementary suggestion, which FLS acknowledged without official endorsement: namely that the metal shell of the valve be tied to chassis by a parallel capacitor and resistor, such that it could not support an arc, anyway.

Unless I miss my guess, it was the 6L6 and its problems that inspired a definitive paper which Fritz Langford-Smith subsequently presented to the 1938 IRE World Radio Convention entitled: 'The Relationship Between the Power Output Stage and the Loudspeaker'.

But old-timers could no doubt recall any number of other valve-related problems that he would have had to help sort out in the early and mid '30s:

- Type 47 output valves suffering from chronic grid current;
- Type 59 output valves with internal open and short-circuits;
- Loose grid caps, loose bases and unreadable type numbers;
- Gassy or low emission rectifiers;
- Microphonic or hum-prone audio voltage amplifiers;
- Autodyne frequency changers that dropped out of oscillation;
- Subtle differences in the behaviour of supposedly identical valves from different makers.

And so on – interminably!

Radiotron publications

By way of product promotion, AWW had sought, almost from the outset, to publicise its customer support activities by issuing stencilled information sheets entitled *Radiotronics*.

In 1935, the modest format was replaced by a regular monthly journal, professionally printed by Cloister Press. As the Company's Application Engineer, Fritz Langford-Smith was named officially as the Editor – a responsibility that effectively extended to other Company technical publications – until his resignation from that role in late 1950.

I can't recall ever having seen any of the early stencilled editions of *Radiotronics* but I do have a file of the printed issues from October 1935 to July 1941. They contain release announcements and details of new valves, some imported, others manufactured by AWV under licence from RCA and still others designed and produced in Australia to meet local requirements.

The very successful all-Australian 2-volt battery series announced in late 1935 were a prime example of AWV initiative in the lastnamed area.

Identified by Fritz Langford-Smith and the sales-engineering group, the urgent need for modern, reliable battery valves was met by the design/production team at Ashfield. Other engineers in the lab derived the data from which the official characteristic sheets and curves were prepared, while the applications team came up with typical circuits, coil winding data, and so on.

Apart from Radiotronics, FLS and his group were responsible for issuing valve data sheets and books for design engineers, quick reference wall charts and booklets for dealers and servicemen, valve interchangeability charts, bulletins for radio amateurs and sundry other publications.

I became deeply involved in all this, when I joined the AWV lab staff in 1936. Ironically, one of my early tasks

was to prepare the drawings for Langford-Smith's paper mentioned above and inspired, at least in part, by the inquest at Reliance over the mortal remains of several metal 6L6's.

Landmark lecture

For Langford-Smith, preparation of the lecture involved sifting and rationalising literature on the broad subject dating back to around 1924, and re-defining the problem as it applied to current loudspeakers and valve types. The role of negative feedback had to be investigated and explained, together with the feasibility of obtaining triode-like performance figures from output tetrodes and pentodes – without sacrificing their innate power conversion efficiency.

Considerable practical work to authenticate the lecture was undertaken by staff in the Ashfield lab using signal sources, metering and distortion measuring equipment much more tedious to operate than their modern counterparts. Although delivered 50 years ago, the lecture re-defined the overall problem in terms that are still broadly relevant in the present solid-state era.

The RD Handbook

Hard on the heels of the lecture came the third edition of the *Radiotron Designer's Handbook*, released in 1940.

The first and second editions of this had been relatively modest publications of around 100-odd pages. But AWV Sales Manager Aub Hosking was not content with a merely 'modest' handbook, and encouraged his Chief Applications Engineer to come up with a more ambitious publication to carry the 'Radiotron' banner. I should perhaps add that FLS scarcely needed such en-

couragement!

The third edition comprised just over 350 pages, and was issued in both paperback and hardback form. It was subdivided into sections covering audio and radio frequencies, power supply components, tests and measurements, valve characteristics, general theory and sundry data.

Once again it fell to my lot to prepare most of the drawings, many of them having to be created from raw data. With FLS as my immediate mentor, preparation of the drawings and involvement with the text turned out to be a revision course in the entire spectrum covered by the book.

In due course, Aub Hosking and Fritz Langford-Smith had the satisfaction of seeing their third edition sell over 280,000 copies, as well as being translated into Polish.

There had to be a fourth edition, of course, but it was in no more than the concept stage when I left AWV to join *Radio & Hobbies* at the end of 1941. About this same time, FLS had become a member of the Ministry of Munitions' Valve Production Advisory Panel and, in the absence of Aub Hosking on war service, acting Sales Manager of AWV, as well.

When ultimately released in Australia in mid 1952, the fourth edition of the RDH – *Radiotron Designer's Handbook* – resembled the third edition only in title and the identity of the editor.

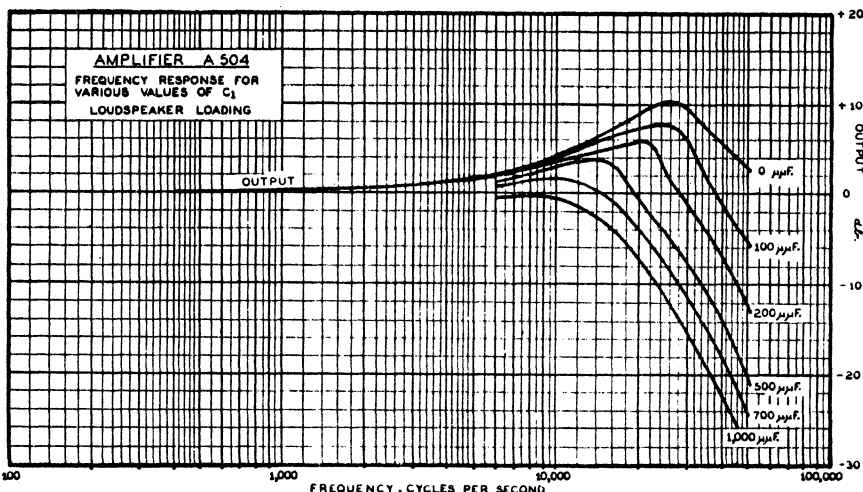
Completely re-written by FLS and nine other authors in the immediate post-war period, the text had been checked for accuracy by 23 engineers, mostly from AWA. Even when set in 8pt type, it ran to 1500 pages and could lay claim to being the most thorough and comprehensive reference book on receiver and audio amplifier design published anywhere in the world. It was reprinted for the UK and overseas markets minus the word 'Radiotron', which was no longer relevant outside Australia.

In an era before computers and word processors, its preparation had been a herculean task and it was to be the astounded by FLS in this country.

FLS – personal

In 1937, Fritz Langford-Smith had married Dulcie Mottram, who shared his involvement in Church of England activities. They set up home in Chatswood, at a time when it was still a quiet north-side suburb. But sadly their first and only child died shortly after birth.

At Chatswood, Fritz pursued his interest in hifi sound and, while still



One of several performance curves for the A-504 amplifier, showing its behaviour with a loudspeaker load and the need to consider response and stability in the supersonic region. It follows naturally on important research by Langford-Smith in the 1930s.

working with him at AWW, I was invited home to hear what he assumed might be his ultimate pride and joy – a unique loudspeaker that he had just imported from the UK.

As I recall, it was a new release from Hartley-Turner featuring a hard, polished bakelised cone, with a highly flexible support spider and chamois surround. Unfortunately, it proved a disappointment. Tested later in the AWW Applications Lab, it was magnificent on sinewave input, very pleasant on solo instrumental and voice, but a mess on complex program material – presumably due to intermodulation effects.

Immediately after the war, there was renewed interest in winning better sound from 78rpm discs, with the aid of new lightweight pickups, more precise compensation and improved amplifier systems.

This time FLS, who was exploring the subject for the fourth edition of the *RDH*, visited John Moyle and I at the *R&H* office in Elizabeth St, City, where we had set up a system which, if nothing else, offered extended frequency response.

FLS was interested in our efforts but, at the same time, disappointed. In the nicest possible way he expressed the firm conviction that there wasn't much

point in achieving an extended top-end response if the most obvious aural effect was to expose a high level of distortion in the source signal. He was absolutely right, of course, but at the time we were loath to admit it.

Out-of-doors, FLS's pride and joy, as mentioned earlier, was his yacht, which was large enough to provide live-in accommodation when he and his wife felt so inclined. I never heard it discussed in the office but, according to his brothers, if he was ever likely to tempt fate, it was while at the wheel on Sydney Harbour!

But a great deal of his private life was taken up with C of E denominational affairs. A committed Christian, Fritz Langford-Smith was Honorary Secretary of the Moore Theological College (University of Sydney), a member of the Sydney Diocesan Synod, of the Provincial Synod of NSW, and the General Synod of Australia.

If you've wondered what he did in his spare time, you have your answer!

The final chapter

Especially after the death of their child, Dulcie Langford-Smith had suffered ill-health and, as his work on the *Designer's Handbook* neared completion, Fritz decided to move to England.

It came as a complete surprise but, as he explained at the time, he was hopeful that the milder climate and the reduced glare would be less stressful for his wife.

Having been offered a position with the English Electric Company in charge of technical publications, he set up home nearby and, according to his brother Neville, took to riding a bicycle to the office (shades of Sir Ernest Fisk!).

Unfortunately, his own health failed when he developed a wasting disease that defied precise diagnosis. Unable to continue working, Fritz and his wife returned to Sydney in 1962, living at Ryde until he died in 1966 at the age of 62, mentally alert but physically immobilised.

The address at his funeral service in St. Anne's Anglican Church, Ryde, was given by the Most Rev. Sir Marcus Loane, Archbishop of Sydney.

To Fritz Langford-Smith, the highly qualified and respected engineer and widely read author/editor, Marcus Loane's touching, personal tribute in a subsequent letter to the family, concluded:

"He was always so gentle, modest and self-effacing... a servant of the Lord Jesus and a good and faithful one." 