

Biochemistry in Western Australia

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Research at the biochemical level began in Australia early in the 20th Century, at universities, medical research institutes and the Australian national science agency now titled the Commonwealth Scientific and Industrial Research Organisation (CSIRO), which was founded in 1926. The first Australian department of biochemistry was established at the University of Adelaide with the appointment of Thorburn Brailsford Robertson as Professor of Biochemistry in 1926. The Australian Biochemical Society was established in 1955, and in 1990, the Society became the Australian Society for Biochemistry and Molecular Biology (ASBMB, www.asbmb.org.au/). The majority of the membership (about 1000) work in universities and research institutes¹.

The historical origins of the development of biochemistry in Western Australia are firmly associated with the University of Western Australia (UWA). In 1946, Eric John Underwood FRS (1905–1980) was appointed Hackett Professor of Agriculture, Faculty Dean and Director of the University Institute of Agriculture. Research and teaching associated with the institute quickly exceeded University resources. Underwood successfully applied for support from CSIRO, the Wool Research Trust Fund and local industry, and additionally contributed to the formation of the Soil Fertility Research Fund (1954) and the Wheat Industry Research Committee of Western Australia (1958). He presented a 'New Deal for Agriculture' to the University's administrators, resulting in funding for research and increased postgraduate numbers.

In 1940, Underwood published a key review on trace elements in nutrition *Nutrition Abstracts and Reviews*, 9 followed by a book, *Trace Elements in Human and Animal Nutrition* (New York, 1956), which was revised in 1962, 1971 and 1977, gaining Underwood worldwide recognition. He also published the book *The Mineral Nutrition of Livestock* (Aberdeen, 1966). Colleagues commented that he never wrote his drafts in double spacing (a common technique before the widespread introduction of word processing and desktop computers) as his writing was precise requiring little room for corrections. His first draft, following minor revision, was usually his last².

Biochemistry began to develop as a standalone discipline in UWA with the research carried by Reginald "Reg" Moir who was way ahead of his time in the understanding of what is now known as the microbiome, who worked under Eric Underwood.

The development of the discipline of biochemistry in its own right came with the passage of legislation to develop a Medical School at UWA in 1955. This gave rise to the development of the pre-clinical precinct that

contained the Departments of Anatomy, Biochemistry and Physiology. Initially, Phil Scutt was seconded from Agriculture to provide the initial teaching in biochemistry for both Medical and Science undergraduate students. He remained associated with biochemistry until his retirement many years later. Foundation professors were subsequently appointed to a number of subjects, with Joe Lugg appointed to the Chair of Biochemistry. The distinctive purpose-built Biochemistry Building is currently referred to as the Curnow building, although David Curnow was accommodated at the Queen Elizabeth Medical Centre and rarely visited the building. The Biochemistry Building was very advanced for its time. It was ecofriendly in today's terms. Cool air was circulated from the basement using two large fans and circulated up through cavities in the outer walls. Outside shutters on the northern walls were adjustable to deflect the sun and many of the internal walls were not weight-bearing. This arrangement kept the building protected from the intense summer heat in Perth. Apparently, during construction there were some problems with the foundations, and the building began to list to the south which was solved by a large concrete pour to the northern side of the basement.

There was not a very harmonious relationship between the Foundation Professors of Biochemistry and Physiology, and, at one time, the Laboratory Manager of Biochemistry went into Perth and bought an enormous padlock and locked the doors between Biochemistry and Physiology. The fire brigade had to be summoned to remove the lock.

The Biochemistry Department was politically active during this period, and Professor Lugg led the student protest marches. On one occasion, he was jailed for his trouble with the students surrounding the Police watch house chanting all night "Let Lugg out of Jug". How quiet things are now.

At this time, in the 1960s up to the early 1970s, second- and third-year biochemistry undergraduate classes were combined with the classes for medical students. The third-year Science and Medical classes were split in 1972, and a few years later second-year Biochemistry was also split. Students were selected into Medicine on the basis of their first-year grades. This turned out to be a problem as it resulted in severe competition between students, with many students selecting first-year courses that were perceived to provide the best chance of obtaining a high mark. Thus the Medical School reverted to selecting students on the basis of their secondary school performance.

In 1972, Ivan Oliver, who had studied with Sir Hans Krebs in Oxford, UK, took over as Professor and Chair of



Biochemistry. This brought about a shift from the study of nutrition in humans and animals to the study of proteins and metabolism. In 1982, the Department of Biochemistry hosted the International Union of Biochemistry Conference, with Pat Stevenson as chair of the local organizing committee. This saw more than 3000 delegates on campus and at the Perth Entertainment Centre where the plenary lectures were held.

With the sudden death of Ivan Oliver in 1986, Peter Hartmann continued serving as Head, and a search for a new Chair was initiated. After an extended search period, Norman Palmer was appointed as the third Professor of Biochemistry in 1990 and led the department through a prosperous period in terms of growth, funding and research output. The Department of Biochemistry moved from the Faculty of Science to the Faculty of Medicine at this time. Under Norman Palmer's leadership, the 'Big Day Out' was initiated, which became an annual event throughout his tenure where the Department would spend a day socializing and carrying out adventurous activities at various venues around Perth.

Towards the end of the 1980s, the Department of Biochemistry, in conjunction with the Department of Microbiology, set up new units in the rapidly developing field of molecular biology, and, a few years later, added molecular genetics units to further broaden the teaching base of the Department. During this period and into the 1990s, there was a large turnover of staff, with many of the original appointments to Biochemistry retiring and being replaced by new members, including Peter Klinken, now Chief Scientist of Western Australia. With the appointment of George Yeoh and the changing research interests of the

Department, a third-year unit in cell biology was added to the units offered by the Department and was taught jointly with the Department of Physiology. Appointments of structural biologists to the Department of Biochemistry were made in the late 1990s to facilitate research in this emerging field, which remains one of the major focuses of the discipline.

The departure of Norman Palmer to James Cook University was followed by the appointment of David Day as Chair of Biochemistry in 1999 and an expansion in the area of plant biochemistry. In the mid-2000s, the Department became heavily involved in the offshore teaching programme offered in Singapore by the Faculty of Life and Physical Sciences. This programme slowly expanded to the extent that now more UWA Biochemistry Majors are graduating from the PSB Singapore campus than from Perth.

Current strengths in Biochemistry and Molecular Biology research at UWA are focused in two areas. First, in and around the Bayliss Building – a state-of-the-art hub for molecular sciences, housing the School of Chemistry and Biochemistry and the Australian Research Council Centre of Excellence in Plant Energy Biology – and within physiology, animal and plant biology, sports science and soil science. Secondly, in and around the Harry Perkins Institute of Medical Research, Lions Eye Institute and Telethon Kids Institute on the Sir Charles Gairdner Hospital campus, including microbiology, pathology and pharmacology.

Globally recognized research excellence is found in the areas of RNA biology, structural biology and enzymology, organellar proteomics and transcriptomics, epigenetics,

synthetic biology, oxidative stress, biosynthesis, mitochondrial disease, molecular genetics and membrane protein biophysics.

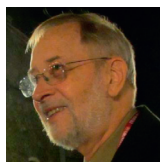
In addition to UWA, several other universities in Perth have included biochemistry as a major component of their courses, and have engaged in biochemistry-, molecular biology- and genetics-related research, including Curtin University, Murdoch University, Edith Cowan University (ECU) and University Notre Dame, Australia.

An Associateship in Medical Technology was offered by the Department of Chemistry (along with Associateships in Chemistry and Pharmacy) at Curtin University (then Western Australian Institute of Technology) in the early 1960s and was a five-year part-time course. The Associateship was recognized for admission to the Australasian Institute of Medical Technology. The Western Australian Institute of Technology began offering full degrees in 1973 and became Curtin University of Technology in January 1987. In 1968 the Associate-ship in Medical Technology was offered by the Department of Pharmacy as a three-year full-time course. In 1970, a separate Department of Medical Laboratory Technology was created. Professor John Foley was appointed Head (Kerry Cox, a Senior Tutor, was later Vice Chancellor of ECU). In 1974, the Department offered an intake into the new Bachelor of Applied Science (Medical Technology) degree. Since the formation of the School of Biomedical Sciences at Curtin University in the 1990s, the Medical Technology degree has evolved to become an accredited BSc in Laboratory Medicine. The School also delivers undergraduate courses in Molecular Genetics and Biotechnology, Human Biology, and Oral Health Therapy. The current total undergraduate full-time equivalent student load is in excess of 1000 students. Curtin University will offer a medical degree starting in 2017. Staff of the School of Biomedical Sciences will make a major contribution to the pre-clinical curriculum. The School has rapidly expanded its research in the biomedical and biological sciences, underpinned by expertise in biochemistry, molecular cell biology and genetics. The School now has an international reputation for research in cancer, molecular genetics, mammalian and human metabolism, medical microbiology and neurodegeneration. The School has made a number of recent appointments at professorial level of individuals with strong biochemical training and backgrounds including Deirdre Coombe, Marco Falasca, Ricardo Mancera, Eric Moses (joint appointment with UWA), Philip Newsholme and Fergal O'Gara. ■

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Graduating from the University of Birmingham, UK with a B.Sc. in Biochemistry in 1983, Philip Newsholme joined the Department of Biochemistry in the University of Oxford where he obtained a PhD in metabolic biochemistry in 1987. He moved to University College Dublin in 1993 to take up a lectureship in Biochemistry, where he set up a pancreatic beta cell research group and became responsible for the teaching of biochemistry to medical students. He received promotion to Senior Lecturer in Biochemistry in 2002, Associate Professor in 2007 and Head of Biochemistry in University College Dublin in September 2008. Philip Newsholme was appointed to the position of Professor and Head of School, Biomedical Sciences at Curtin University in Perth, Western Australia in September 2011. His research is currently funded by Diabetes Australia, and the NHMRC.



Professor Hartmann completed his PhD at the University of Sydney in 1967. After postdoctoral positions at NIRD in the UK, University of Pennsylvania, and University of Sydney, he was appointed to a lectureship in biochemistry at The University of Western Australia in 1972. He has been Head of Department of Biochemistry and Dean of the Faculty of Science at The University of Western Australia. His initial research interest was in lactation in dairy animals, and in 1973 commenced studies on the biochemistry and physiology of lactation in women. He has published extensively on the synthesis and secretion of milk over the entire lactation cycle of women - from conception to weaning. Over the last 51 years he has published over 200 papers in peer-reviewed journals, 21 book chapters, and 62 review papers.



Robert Tuckey graduated from the University of Western Australia with a PhD in 1980 where he studied lipid biochemistry. He then moved to Duke University, Durham, North Carolina to do post-doctoral work with Henry Kamin on the steroidogenic cytochrome P450, CYP11A1, and continued this work as a Raine Research Fellow at the University of Western Australia. He took up a lectureship in Biochemistry in 1989 and was promoted to senior lecturer in 1994. He has taught biochemistry, endocrinology and molecular biology to medical and science students. His current research involves the study of cytochrome P450s involved in the metabolism of vitamin D and is funded by the NHMRC.



Charlie Bond graduated with a PhD in protein crystallography from the University of Manchester in 1996, and postdocced with Mitchell Guss (Sydney) and Bill Hunter (Dundee) before obtaining a BBSRC David Phillips Fellowship in 2001. In 2006 he moved to a Professorial Fellowship at the University of Western Australia, where he studies protein:nucleic acid interactions, and their functions in gene regulatory complexes in eukaryotes. He loves to collaborate, to combine his expertise in crystallography, bioinformatics, biochemistry and molecular biology, with that of experts in cell biology and new biophysical techniques.

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