CLINICAL AND EXPERIMENTAL
OPTOMETRY

PROFILE

Emeritus Professor Josef Lederer
A pioneer of low vision care

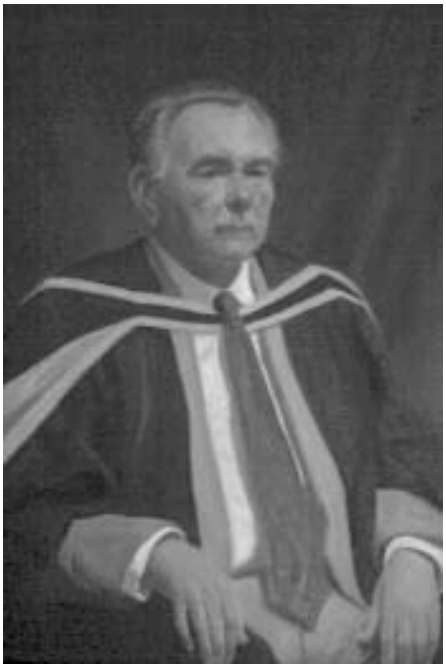
Foundation Professor of Optometry, The University of New South Wales

Josef Lederer migrated to Australia at the age of 18, with little English and a schooling disrupted by the rise of Hitler's Third Reich and imminent war. No-one, least of all Josef Lederer, would have thought that later he would be the foundation Professor of Optometry at The University of New South Wales and the first person to be appointed to a chair of optometry in Australia. While low vision practitioners will remember him best for the 'Lederer Lens', Josef Lederer was active in several other areas of teaching and research, and was one of the most important figures in the development of modern Australian optometry.

FROM VIENNA TO SYDNEY

Josef Lederer was born in Vienna on Christmas Eve—24 December 1921. His mother was from an Italian family that had migrated to Austria two generations earlier, his father was from a Jewish family originally from Bohemia.[a]

The Lederers were lawyers and chemists. His father was one of six brothers, three of whom were lawyers and three were industrial chemists. Josef had one brother and the family decided that Josef would follow law, while the younger brother would be the industrial chemist. Perhaps it was the two traditions of science and law that later made Lederer, the scientist and academic, an effective politician for his future school and his future profession.



Portrait of Josef Lederer, by P Henke

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Lederer entered high school at the age of 10 and was a promising student. The law career seemed assured. He later recollected that some time before he was due to matriculate, a position had been arranged for him in the Austrian Police Department.

A musical career was also a possibility for the young Lederer. He had taken piano lessons from the age of six and such was his talent that he gave his first solo recital in Vienna at the age of 13. Also at age 13, he learned to play tennis. Perhaps sport was never a serious career prospect, although tennis remained a regular activity for him until well into his retirement and for some years he was a referee in junior soccer competitions.

His matriculation from high school in Vienna was never to be. In 1938, Hitler's Germany annexed Austria and life became difficult for those with any Jewish origin. Lederer's father had the foresight to apply to migrate to Australia, while still in Vienna, but it was too dangerous to wait for those formalities to be finalised. In July 1938, the four Lederers escaped to a little village near Trieste, where they hid for six weeks before taking a ship to Haifa, in what was then Palestine. In Haifa, Lederer helped support the family by working as a painter and decorator.

After seven months in Haifa, their immigration papers for Australia arrived and in December 1938, the family boarded a ship in Port Said. They arrived in Sydney, Australia, on 19 January 1939.

In Sydney, Lederer's father could not practise his profession, but managed to make some money by using his command of English to help other migrants. Josef's younger brother found work in a textile factory, while Josef, who came with only a smattering of English, took up a number of odd jobs, including operating the first espresso coffee machine to be imported into Australia.

a. Many of the details of Josef Lederer's early life and subsequent career were obtained from an oral history, *Josef Lederer—Optometry in the University of New South Wales 1951–1981* by Sue Knights, edited by Linda Bowman, University Interviews Project, UNSW Archives.

Gradually, the family re-established itself in the new country. The father became a chartered accountant and tax agent, while the mother set up a small business selling Viennese cakes to coffee lounges and restaurants.

Josef Lederer decided he should complete matriculation, not an easy task because of his initial lack of English and the disruption to his Viennese education. However, just two years later, in January 1941, he sat for and passed the examinations.

Lederer's next task was to decide on a career. As he had to earn a living, studying at Sydney University (Sydney's only university at the time) was not an option. However, the Sydney Technical College offered part-time diploma courses in many professions.

His father wanted him to study accountancy, but to use Lederer's own words, he could see 'little joy in making a little money counting up other people's big money'. Eventually, he chose optometry as something that looked interesting and offered the chance of immediate remuneration.

OPTOMETRIST AND TEACHER

Lederer's entry into the optometry course was just 10 years after the passage of legislation that first regulated the profession in NSW. The new legislation had been the stimulus for the establishment of a four-year part-time diploma course at the Sydney Technical College.

Lederer completed the optometry course at the end of 1944 with great distinction and was awarded the Sydney Technical College Medal. Remarkably, he had already published seven papers[b] in the *Australian Journal of Optometry* (that evolved into this journal) by the time he obtained his optometry diploma. His obvious academic talent led to his appointment as a part-time lecturer in the Optometry Department, the year after he completed his course. At the same time, he was in private practice with the firm of Gibb and Beeman.

The end of the war in 1945 saw a huge increase in enrolments at tertiary institutions. It was decided that the optometry course needed its first full-time teacher, a position for which Lederer applied and to which he was appointed in February 1947. He taught most of the professional part of the course and, in addition, he had the more daunting task of working with and often against the Board of Optometrical Registration and the various professional bodies to develop the kind of optometry course he considered necessary for the future of the profession.

At that time, it was particularly important to raise the standard of the course, because the government of the day planned to make the technical colleges autonomous with the power to grant their own degrees.[1] Lederer wanted to ensure that the optometry course would find a place in the proposed new University of Technology. His initiatives at this stage included extending the course from four to five years of part-time study and establishing the first optometry teaching clinic in 1948.

He also felt it was important, for his credibility and that of the course, that its principal teacher should have a university degree. In 1947, he enrolled as a full-time student at Sydney University, graduating three years later with a Bachelor of Science majoring in physiology and geology.

By the end of that course, he had impressed the professor of physiology at Sydney University sufficiently to be appointed a part-time lecturer in physiology in the Faculty of Medicine.

Lederer's life has never been purely devoted to optometry and academia. During this period he married and had three children, who were born between 1946 and 1951.

TEACHER, RESEARCHER AND ADMINISTRATOR

The New South Wales University of Technology[c] was eventually established in March 1949 and by 1950, the optometry diploma course had been transferred to the new university and was administered by the School of Physics. Lederer, now a Senior Lecturer, implemented a one-year full-time (or two-year part-time) course, which enabled holders of the five-year diploma to convert it to a Bachelor of Science degree.

Lederer felt that his own bachelor's degree was insufficient for the head of a university department and he enrolled as a candidate for the degree of Master of Science at the University of Technology. He was awarded this degree in 1956 at the same graduation ceremony that conferred the first Bachelor of Science (Optometrical Science) degrees.

His thesis was entitled 'Studies in physiological optics' and its contents ranged from properties of the retinal image through to duction measurements, management of low vision and the design of spectacle magnifiers. He believed that the low vision chapters were the most important but his examiners (who were presumably physicists) thought that the chapter on anisopia was the highlight.

These were perhaps the most remarkable years in a life that is full of remarkable years. Lederer was head of a new department in a new university, he was a part-time lecturer in physiology at Sydney University and he was involved in research for his Master of Science degree.

Lederer saw a full-time optometry degree course as the next logical step in the development of his profession. One problem was to decide on a name for the new degree. Lederer had wanted 'Bachelor of Optometry' for the degree conversion course but this was rejected by the university administration, which had an aversion to new degree names. The conversion degree had been called 'BSc (Optom Sc)' but very soon the 'Optometric Science' was

b. The seven papers are: Stereoscopic calculations in orthoptics. *Aust J Optom* 1943; 26: 506-510; The field of view in direct ophthalmoscopy. *Aust J Optom* 1943; 26: 533 and 575; Is the darkest line always parallel to the meridian of greatest refractive error? *Aust J Optom* 1944; 27: 51 and 95; The retinoscopic reflex. *Aust J Optom* 1944; 27: 99-101; The size of print in elementary school books. *Aust J Optom* 1944; 27: 295 and 335-336; Optometrical applications of a large convex lens. *Aust J Optom* 1944; 27: 368-369 and 384; The stenopaic disc. *Aust J Optom* 1944; 27: 491-492.

c. The University of Technology later became The University of New South Wales.

dropped. However, by the time the full-time course was being considered seriously, the administration thought the course was more professional than scientific and did not want 'BSc' for the full-time course. In the end Lederer achieved his plan: the course led to a 'Bachelor of Optometry' degree, the first distinctive optometry degree in the British Commonwealth.

In 1959, Lederer was promoted to Associate Professor. Optometry was still a Department in the School of Physics (later in the School of Physics and Optometry) and it was not until 1976 that the School of Optometry was established, with Lederer as the Foundation Professor in the new Chair of Optometry. Meanwhile, in 1971, Lederer supervised moving the school from its original home in the old premises of the Sydney Technical College in Ultimo to the main campus of the university and he encouraged and inspired his graduates and colleagues to pursue research interests. He was also actively involved in two major advances in optometric legislation.

THE POLITICIAN

Partly through necessity but perhaps also because of the familial interest in law, Lederer was an active and effective opto-politician. He was a councillor of the Institute of Optometrists (later the Australian Optometrical Association NSW Division) for more than 25 years and a member of the Optometrists Registration Board.

As a politician, he was very much a strategist, leaving the active lobbying to men such as the late George Bell and other officers of the state and federal optometric associations. He played a major role in steering legislation through the NSW legislature which, in 1963, redefined optometry and gave optometrists the right to use diagnostic drugs. There was opposition to this legislation from the medical profession, as would be expected, and from those within the optometric profession who regarded the push to use drugs as an unnecessary rocking of the boat. Lederer and his colleagues could see only that it was in the public interest to allow optometrists access to diagnostic drugs and by 1963 they were able to convince a sympathetic government to pass the legislation.

LOW VISION AND THE LEDERER LENS

Lederer's activities in the field of low vision were a happy amalgam of scientific research and clinical application. Until the 1950s, designers of optical aids for people with reduced visual acuity concentrated on compound telescopic or microscopic systems mounted on a spectacle frame and hand-held or stand magnifiers. Optically, compound lenses offer the designer more degrees of freedom for controlling aberrations than a single lens, but they tend to be heavy and expensive.

Lederer recognised that a large proportion of low vision patients could not afford expensive optical aids, so that economy was an important consideration in the design of a new optical aid.

As with most great inventions, Lederer's solution was elegant. For a given power of lens and for a particular aberration, it is possible to select spherical surfaces that eliminate that aberration. The aberrations of interest to the spectacle lens designer are curvature of field, astigmatism and distortion. Spherical aberration and coma have negligible effects because of the small aperture stop formed by the pupil of the eye. Each aberration can be eliminated only for a finite range of powers but the powers that are useful for spectacle magnifiers lie outside these ranges. Lederer applied calculus to find lens forms that minimised the aberrations and plotted the results for each aberration on the one graph (Figure 1). He was then able to find, for a given power, the lens form that was the best compromise for the three aberrations.[2] The first series of Lederer Lenses had powers of +10.75 D, +16.00 D and +24.00 D, with magnifications of 2.5x, 4x and 6x, respectively.

Before releasing the lenses, Lederer tested them extensively in his low vision clinic, which was the first of its kind in Australia. He defined criteria for the success or failure for each of the 550 patients in his study and showed that his results compared favourably with those of a study

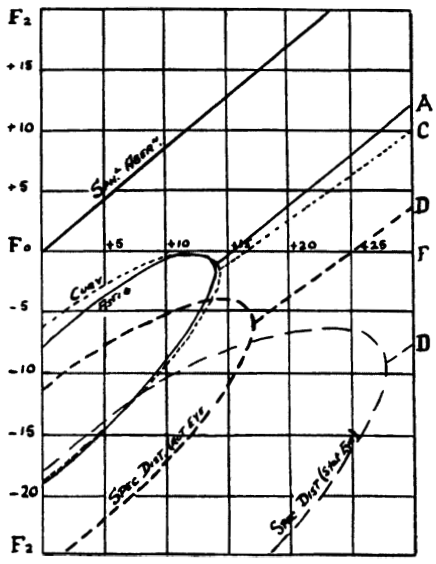

Figure 1. Graph showing aberrations for lenses of power F and back surface powers F_2 calculated and drawn by Josef Lederer. From *Aust J Optom* 1957; 40: 448.

by Feinbloom using mainly telescopic and microscopic lenses.

Even before his Master's thesis was completed, he published a paper based on the theory of his design in the prestigious British scientific journal *Nature*,[3] The publication marked another first for Lederer: the first paper by an optometrist from Australia, possibly from anywhere, to appear in that journal. The paper did not escape the attention of Arthur Bennett and HH Emsley.[d] Bennett found two algebraic errors, which made no difference to the outcome of the design, while Emsley thought that the third-order theory used by Lederer was not sufficiently accurate. Lederer acknowledged Bennett's observation and answered Emsley by pointing out that third-order theory was adequate for clinical design, using as evidence the success rate with his 550 patients.

d. Comments, *Nature* 1955; 4453: 411. Emsley was the author of several books on visual and ophthalmic optics in the first half of the 20th Century; Bennett was his successor in the second half of that century.

Except for a preliminary report,[3] the work was not fully published in Australia until 1957,[4] the delay being due to factors that the editor did not clarify. In the meantime, there was considerable publicity in newspapers and magazines and for a while 'Lederer' was a household word, at least among low vision people and their families, if not with the larger population.

In 1956, WG Kett, then editor of the *Australian Journal of Optometry*, took the news of the Lederer Lens to England and Europe, where he described the lenses to various meetings of optometrists and opticians. From Kett's report,[5] the reception was lukewarm, yet very soon after the Lederer Lens was a standard component of the low vision armamentarium[6] and 'Lederer type' lenses were produced by many manufacturers. Part of the attraction of the first series of Lederer Lenses is that no special tools were needed for their manufacture.

Figure 1 is from the 1957 paper.[7] It was hand-drawn by Lederer himself, after laborious calculations with slide rule and log tables.[e]

Modern computational methods, a plethora of optical materials and the possibility of producing surfaces with any desirable geometry have made the original Lederer Lenses obsolete but the principles of simple single lens spectacle magnifiers is still applied wherever low vision appliances are prescribed.

Equally important, Lederer established a systematic approach to the management of the low vision patient[8] and it is appropriate that his last four papers were related to this topic.[9]

He applied and taught his techniques first in the Low Vision Clinic at the University of New South Wales and later at satellite clinics at the Royal Bind Society and Concord Repatriation Hospital. He continued working and teaching at the latter for several years after retirement from the university.

e. Slide rules and log tables were primitive tools used by scientists and engineers for mathematical calculations in the days before pocket calculators, personal computers and research assistants.

Soon after development of his lenses, Lederer began to pass on his knowledge and experience of low vision in a series of two-day seminars given in various states of Australia. He gave practising optometrists new insights about how people with low vision could be given optometric help and laid the foundations for the future development of low vision care by later generations.

LEDERER'S OTHER CLINICAL AND RESEARCH INTERESTS

As his publication list shows, Lederer was interested in all aspects of clinical optometry and several areas of vision science. Binocular vision was his greatest scientific interest and he inspired others such as George Amigo, the late Steven Halass and myself to work extensively in this area.

He also worked extensively in industrial optometry, now known variously as occupational optometry and visual ergonomics, or under the broader heading of environmental optometry. Typically, he developed and taught a systematic approach to analysing visual workplace requirements and consulted with private industry on the design and provision of eye protection devices.

He made a substantial contribution to the management of children with learning difficulties by establishing a remedial reading clinic in the late 1950s,[10] thereby encouraging his students to take an interest in this area at a time when government authorities did not acknowledge that there was such a problem as dyslexia.

So here is a man for all seasons. A man who awakened optometrists to the potential of their role in helping the partially sighted make best use of their residual vision and who provided them with a new tool to help realise that potential; a man who aroused our interest in other domains of optometric science to vastly broaden the scope of optometric practice; and a man who shaped the development of optometric education and legislation for three crucial decades in that period of great social change after the Second World War.

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