ASBMB: ‘down’-under the microscope

Biochemists and molecular biologists investigate all forms of life, such as viruses, bacteria, yeast, fungi, plants and animals. The field is progressing at a breath-taking rate and the possibilities of discovery continue to expand. **Professor Leann Tilley**, President of the Australian Society for Biochemistry and Molecular Biology (ASBMB) spoke to us at *Research Features* to further discuss this and how ASBMB is devoted to promoting research, new developments and education in biochemistry and molecular biology in Australia.

Progress in science is achieved through observation and experiment. Biochemistry and its close cousin, molecular biology, are experimental sciences that advance from well-thought out investigations in the laboratory. Biochemistry and molecular biology are dynamic, exciting sciences that contribute important information to biology, medicine, nutrition, agriculture, physiology, genetics, and immunology – practically all the primary specialities in the life sciences. They can be defined as the sciences concerned with the chemical basis of life as these sciences allow an understanding of how the natural world works.

Biochemists and molecular biologists are interested in the molecular functions of all living organisms, from the smallest virus to the largest whale and the ASBMB aims to help build their interest and promote their research in Australia. Led by their President Professor Leann Tilley, the ASBMB strives to promote the discipline, facilitate research, advance knowledge, and inform and advise the Australian community and government. Prof Tilley discussed with us the ASBMB’s mission and role within the world of Australian science in greater detail.

Hi Prof Tilley! How would you define your responsibilities in your current role as President of the Australian Society for Biochemistry and Molecular Biology (ASBMB)?

As the President of ASBMB, I work with the ASBMB Council and the Executive Committee to promote research, new developments and education in biochemistry and molecular biology in Australia. The Executive group works to encourage excellence in biochemistry and molecular biology and to disseminate information about biochemistry and molecular biology achievements to members of the academic, research and industry communities, and more generally to the public. The Executive group also seeks to advise Government bodies on policies relevant to biochemistry and molecular biology.

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Why was ASBMB set up and what are its founding aims and objectives?

The Society was established in 1955 as the Australian Biochemical Society. It underwent a name change to incorporate molecular biology in 1990.

ASBMB aims to:

1 Promote, support and facilitate research.
2 Advance knowledge of biochemistry and molecular biology.
3 Facilitate the dissemination of information relating to research and teaching among professional biochemists and molecular biologists and students of these sciences by means of publications, by conducting conferences, seminars and lectures at local, national and international levels, and by facilitating interactions between Australian and international biochemists and molecular biologists.
4 Advise appropriate government, industrial and educational bodies on matters relating to research and teaching in biochemistry and molecular biology.
5 Inform the Australian community about research contributions to agricultural, chemical, food, medical and pharmaceutical sciences, and promote an appreciation of the roles of biochemistry and molecular biology in the maintenance and improvement of living standards in the Australian and international communities, and in enhancing the economy through the development of innovative technology.

From a more personal perspective, which areas of biochemistry and molecular biology do you focus your research on?

My laboratory is working to understand and control malaria. We are particularly interested in how the malaria parasite alters its host red blood cells (RBCs) in ways that underpin malaria pathology, as well as how the parasite transforms itself in preparation for transmission to a mosquito vector. My lab has made significant contributions to studies of the action of and resistance to the antimalarial drug, artemisinin.

We embrace a large range of technologies, from drug and protein biochemistry to molecular cell biology and novel imaging technologies. I believe that answering the major medical and biotechnology questions of the 21st century will require convergence of the life and physical sciences, with particular reliance on advanced imaging techniques and biocomputational approaches. My lab would like to be part of the exciting developments in this area.

When ASBMB was first established back in 1955, it was known as the Australian

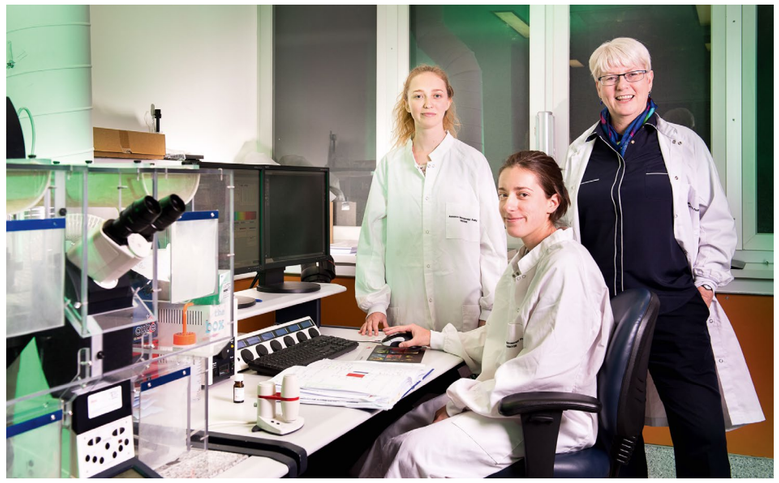
Professor Leann Tilley, President of the ASBMB.

Biochemical Society. Please can you expand on the reasoning behind the name change to incorporate molecular biology?
Biochemistry emerged as a sub-discipline from physiology in the early part of last century, as a cross-disciplinary field that uses chemical approaches to investigate physiological processes. As biochemistry developed and expanded in the early 1950s, Australian biochemists felt the need for a specialist biochemical society. Professor Rudi Lemberg established the Australian Biochemical Society and became its Foundation President in 1955. With the invention of the Polymerase Chain Reaction (PCR) technique and methods for partial automation of DNA sequencing in the 1980s, the new field of molecular biology was launched and the Society's then President, Professor Bruce Stone, led the movement to expand the name of the Society to reflect these changes.

ASBMB publishes its own educational magazine called The Australian Biochemist. What influence has this had in ensuring ASBMB's research reaches its members?
ASBMB publishes an informative scientific research and educational magazine three times a year, *The Australian Biochemist*, and it is available to our members online. *The Australian Biochemist* keeps members up-to-date with relevant scientific and discipline news in Australia and abroad. Articles provide information about new development in areas of research and technical interest to Australian biochemists and molecular biologists. It provides Society members with an introduction to new perspectives and approaches, and emerging opportunities for innovation and discovery in biochemistry and molecular biology. The magazine also profiles Award winners and provides information about developments in research funding, government research strategy and career options.

ASBMB offers several fantastic awards schemes. Why is it so important recognise biochemists and molecular biologists in this way?
A recent article published in the international science journal *Nature* points out that ~40% of research scientists work more than 60 hours in a week, compete for ever-dwindling funding, face constant criticism and rejection via the peer review system and have a highly uncertain career path.

The ASBMB awards seek to provide positive recognition and endorsement of the excellence and achievements of Australian biochemists and molecular biologists by providing competitive medals and awards for members at different stages of their scientific careers. Our awards can provide important credibility for early career researchers, thereby fostering ambition and helping forge careers paths.

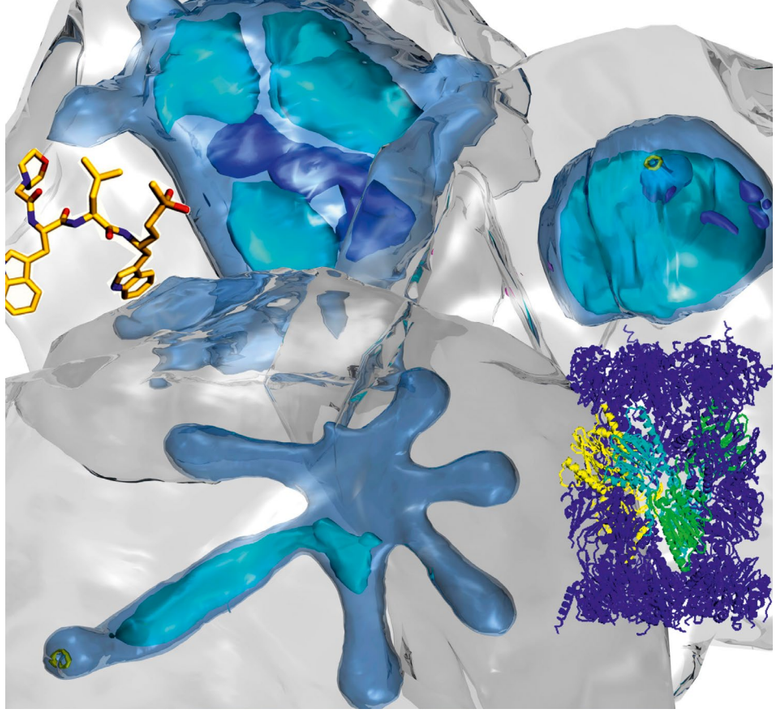


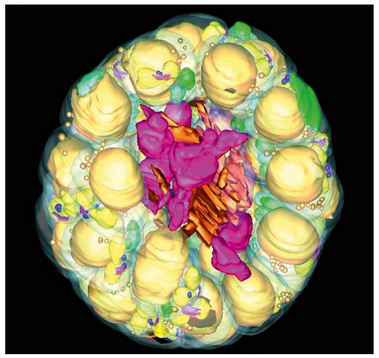
I am confident that the next decade will see biochemists and molecular biologists embrace new integrative approaches, which will change biochemistry and molecular biology from phenomenon-focused observational disciplines into a more quantitative, information-driven, holistic discipline

ASBMB also awards Travel fellowships to outstanding PhD students and postdoctoral researchers to attend international conferences and to further their scientific development by travelling to visit international colleagues.

You currently work as a Professor at the University of Melbourne, having previously served as both the Director and Deputy Director of the Australian Research Council Centre of Excellence for Coherent X-ray Science (CXS) as well. How do you think these previous roles have helped in your current role as President of ASBMB?
This CXS received international acclaim for building a tightly-knit cross-disciplinary group, for fostering cross-institutional work, for making important contributions to the development of new techniques and for implementing infrastructure that is of benefit to many colleagues. The skills I learned working with the CXS are critical to my efforts to set directions for the ASBMB, including efforts to reinvigorate the annual conference, to modernise our communication methods, to make use of social media, to seek input into government policy and to develop innovative educational resources.

Although your society's name features a more Australian focus, do you also extend your outreach to collaborate with other societies, researchers and institutions across the world?
The ASBMB has close links with the New Zealand Society for Biochemistry and Molecular Biology (NZSBMB), and NZSBMB aims to hold their annual meeting in conjunction with ASBMB every three years. The ASBMB actively participates in joint activities with the Federation of Asian and Oceanian Biochemists and Molecular Biologists (FAOBMB) and the International Union of Biochemistry and Molecular Biology (IUBMB). For example, Australia is bidding to host a joint ComBio/NZBMB/FAOBMB/IUBMB meeting in Melbourne in 2024. This represents an important opportunity to showcase Australian science to an international audience.





Above: Resistance to the antimalarial drug, artemisinin, can be overcome by co-treating parasites with an anti-cancer drug, of the proteasome-inhibitor class. Electron microscope image generated by Dr Eric Hanssen, University of Melbourne, Australia.
Left: Malaria parasite undergoing division. Electron microscope image generated by Dr Mauro Maiorca, University of Melbourne, Australia.

ComBio is ASBMB's major conference held each year. What is the significance of this and what will the conference focus on when it's run later this year?
ASBMB coordinates the national scientific conference, ComBio, run in conjunction with other societies. The programme features prominent international speakers alongside a range of high calibre Australian presenters. The meeting themes cover a wide range of topics to appeal across the spectrum of interests of biochemists and molecular biologists. At ComBio, young scientists are given a vital opportunity to present their work, and all delegates benefit from networking during scientific and social events. Attendees learn about cutting-edge technology at the trade exhibition run by ASBMB's Sustaining Industry Members.

The 2017 meeting will exemplify the broad interests of participants, with themes in: cell biology, biotechnology, stem cell biology, cell signalling, genomics, epigenetics, bioinformatics, protein biology, metabolism, education and career development. Keynote lectures will be in the areas of structural cell biology, epigenetics, cell signalling, intercellular communications, gene editing, metabolic engineering and stem cell biology.

How do you see the landscape for biochemistry and molecular biology changing over the next five to ten years? Are there any areas that we should be feeling particularly excited about?
Large-scale research endeavours, such as the Genome and Proteome projects, are yielding an enormous wealth of biometric information about living organisms. However, it is becoming clear that many pieces of the puzzle of life are still missing. We are far from understanding the complexity of cellular machinery – let alone whole organisms. It is increasingly evident that answering the major biology and biotechnology questions of the 21st century will require the integration of insights from many different approaches.

Molecular bioscientists are now working to integrate data from a range of technologies to understand cellular organisation at an unprecedented level. I am confident that the next decade will see biochemists and molecular biologists embrace new integrative approaches, which will change biochemistry and molecular biology from phenomenon-focused observational disciplines into a more quantitative, information-driven, holistic discipline.

A recent revolutionary development has made it possible to determine the 3D structures of proteins using a technology called Single Particle Cryo-EM. As Richard Feynman (Nobel Prize in Physics) said: "It is very easy to answer many fundamental biological questions; you just look at the thing!" CryoEM is transforming the way protein structures are determined, providing a capability that was beyond imagination only a few years ago.

Another revolution is being built on new techniques for gene editing, such as CRISPR, which will make enormous advances in health care and AgriBioscience possible, and develop innovative bioengineering, biomedical, agri-food and biomaterials products.

• If you have any enquiries about the ASBMB, the Australian Biochemist magazine or would like to find out more about ASBMB membership and upcoming meetings, please visit their website at https://www.asbmb.org.au/.

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