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Anita Lawrence - Contributions to Acoustics in Australia

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ABSTRACT

Anita Lawrence was a pioneer in acoustics in Australia and a pivotal contributor to the formation and development of the Australian Acoustical Society (AAS). She was involved at the outset and continued throughout the decades. She contributed greatly to the international reputation for AAS via her role in the hosting of international meetings in Australia. In addition to initiating courses to provide acoustic education, her contributions were broad and included important research findings relevant to the Australian context and the development of Australian Standards. Her passion for acoustics, especially for quality of acoustics inside and outside buildings, has led to a legacy in her generous donations to the University of New South Wales. Her bequest is to be used solely to provide scholarships for PhD students studying acoustics within the School of the Built Environment. This paper will outline some of the achievements of Anita Lawrence.

1 INTRODUCTION

The standing of acoustics and of the Australian Acoustical Society in the local and international domain owes a considerable debt to the dedication and vision of the pioneers working in the area in the 1900s. Historical research by Montano (2020) indicates that the first attempts anywhere in the world at measuring noise outside a laboratory were made by Laby and colleagues from RMIT. In 1928, and sponsored by the local Melbourne radio station, they took their laboratory equipment, including an early form of chart recorder, into the streets of Melbourne to both do a live broadcast and also to quantify the street noises. In subsequent decades there was the development of measuring equipment and it became possible to quantify so many aspects of the sound around us. Gerald Riley, based in Victoria, invested in developing acoustic facilities and his contribution cannot be overlooked. However, it was not until a group of those working in acoustics, mainly in NSW, began to meet informally that the vision to form an organisation called the Australian Acoustical Society evolved. An important member of that group was Anita Lawrence, recently graduated from architecture and with a passion for acoustics, who took on the role as Secretary for the group. From that time Anita continued to work to enhance the understanding and appreciation of achieving good acoustics within Australia and in the international domain. This paper extends the Obituary published in Acoustics Australia (Burgess, 2021) and attempts to summarise the achievements of Anita as well as discuss the legacy she has left for acoustics in Australia.

2 CONTRIBUTIONS TO EDUCATION

Anita Lawrence was the first female graduate from the Architecture Department at the University of New South Wales (UNSW) and she was the first woman to receive a University Medal from UNSW when in 1955 she was granted a Bachelor of Architecture with First Class Honours. Unfortunately, we do not have a record of the project that led to that achievement but her first job was working on an acoustics project for the CSIRO. It was not long till she joined the academic staff of UNSW Architecture and began a 32-year career in academia leading to a professorial position.

The growth in demand for buildings was increasing as part of the post-war boom and building techniques were developing rapidly so the importance of understanding how to provide acceptable indoor and outdoor acoustic environments in and around the developing cities was beginning to be appreciated. She embraced the task of teaching acoustics to the budding architects and was known to state "*a person's experience of a building can be drastically altered by bad acoustics – it's imperative that architects, builders and landscape architects understand the importance of achieving optimal sound in a room or building*." Her first publication seems to be a report on "Acoustics in Buildings'' which is listed in the National Library as "'*Published under the auspices of the Building Research and Development Advisory Committee by Hodder and Stoughton, 1962'' as No 1 in the Australian Building Science Series*, (https://catalogue.nla.gov.au/Record/752456). In 1970, based on the notes prepared for the lectures for the architecture students, she published with Elsevier, ''Architectural Acoustics''. This slender book of 219 pages explains the principles of acoustic design within buildings and of controlling noise outside and within buildings in a simple clear manner to be understood by architects and builders who do not have a strong

mathematical/science background. Not only did she write the text but she also produced all the illustrations in the book. This book covers clearly all the basic principles so that reading this book 50 years later there is little that needs to be changed.

In the early 1970s Anita initiated the first post graduate course in acoustics in Australia at UNSW which commenced as a Graduate Diploma in Architectural Acoustics and under the Faculty of Architecture. A few years later this was upgraded to a Master of Science (Acoustics). This was a part time program requiring attendance at classes at the UNSW, which were in the late afternoon/early evening as the majority of the students had a full-time job. Most of the students had undergraduate degrees which had included only a small component on sound and had found employment in the growing field of acoustic consultancies or in the newly established environment agencies. The MSc (Acoustics) program provided the broad understanding and knowledge of acoustics required for a generation of acoustic consultants and government employees. This program continued for two decades until the University considered that, because of the small annual cohort, it was no longer financially viable.

Anita also supervised domestic and international PhD students. By the standards of today, the number was small, but at that time the total number of such higher degree students across the University sector was not high. These research students investigated topics involving community and transportation noise – for example the annoyance from the combination of road traffic and aircraft noise exposure.

3 CONTRIBUTIONS TO AND APPLICATION OF RESEARCH

Anita Lawrence maintained an active research program, presented her findings at National and International Conferences and published widely. She was awarded a number of research grants, predominantly in relation to environmental noise and especially road traffic noise. One substantial grant allowed for purchase and fit out of a mobile acoustics laboratory. This was a large truck with special shelving to lock in position the items of acoustic equipment. While sound level meters and tape recorders had internal battery supply most other acoustic equipment operated on mains power so the mobile laboratory included its own power supply. The mobile laboratory allowed for a wider range of measurements of community noise to be undertaken than were possible with the limited range of portable/battery powered equipment at that time.

The mobile laboratory allowed for a ground-breaking research project of field measurements in a test room facility near a busy road in an industrial area. These field measurements were of the acoustic performance of various window systems typically used in Australian construction and provided the important comparison with laboratory measured values. At that time, the increasing traffic volumes along streets led to more noise and a demand for retrofit systems for existing low quality window systems. The various commercial options available at the time could be fitted to the standard windows in the test facility and the effectiveness quantified. The findings from these field studies assisted with the development of improved window systems as well as feeding into guidance on building standards. While the primary intention was to measure the transmission through the façade, the field test facility comprised two rooms, so it also allowed for investigations on procedures for the measurement of field sound transmission loss. These findings contributed to the role Anita had from the late 1960s, on the committee developing Australian Standards for such measurements. She also drew upon her research findings in the area of environmental noise assessment as chair of the Standards Australia Committee which produced the first Australian Standard on Environmental Noise – the well known AS 1055. This was first released in 1973 and detailed not only measurement procedures but also provided guidance on typical noise levels based on land-use planning and time-of-day. This approach became the basis for most environmental noise regulations around Australia. AS 1055, *Description and measurement of environmental noise*, still exists today, of course substantially revised with the most recent version being adopted in 2018. It is one of the very few Australian Standards on the acoustics that continues to exist in its own right and not as an identical text adaption by Standards Australia of an ISO Standard.

Figure 1: Anita Lawrence measuring the noise outside the test facility in Alexandria, 1982 (UNSW Archives).

4 CONTRIBUTION TO THE AUSTRALIAN ACOUSTICAL SOCIETY

From Secretary of the Committee that founded the Australian Acoustical Society in 1964, Anita Lawrence undertook many roles in the management of the Society, both in Federal Council and in the NSW Division. She was the chair for a number of the early conferences that were held in NSW. She also organised workshops and other meetings, primarily on the topic of community and traffic noise.

However, it is for her activities in the international acoustics domain that the AAS owes a great debt. She had a vital role in developing the technical program for the first International Congress in Acoustics to be held in the Asia Pacific region. The Director of NAL at that time, Jack Rose, and Anita presented the bid to the ICA to host the 1980 ICA in Sydney. At that time international travel was opening up with wide bodied aircraft and, while it was still expensive, lower cost fares than in the previous decades. But imagine the task of organising such a conference at such a distance relying on postal mail with the occasional, expensive telephone call. Also consider the logistics of dealing with around 800 manuscripts which were typed on special manuscript paper which had to be sent out by post to each author. The typed manuscripts then had to be manually compiled into the proceedings. It may seem incredible now but in those days every aspect of the compilation of the proceedings and the program was done manually. For example, pagination involved manually sticking on each page a number from a long strip of numbers somewhat like a strip of small postage stamps. This ICA was well attended, around 800, and certainly enhanced the reputation of acoustics in Australia. Anita regularly attended and presented papers at ICA congresses which are held every 3 years.

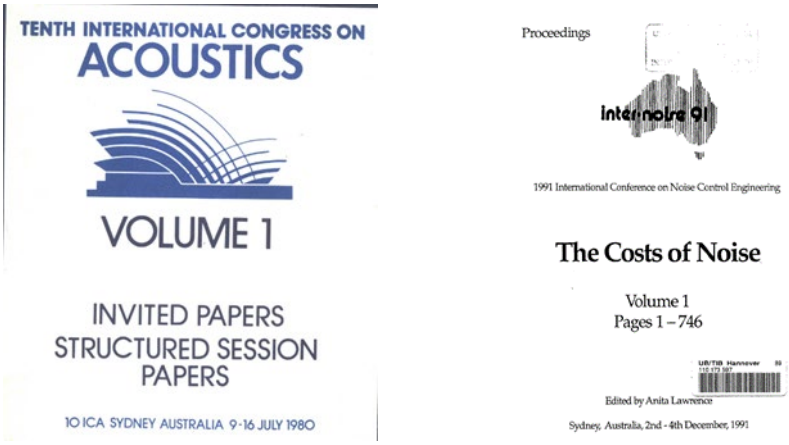

Figure 2: Cover of the ICA in 1980 (left) and the Internoise in 1991 (right).

Anita was also very involved with the International Institute of Noise Control Engineering (I-INCE), the body responsible for the annual Internoise Congress. She was the Chair of the Internoise 1991 held in Sydney at UNSW, which was the first held in the southern hemisphere and only the third held in the Asia Pacific area since the organisation started in the early 1970s. By 1991 some of the time-consuming challenges associated with organising a large conference had been overcome due to the availability of computers and fax for communications, but it was still before widespread use of email. Again, this was a successful conference and further enhanced the reputation of acoustics in Australia. Following the Internoise she was a member of the Board of I-INCE for a 3-year term and then for a further year as an honorary member.

5 CONCLUSION

The national and international status for the Australian Acoustical Society and acoustics education in Australia owes much to the contribution by Anita Lawrence over more than 30 years. But this contribution did not stop with her retirement or her death. After retirement she provided a generous grant to UNSW's Faculty of Built Environment to establish and fund the Anita Lawrence Chair in High Performance Architecture. Professor Mattheos Santamouris, a built environment expert, was appointed to this position in 2015. His area of research looks at minimising the environmental footprint of buildings through enhanced architectural design and performance evaluation, including how ventilation, lighting, acoustics, energy and water can be incorporated into buildings to improve their efficiency.

Figure 3: Anita Lawrence at the announcement in 2015 of her generous bequest of half her estate to fund the Anita Lawrence Chair in High Performance Architecture (UNSW Archives)

Anita Lawrence passed away in April 2019, and in her will bequeathed $2.3 million to be allocated to enhance teaching and research in acoustics at UNSW. The terms of this generous bequest specifically relate to aspects of acoustics in the built environment and community noise and will be used to provide scholarships to support PhD students in the UNSW School of Built Environment. The first student receiving this scholarship commenced in late 2021 on a topic involving the acoustics of city spaces/precincts where there is currently a challenge to achieve a lively, dynamic environment while complying with the regulatory framework for noise limits. It is intended that, subject to suitable candidates, at least one scholarship will be offered annually.

Her generous donation to provide for a Chair and a series of scholarships are a legacy of the pioneering role of Anita Lawrence to acoustics internationally, nationally and at UNSW.

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Montano W (2020) "Noise Abatement Actions In Australasia - 1920s and 30s" *Acoustics Australia*, 48 (2), pp 149-15

Appendix Short Listing of Publications by Anita Lawrence

Lawrence A (1968) ''Education in architectural acoustics'' *Applied Acoustics* , 1(4), pp 267-273
Lawrence A (1973) ''Vehicle Noise Measurements and Community Noise Standards'' *The Journal of the Acoustical Society of America* 53,p 305; https://doi.org/10.1121/1.1982236
Lawrence A (1977) ''Reduction of community noise levels through effective vehicle noise legislation'', *The Journal of the Acoustical Society of America* 62, S7; https://doi.org/10.1121/1.2016390
Bodsworth B., Lawrence A. (1978) ''The contribution of heavy vehicles to urban traffic noise'', Applied Acoustics, 11 (1), pp 57-65
Lawrence A, (1978),'' Noise criteria for outdoor living'' *The Journal of the Acoustical Society of America* 64, S58; https://doi.org/10.1121/1.2004279
Lawrence A, Burgess M (1980) ''Measurement of traffic noise shielding provided by buildings'' *Applied Acoustics,* 13(3) pp 211-225 https://doi.org/10.1016/0003-682X(80)90052-3
Lawrence A (1981) ''Improving the effectiveness of sound isolation building codes and regulations'' *The Journal of the Acoustical Society of America* 69, S48; https://doi.org/10.1121/1.386235
Lawrence A.B. Burgess M.A. (1982) Traffic noise and the open window *The Journal of the Acoustical Society of America* 72, S91, https://doi.org/10.1121/1.2020146
Putra, A, Lawrence, A.B. (1991) The effects of ambient noise level from road traffic on peoples responses to aircraft noise *International Conference on Noise Control Engineering*, Sydney, Australia
Lawrence A (2000) ''30-plus years of community noise standards and regulations in Australia'' *Acoustics Australia* 28(3), pp 103-104