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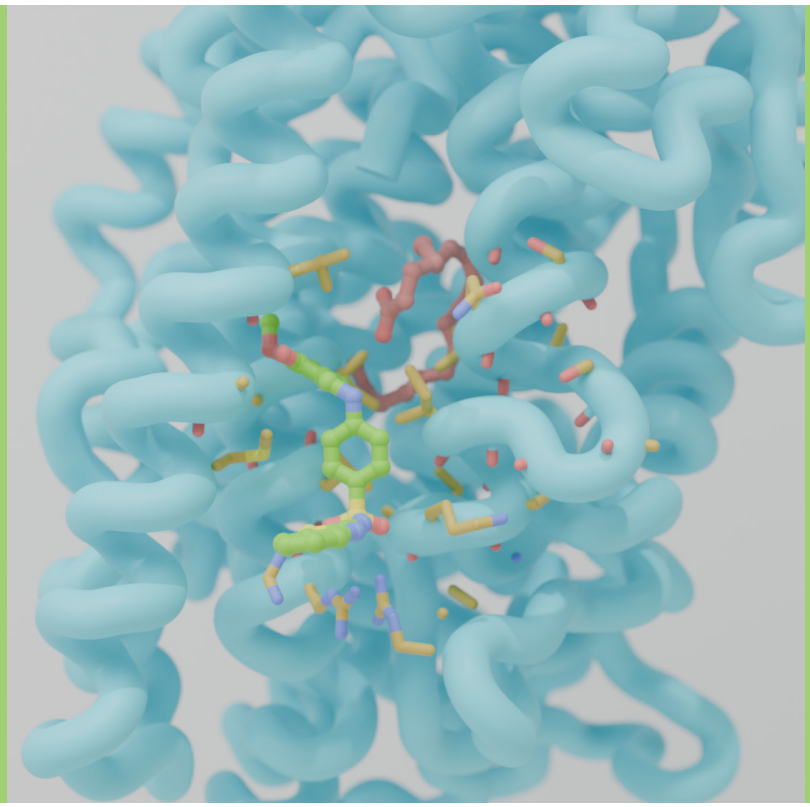

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Cryo-EM structure of 12-LOX (blue) with the inhibitor ML355 (green) bound to an allosteric site. Created in Blender MolecularNodes. Image courtesy of Jesse Mobbs, Monash Institute of Pharmaceutical Sciences, Monash University.

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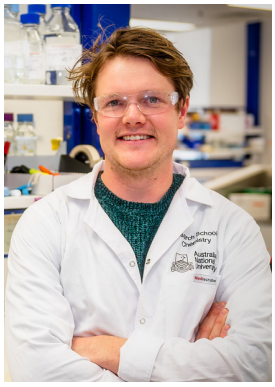

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Sugar Decorations Alter Proteolysis of Cortisol Carrier Protein

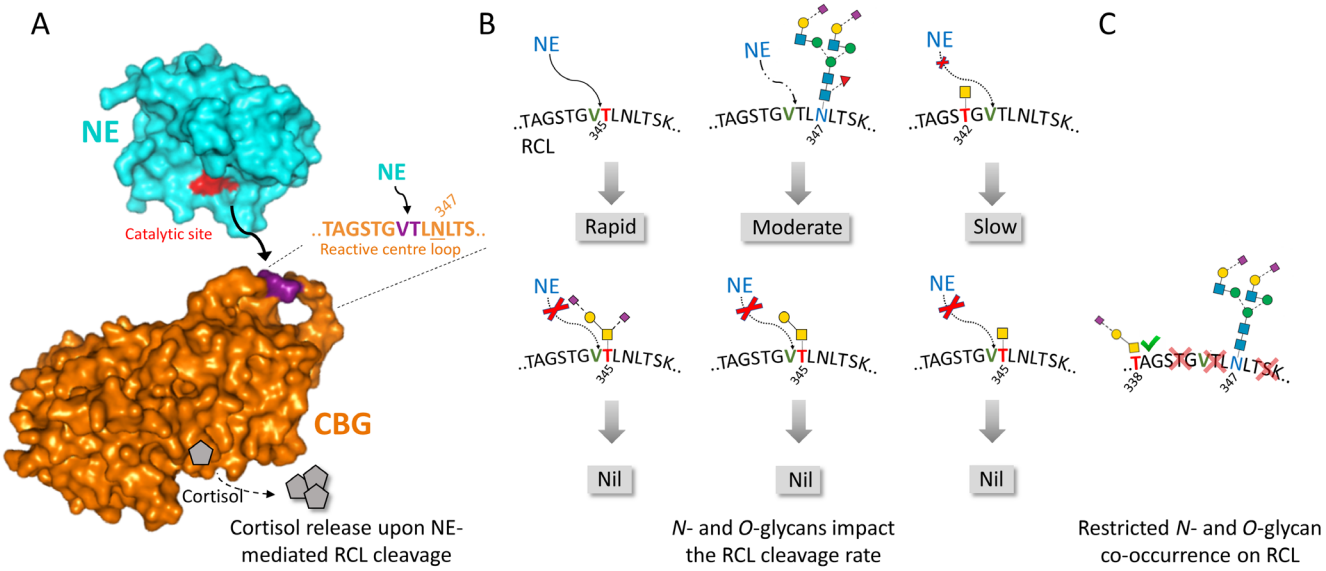
Chernykh A, Abrahams JL, Grant OC, Kambanis L, Sumer-Bayraktar Z, Ugonotti J, Kawahara R, Corcilius L, Payne RJ, Woods RJ, Thaysen-Andersen M*. Position-specific *N*- and *O*-glycosylation of the reactive center loop impacts neutrophil elastase-mediated proteolysis of corticosteroid-binding globulin. *J Biol Chem* 2024;300(1):105519.
***Corresponding author: morten.andersen@mq.edu.au**

Pro- and anti-inflammatory processes are tightly controlled within our immune system to maintain homeostasis. Corticosteroid-binding globulin (CBG) is a key glucocorticoid carrying protein that binds and transports anti-inflammatory cortisol in the blood circulation, and contributes to the timely and tissue-specific delivery of cortisol to sites of inflammation.

CBG features a characteristic reactive centre loop (RCL) that serves as a target for several potent proteases including neutrophil elastase (NE) present at inflammatory sites. Cleavage of the RCL leads to profound conformational changes of CBG involving irreversible destruction of the cortisol-binding site, reduced cortisol binding affinity and, consequently, cortisol liberation from CBG (**Fig. A**).

CBG harbours six *N*-glycosylation sites, including at Asn347 located within the exposed RCL region. We have previously produced data to suggest that the Asn347-glycans impact the RCL cleavage reaction by conferring steric hindrance of the RCL cleavage site, yet the relationship between RCL glycosylation, loop cleavage and cortisol release remains incompletely understood.

To this end, we set out to characterise the structure–function relationships of the glycosylated RCL region of CBG from human donor serum using comprehensive



*(**A**) Release of cortisol upon neutrophil elastase (NE, cyan)-mediated cleavage of the reactive centre loop (RCL) of corticosteroid-binding globulin (CBG, orange). Key residues of the RCL are shown.*
*(**B**) Impact of the* N- *and* O*-glycan structures and their position on the relative RCL cleavage rate as documented in this study.*
*(**C**) RCL* O- *and* N*-glycan co-occurrence was exclusively found between Thr338 and Asn347, an experimental observation that was supported by molecular modelling.*
Figure from the Journal of Biological Chemistry *2024;300(1):105519 with permission from Elsevier.*

glycoprofiling approaches in combination with advanced molecular modelling (in collaboration with the Woods' lab, CCRC), *in vitro* glycosylation assays, and longitudinal cleavage assays of recombinant CBG (rCBG) and synthetic RCL *O*-glycopeptides kindly provided by the Payne lab (University of Sydney).

Firstly, we used mass spectrometry-based characterisation strategies to define, with high structural resolution, the *N*-glycans positioned at Asn347 of serum CBG. Guided by the elucidated Asn347-glycans, we performed molecular dynamics (MD) simulations of a CBG-NE complex to explore how specific features of the Asn347-glycans impact RCL proteolysis. Our experimental and *in silico* analyses confirmed that key volume-enhancing features (core fucosylation, antennary branching) of the Asn347-glycans are inhibiting the RCL cleavage rate.

Excitingly, our comprehensive CBG glycoprofiling data also revealed a previously unknown presence of *O*-glycosylation (sialyl T, disialyl T) across four RCL sites (Thr338, Thr342, Thr345, Ser350). One such site (Thr338) demonstrated an interesting *O*-glycan co-occurrence with an Asn347-linked *N*-glycan. Providing a plausible explanation for the co-occurrence, in silico modelling of a CBG-GalNAc-T2 complex showed that Asn347 is only able to accommodate a bulky *N*-glycan when GalNAc-T2 is aligned to Thr338. These *in silico* observations provide molecular-level clues to the restricted *O*- and *N*-glycan co-occurrence pattern experimentally observed for serum CBG.

To investigate the GalNAc-T isoenzyme(s) responsible for the newly-discovered RCL *O*-glycosylation of serum CBG, we asked if GalNAc-T2 and GalNAc-T3 transfer *O*-glycans to a synthetic RCL peptide. GalNAc-T2 and GalNAc-T3 are highly expressed in liver and gall bladder, respectively, two principal tissue origins of CBG. Interestingly, both GalNAc-T isoenzymes demonstrated an ability to transfer GalNAc to multiple RCL sites, indicating that GalNAc-T2 and GalNAc-T3 may facilitate the RCL *O*-glycosylation of serum CBG.

Focusing on the Thr345 *O*-glycosylation site strategically located within the NE cleavage site, we then set out to test if the newly identified RCL *O*-glycosylation influences the NE cleavage reaction. We used LC-MS/MS to longitudinally monitor the proteolysis reaction of both a native and an asialylated variant of rCBG, which carries almost exclusively Thr345 *O*-glycosylation on the RCL. The data revealed that both sialylated and asialylated *O*-glycans at Thr345 strongly inhibit the NE proteolysis reaction, while non-glycosylated RCL is rapidly cleaved by NE. Recapitulating the cleavage data, MD simulations of a NE-RCL complex indicated that both elongated and ultra-short *O*-glycans at Thr345 strongly interfere with the accessibility of NE to the RCL substrate consequently disrupting the cleavage process.

Finally, we explored the relationship between the newly discovered RCL *O*-glycosylation events and loop cleavage using NE-based digestion experiments of synthetic RCL peptides with and without *O*-glycosylation at Thr342 or Thr345. Longitudinal monitoring by MALDI-MS documented that the non-glycosylated RCL peptide was cleaved within seconds while the RCL peptides with *O*-glycans at Thr342 and Thr345 conferred moderate and strong protection against NE cleavage over several minutes. Collectively, the longitudinal cleavage experiments uncovered previously unknown relationships between the site-specific *O*-glycans of the RCL and their protection against NE-mediated cleavage.

In summary, we report on the structure-function relationship of complex RCL *N*- and *O*-glycosylation patterns of serum CBG with a focus on RCL cleavage and cortisol release. The study has unveiled novel *N*- and *O*-glycosylation events with site-specific resolution and demonstrated their intricate relationships and biological importance in the context of NE-mediated proteolysis (**Fig. B,C**). Our study contributes to an improved understanding of mechanisms governing cortisol delivery to sites of inflammation, and highlights the complex nature of how glycosylation contributes to CBG-guided delivery of cortisol to inflamed tissues.

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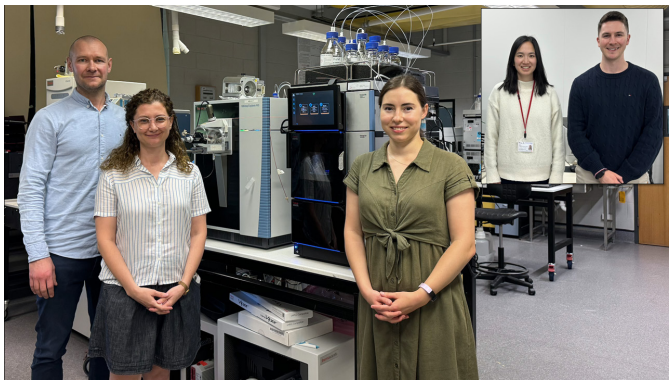
Morten Thaysen-Andersen
School of Natural Sciences, Macquarie University



From left: Morten Thaysen-Andersen, Zeynep Sumer-Bayraktar and Anastasia Chernykh. Insert: Rebeca Kawahara and Julian Ugonotti.

Publications with Impact

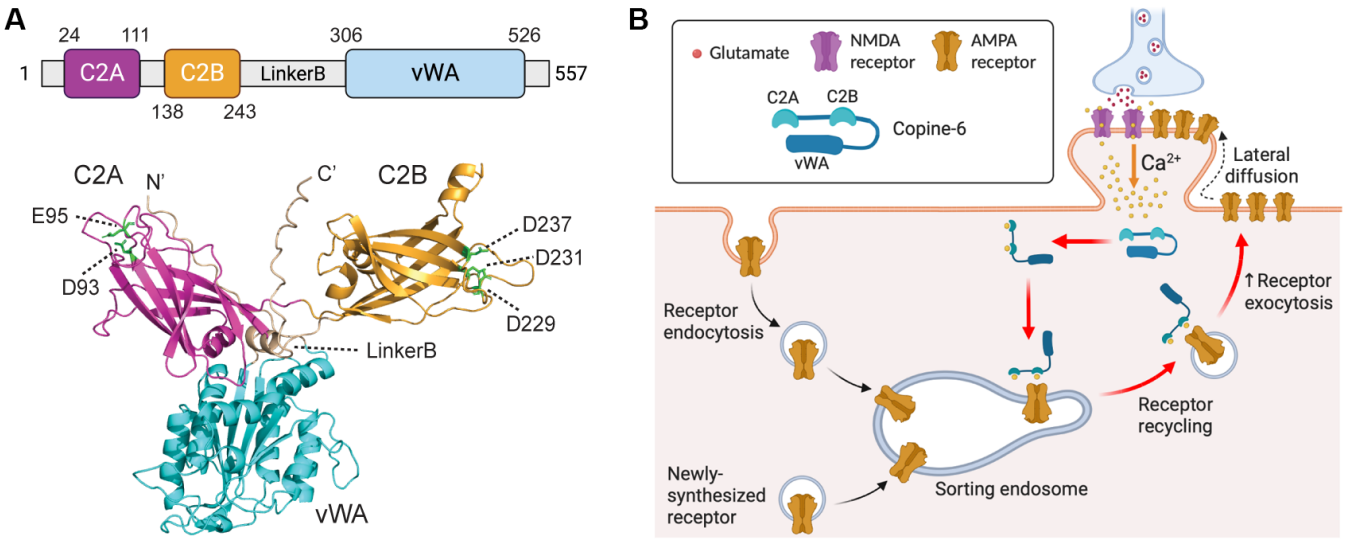
A Neuronal Protein That Senses Calcium Influx During Synaptic Strengthening

Tan JZA#*, Jang SE#, Batallas-Borja A, Bhembre N, Chandra M, Zhang L, Guo H, Ringuet MT, Widagdo J, Collins BM, Anggono V*. Copine-6 is a Ca^{2+} sensor for activity-induced AMPA receptor exocytosis. *Cell Rep* 2023;42(12):113460.
#Contributed equally to this work
***Corresponding authors: v.anggono@uq.edu.au, anson.tan@uq.edu.au**

Efficient communication between neurons is essential for fast processing and transmission of cellular signals in the brain. Excitatory neurotransmission in the mammalian central nervous system is mediated by the binding of the neurotransmitter glutamate to the α-amino-3-hydroxy-5-methyl-4-isoxazole propionic acid (AMPA) receptors. The ability of neurons to modulate their synaptic strength (termed synaptic plasticity) is critical for learning and memory formation. During long-term potentiation (LTP), a form of synaptic plasticity that strengthens neuronal circuits associated with learning and memory, calcium (Ca^{2+}) ions enter the dendrite of postsynaptic neurons and trigger rapid recruitment of AMPA receptors to the neuronal plasma membrane and synapses (the points of contact between neurons). One of the major questions in the field is how Ca^{2+} regulates the activity-dependent insertion of AMPA receptors into the neuronal postsynaptic membrane.

The fusion of AMPA receptor-containing vesicles with the postsynaptic membrane is mediated by the soluble N-ethylmaleimide sensitive factor-attachment protein receptor (SNARE) complex. Previously, work from the Südhof and Malenka labs (*Nature* 2017;544(7650):316-321) identified two SNARE-associated proteins, synaptotagmin-1 (Syt-1) and synaptotagmin-7 (Syt-7), as functionally redundant Ca^{2+} sensors that mediate AMPA receptor exocytosis during LTP. However, these two proteins have vastly different Ca^{2+} binding profiles and are localised predominantly in the presynaptic nerve terminals (Syt-1) and axonal plasma membranes (Syt-7). Thus, we argued for an alternative postsynaptic SNARE-associated Ca^{2+}-binding protein that regulates AMPAR exocytosis during synaptic potentiation.

In our study, we considered the neuronal-specific, cytosolic Ca^{2+}- and phospholipid-binding protein, Copine-6, as a candidate postsynaptic Ca^{2+} sensor



*(**A**) Domain structure (top) and the AlphaFold predicted structure (bottom) of Copine-6, depicting the N-terminal C2A (magenta) and C2B (orange) Ca^{2+}-binding domains and the vWA domain (cyan). The C2A (D93N and E95A) and C2B (D229N, D231N and D237N) Ca^{2+}-binding mutants appear in green.*

*(**B**) A proposed working model for the role of Copine-6 as the postsynaptic Ca^{2+} sensor. Activation of the NMDA-type glutamate receptor during synaptic potentiation mediates the flux of Ca^{2+} into the postsynaptic compartment. Copine-6 senses and binds Ca^{2+}, triggering a conformational change that enhances its interaction with GluA1 via its C2 domains and concomitant translocation to the Rab11b-positive endosomes. Consequently, Copine-6 promotes the forward trafficking of AMPA receptors from the sorting/recycling endosome towards the plasma membrane during synaptic potentiation.*

Figure panels from Cell Reports *2023;42:113460 (CC-BY-NC-ND license).*

for AMPA receptor exocytosis for several reasons. First, Copine-6 localises in the dendrites and is highly expressed in excitatory neurons of the adult mouse hippocampus, a brain region that is critical for learning and memory. Second, Copine-6 binds to components of the SNARE complex in a Ca^{2+}-dependent manner. Third, Copine-6 expression can be upregulated in response to heightened neuronal activity. More importantly, Copine-6 knockout mice display deficits in hippocampal LTP, learning and memory.

To test our hypothesis, we first performed pull-down assays and found that Copine-6 interacts with the carboxyl-terminal tail of the GluA1 subunit of AMPA receptors via the C2 domains. Using the proximal ligation assay, we also observed a robust interaction between GluA1 and Copine-6 in the soma and dendrite of primary hippocampal neurons, which was further enhanced following synaptic potentiation. This process requires direct binding of Ca^{2+} to the C2 domain of Copine-6. We next assessed the role of Copine-6 in regulating the surface expression of AMPA receptors on the neuronal plasma membrane. Loss of Copine-6 expression did not affect the steady-state expression of surface AMPA receptors under basal conditions but specifically inhibited activity-induced exocytosis of GluA1-containing AMPA receptors during synaptic potentiation in neurons. Re-expression of wildtype Copine-6 fully restored activity-dependent AMPA receptor insertion to the plasma membrane; however, the Ca^{2+}-binding defective mutants failed to do so. Interestingly, we found that Copine-6 translocated from the cytosol to the recycling endosomes and the plasma membrane upon neuronal stimulation in a Ca^{2+}-dependent manner.

How could we then reconcile our results with the previous work on Syt-1 and Syt-7? As the major Ca^{2+} sensors of presynaptic neurotransmitter release, the loss of Syt-1 and Syt-7 severely impairs neuronal firing. The fact that Copine-6 expression is regulated by neuronal activity prompted us to investigate the level of Copine-6 protein in Syt-1/Syt-7 double knockdown neurons. Indeed, the simultaneous depletion of Syt-1 and Syt-7 caused a significant downregulation in the level of Copine-6 protein expression. Importantly, overexpression of the Copine-6 wildtype, but not the Ca^{2+}-binding defective mutants, completely restored the activity-induced exocytosis of AMPA receptors in Syt-1/Syt-7 double knockdown neurons. Thus, the reduction of Copine-6 expression may account for the apparent impairment of AMPA receptor exocytosis during synaptic potentiation in the absence of Syt-1 and Syt-7. Furthermore, we could not detect any proximal interaction between Syt-1 and either GluA1 or Copine-6 in primary hippocampal neurons. Therefore, we conclude that Copine-6 is a postsynaptic Ca^{2+} sensor that mobilises AMPA receptors from the recycling endosomes for plasma membrane insertion during synaptic potentiation.

Victor Anggono and Anson Tan
Clem Jones Centre for Ageing Dementia Research
Queensland Brain Institute
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From left: Jing Zhi (Anson) Tan, Se Eun (Joanne) Jang and Victor Anggono.

A Snapshot Into the Conformational States and Small Molecule Binding of 12-Lipoxygenase

Mobbs JI, Black KA, Tran M, Burger WAC, Venugopal H, Holman TR, Holinstat M, Thal DM*, Glukhova A*. Cryo-EM structures of human arachidonate 12S-lipoxygenase bound to endogenous and exogenous inhibitors. *Blood* 2023;142(14):1233–1242.
***Corresponding authors: glukhova.a@wehi.edu.au, david.thal@monash.edu**

Lipoxygenases (LOXs) are a class of enzymes that catalyse the dioxygenation of polyunsaturated fatty acids, converting them into signalling molecules with wide-reaching roles and implications. In humans, 12S-lipoxygenase (12-LOX/ALOX12) catalyses the dioxygenation of arachidonic acid into a proinflammatory oxylipin (12S-HpETE), making 12-LOX an important drug target for thrombosis, heparin-induced thrombocytopenia (HIT) and some cancers. Recently, ML355, a selective 12-LOX inhibitor, went into Phase 2 clinical trials for HIT. However, drug discovery at 12-LOX has been limited, in part due to a need for more structural information on this enzyme. Traditionally, X-ray crystallography is used for LOX

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structural determination. However, this approach can be challenging due to the dynamic and heterogeneous nature of LOXs, and has often required protein modifications or inhibitors to succeed. In this study, we turned to single-particle cryo-electron microscopy (cryo-EM) to determine the first structures of human 12-LOX (1.7–2.8 Å) in the presence of ML355.

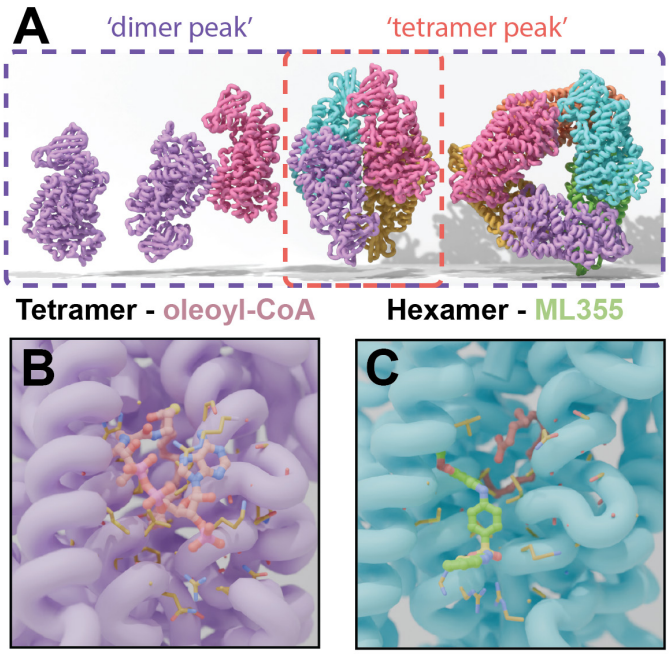
We expressed human 12-LOX in HEK293 cells and separated what appeared to be dimeric and tetrameric forms by size-exclusion chromatography (SEC), and subjected both samples to cryo-EM. Unexpectedly, the 'dimeric' peak was comprised of multiple oligomeric forms and gave rise to structures of monomeric (2.8 Å), dimeric (2.5 Å), tetrameric (2.3 Å) and hexameric (2.6 Å) 12-LOX, while the 'tetrameric' peak yielded a single tetrameric 12-LOX structure (1.8 Å). Fascinatingly, different oligomeric forms represented 12-LOX bound to different small molecules and in different conformational states.

The 12-LOX hexamer was the only oligomeric form bound to ML355. Contrary to previous computational studies, proposing that ML355 binds directly within the active site, we observed that ML355 binds to the entrance of the active site, exerting allosteric inhibition on 12-LOX activity.

The 12-LOX tetramer was bound to a fatty acyl-coenzyme A (CoA) ester (oleoyl-CoA) co-purified from HEK293 cells. We confirmed that oleoyl-CoA inhibits 12-LOX in the micromolar range and could be an endogenous inhibitor of 12-LOX, consistent with previous findings that medium-chain fatty acyl-CoA esters inhibit lipoxygenase activity in platelets.

The 12-LOX dimer structure was unique because the two subunits adopted different conformations – an 'open' and a 'closed'. These confirmations were defined based on the accessibility of the active site to the solvent. Only the 'open' conformation had a molecule occupying its active site, while the 'closed' subunit was empty. A similar state has been seen at other LOXs and might represent a snapshot of the 12-LOX catalytic site when only one of the subunits is performing catalysis.

Our work relied on cryo-EM for both structure determination and separating different states of the enzyme. Not only were we able to determine four high-resolution structures from a single grid, but cryo-EM was instrumental in improving the resolution and identifying acyl-CoA in 12-LOX tetramers by separating subunits with different acyl-CoA occupancy.



*(**A**) Cryo-EM structures from dimer peak in purple box and tetramer peak in red box.*
*(**B**) Oleoyl-CoA binding site.*
*(**C**) ML355 binding site.*
*Images **B** and **C** created in Blender MolecularNodes.*

Our work provided unexpected insights into 12-LOX oligomerisation, conformational change and inhibition by endogenous fatty acyl-CoAs. However, future studies are needed to understand the biological relevance of our observations. Meanwhile, the structural characterisation of ML355 binding will hopefully facilitate drug discovery efforts for next-generation anti-platelet drugs.

Jesse Mobbs
Monash Institute of Pharmaceutical Sciences
Monash University
Alisa Glukhova
Walter and Eliza Hall Institute of Medical Research and University of Melbourne

From left: Jesse Mobbs, Katrina Black, Michelle Tran, Wessel Burger, Hariprasad Venugopal, Theodore Holman, Michael Holinstat, David Thal and Alisa Glukhova.

Pathogens Induce Pro-survival Proteins to Modulate the Host Inflammatory Response

Speir M[#], Tye H[#], Gottschalk TA[#], Simpson DS, Djajawi TM[‡], Deo P[‡], Ambrose RL, Conos SA, Emery J, Abraham G, Pascoe A, Hughes SA, Weir A, Hawkins ED, Kong I, Herold MJ, Pearson JS, Lalaoui N, Naderer T[§], Vince JE[§], Lawlor KE*. A1 is induced by pathogen ligands to limit myeloid cell death and NLRP3 inflammasome activation. *EMBO Rep* 2023;24(11):e56865.

[#,‡,§] Contributed equally to this work

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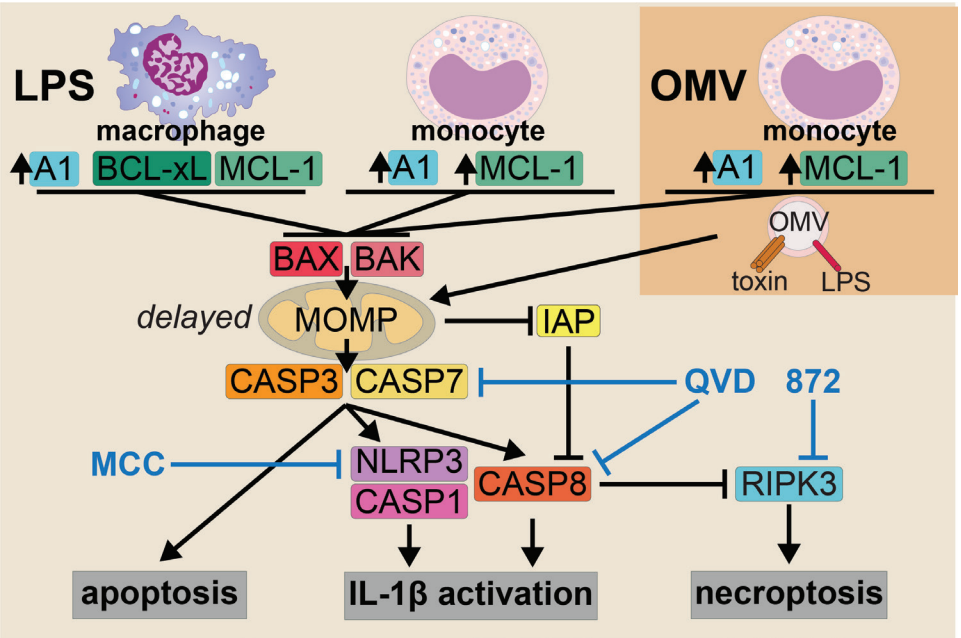
Intrinsic, or mitochondrial, apoptosis is a BCL-2 family regulated form of programmed cell death that is instrumental for the phagocytic clearance of stressed, damaged or infected cells. Triggered by various cellular stressors, activation of mitochondrial pore-forming effectors BAX and BAK commit the cell to death by causing mitochondrial outer membrane permeabilisation (MOMP). MOMP then triggers a signalling cascade that culminates in executioner caspase-3 and -7 activity and cellular breakdown. BAX/BAK activation is triggered by the induction of pro-apoptotic BH3-only proteins (e.g., BIM, NOXA, PUMA) that antagonise the activity of pro-survival members, including BCL-2, BCL-xL, BCL-w, MCL-1 and BCL2A1 (A1; BFL-1 in humans). Until recently, apoptosis has been considered 'immunologically silent'. However, work by our groups and others has demonstrated crosstalk between intrinsic apoptosis and the NLRP3 inflammasome complex in macrophages. However, the regulation of this process has not been fully elucidated and its role in the context of infection is unclear. Therefore, we sought to investigate how pathogen exposure may regulate intrinsic apoptosis and inflammatory responses in myeloid cells.

Our past work has shown genetically and chemically that macrophage survival is largely dependent on the pro-survival proteins BCL-xL and MCL-1. However, we also observed that exposure of macrophages to Gram-negative bacteria-derived lipopolysaccharide (LPS), prior to apoptosis induction using BH3-mimetic drugs targeting BCL-xL and MCL-1, delayed apoptosis and limited NLRP3 inflammasome activity and IL-1β secretion. This suggested that LPS transiently induces another survival factor in macrophages that can modulate their inflammatory capacity. We identified through transcriptomics that LPS potently induces the expression of the short-lived pro-survival molecule A1 in macrophages and confirmed its transient nature at the mRNA and protein level.

We next sought to validate whether LPS-induced A1 expression delays macrophage death and inflammatory responses using A1-deficient mice. Exposure of LPS-primed A1-deficient macrophages to MCL-1 and BCL-xL antagonists induced rapid cell death and enhanced IL-1β release compared to wildtype cells. A1-deficient macrophages exhibited earlier and more robust apoptotic caspase activity, as well as signs of NLRP3 inflammasome and IL-1β activation. Inhibition



A1 induced by bacterial components (LPS, OMVs) delays intrinsic apoptosis and restricts both NLRP3-dependent and caspase-8-mediated IL-1β activation in macrophages and monocytes.
Figure adapted from EMBO Rep *2023;24(11):e56865 (CC-BY license).*

of NLRP3 only partially moderated IL-1β activation and release in A1-deficient macrophages, with dual inhibition of NLRP3 and apoptotic caspases required to completely block this response, supporting our prior work showing that caspase-8 can also cleave and activate IL-1β.

Finally, we assessed the influence of A1 on inflammatory monocyte cell death responses upon pathogen sensing. We confirmed that inflammatory monocytes upregulate A1 expression in response to LPS, albeit more transiently than macrophages. Similarly, A1-deficiency also rendered LPS-primed monocytes sensitive to early apoptotic cell death associated with significant IL-1β release. Although in this scenario, only MCL-1 targeting was required for BAX/BAK activation. Remarkably, exposure of A1-deficient monocytes to outer membrane vesicles secreted from the Gram-negative bacteria *Neisseria gonorrhoeae* (NOMVs), which target mitochondria to induce apoptosis, also triggered enhanced monocyte death and NLRP3 inflammasome- and caspase-8-dependent IL-1β activation. Importantly, A1-deficiency also exaggerated systemic IL-1β responses to acute *in vivo* NOMV challenge. Collectively, these findings show that Gram-negative bacteria can induce A1 in myeloid cells to prolong their survival and reduce their inflammatory potential; likely as a mechanism to evade the host immune response. Our work also highlights the potential to develop host cell death-directed antimicrobial therapies as a novel approach to combat emerging antibiotic resistant bacteria.

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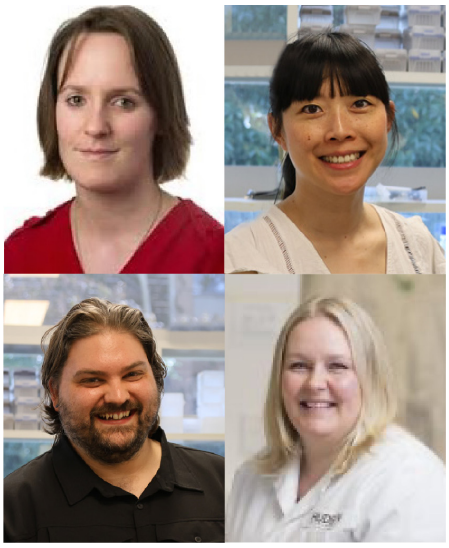

Clockwise from top left: Mary Speir, Hazel Tye, Kate Lawlor and Timothy Gottschalk.

Boosting SIRT2 Levels Won't Make You Live Longer

Wu LE*, Fiveash CE, Bentley NL, Kang MJ, Govindaraju H, Barbour JA, Wilkins BP, Hancock SE, Madawala R, Das A, Massudi H, Li C, Kim LJ, Wong ASA, Marinova MB, Sultani G, Das A, Youngson NA, Le Couteur DG, Sinclair DA, Turner N*. SIRT2 transgenic over-expression does not impact lifespan in mice. *Aging Cell* 2023;22(12):e14027.
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The sirtuin family of NAD^+-dependent deacylase enzymes have received significant attention due to their roles in a diverse range of processes, including epigenetic regulation, DNA repair and metabolic homeostasis. In mammals, there are seven sirtuin isoforms (SIRT1-7), which vary in their subcellular distribution and enzymatic activity. SIRT1 is the best characterised isoform in mammals, in part because of the identification of small allosteric activators for SIRT1 that have shown therapeutic potential in preclinical animal models.

Initial interest in the sirtuin proteins was sparked by the description of a role for Sir2 in the regulation of yeast replicative lifespan. The story, however, is much less clear with regards to the effects of mammalian sirtuins on lifespan. For example, while a role has been ascribed to SIRT6 in regulating mammalian ageing, whole-body transgenic over-expression of SIRT1 in mice does not increase lifespan, but SIRT1 over-expression restricted to the hypothalamus does lead to lifespan extension.

SIRT2 is another member of the sirtuin family that has been linked with a number of different physiological and pathological processes. SIRT2 has well-studied substrates, including glucose-6-phosphate dehydrogenase, isocitrate dehydrogenase 1 and tubulin. Another target of SIRT2 is the kinetochore attachment protein BubR1, which is involved in maintaining accurate chromosome segregation during mitosis to prevent cellular senescence during ageing. BubR1 over-expression increases lifespan, while BubR1 under-expression leads to accelerated onset of age-related pathologies and shortened overall lifespan. SIRT2 stabilises BubR1 protein, and previous work showed that SIRT2 over-expression in the progeroid mouse strain of BubR1 under-expression partially rescued the lifespan of male, but not female animals. This suggested a potential role for SIRT2 in mammalian longevity, which was also supported by research from our group demonstrating that elevating SIRT2 expression on a non-progeroid C57BL6 background could delay reproductive ageing and extended the period of functional fertility.

Publications with Impact

Using animals globally overexpressing SIRT2 on a C57BL6 background, we sought to examine the impact of elevating SIRT2 protein on health and lifespan in both male and female mice. Additionally, we also examined lifespan under the effect of high fat diet (HFD) induced obesity in male mice, an intervention that accelerates age-related pathologies and reduces lifespan. In contrast to the effects in the BubR1 hypomorph mouse model, SIRT2 over-expression had no effect on lifespan in chow-fed male mice, with a median survival of 869 days in wildtype animals compared to 862 days in SIRT2-Tg mice. Male mice fed the HFD lived approximately 140 days shorter than those on a chow diet, with no significant difference between the wildtype and SIRT2 transgenic mice. The overall lifespan was slightly shorter in females on a chow diet (~790 days), but there was again no influence of SIRT2 over-expression.

In addition to examining lifespan, we were also interested in characterising aspects of physiology and metabolism in separate cohorts of animals as they aged, including motor coordination, mitochondrial function, bone health and fertility. Across the groups of animals examined at 6, 12 and 18 months, there was limited effect of SIRT2 over-expression on body composition, glucose homeostasis measured by a glucose tolerance test, or the respiratory function of mitochondria isolated from liver. SIRT2 has been extensively studied in relation to neurodegenerative diseases and brain metabolism and to explore this we traced the metabolism of ^{13}C isotope labelled glucose and acetate into the cerebral cortex of SIRT2-Tg and wildtype littermates measuring both ^{13}C label incorporation and total metabolite levels using ^{1}H and ^{13}C NMR spectroscopy. We observed minimal impact of SIRT2 over-expression on ^{13}C label incorporation, but did find increases in the total levels of several metabolites in SIRT2 transgenic brain, including alanine, aspartate, ATP, creatine, GABA, glutamine, lactate, myo-inositol and *N*-acetyl-aspartate. Given the possible changes in brain metabolism and the previous work hinting at a role for SIRT2 in locomotion, animals were also subjected to the accelerating rotarod test to assess their motor coordination in ageing. No impact of SIRT2 over-expression on rotarod performance was observed in any group. Our final measures involved assessment of bone health and sperm function in males, as both of these parameters are greatly influenced by ageing. In line with other findings, we observed no significant impact of SIRT2 over-expression.

Collectively, our study showed that under standard laboratory conditions, over-expression of SIRT2 protein had minimal impact on lifespan and age-related health in mice. These findings add to the expanding literature on the role of different mammalian sirtuins in the regulation of metabolism, health and longevity. There is now also substantial interest in this field in exploring novel ways of modulating the levels of NAD^+, the obligate co-substrate for sirtuin enzymes, as an alternate means of impacting SIRT-dependent pathways.

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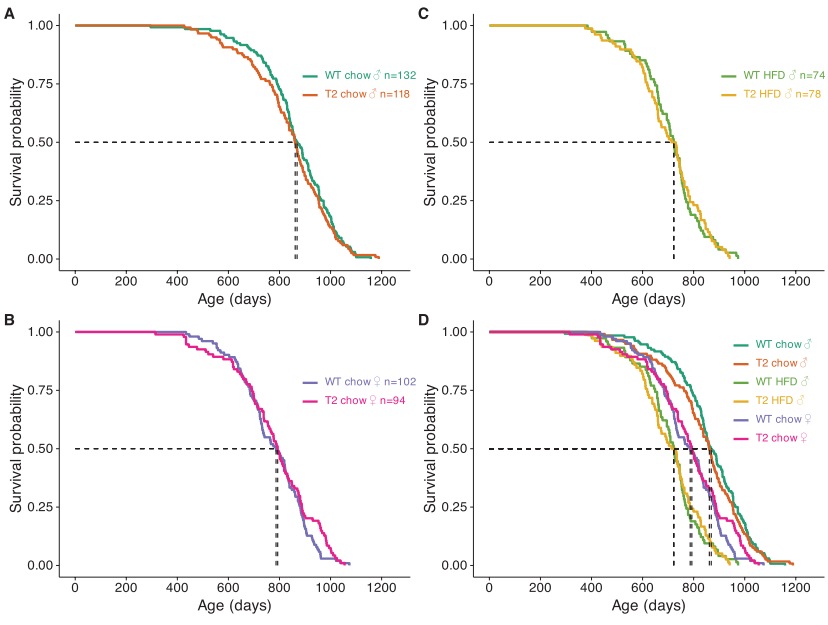

E

Sex, diet	Median lifespan in days (95% CI) WT	T2	Hazard ratio	95% CI
Male chow	869 (844, 912)	862 (837, 885)	0.91	0.71, 1.17
Male HFD	723 (695, 749)	722 (663, 747)	0.99	0.72, 1.37
Female chow	786 (733, 825)	793 (760, 831)	1.17	0.88, 1.55

From left: Lindsay Wu and Nigel Turner.

*Kaplan-Meier survival curves for wildtype (WT) and SIRT2-Tg (T2) mice separated into (**A**) male and (**B**) female mice on a standard chow diet, and (**C**) males fed a high-fat diet (HFD), with all data combined in panel (**D**). Dotted lines indicate median survival, also shown in (**E**) with hazard ratios and 95% confidence intervals. Figure from* Aging Cell *2023;22(12): e14027. (CC-BY license).*

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ASBMB Education Feature

The ASBMB Education Feature is coordinated by Tracey Kuit (tracey_kuit@uow.edu.au) and Amber Willems-Jones (amber.willems@unimelb.edu.au).

Laboratory Data Generators: Extending the Teaching Lab Online with Real Results

Matthew Clemson, Alice Huang and Gareth Denyer, University of Sydney

The teaching laboratory is a busy space. Students and instructors have limited time and resources to work through a set of well-defined protocols, to learn techniques, become familiar with equipment, record and analyse data, and interpret results. Not surprisingly, this leads to students focusing on following the step-by-step protocol carefully, avoiding making any 'mistakes' without considering the underlying theory as deeply as intended. And whenever the planets don't align – absences, pandemics, extreme weather events, or that essential reagent was forgotten – pre-prepared data is distributed for the analysis and write-up.

An ideal learning laboratory would not be limited by time, space, cost or availability of reagents or equipment. It would provide a safe environment for students to deviate from protocols and observe the consequences. It would allow them to generate their own unique data and engage in unlimited cycles of prediction, action, feedback and reflection until they are confident with their laboratory technique.

Online laboratory simulations have been observed to lead to similar increases in student disciplinary knowledge (1,2), and similar performance in final exams covering lab-related concepts (3,4) when compared to traditional wet labs. Enter the Laboratory Data Generator (LDG, **Fig. 1**). Built within the gaming engine Unity, we have designed a program to provide 24/7 access to an online lab bench that adheres to scientific principles and produces data that are a direct consequence of the biochemical reactions and procedural steps that students undertake within the program.

The LDG approach also provides an ideal platform for large-class assessments that are personalised, whilst still allowing students to work collaboratively. Each time a student begins an experiment, they are provided with a set of samples unique to the student and experiment. Students can work with their peers or seek assistance from AI, but they ultimately need to 'perform' the experimental steps, gather and analyse their own unique data, and report their own results.

Second year Biochemistry and Molecular Biology students (n=765) completed a practical assignment in which they were challenged to estimate the blood alcohol concentration in several unique samples using the LDG. The experiment was based on a spectrophotometric, enzyme-catalysed assay in which colourless ethanol is converted to a red product (**Fig. 2**).

Fig. 1. *Screenshot of the Laboratory Data Generator with an experiment in progress.*

Reaction 1: alcohol oxidase

CH_3CH_2OH *(colourless)* + O_2 → CH_3CHO + H_2O_2

Reaction 2: peroxidase

Phenol + 4-AAP + $2H_2O_2$ →

phenyl-aminoantipyrine complex *(red)* + $4H_2O$

Fig. 2. *Experiment reactions performed and analysed by students in second year Biochemistry and Molecular Biology.*

Students were given time in class to complete the activities, with instructors available to guide them through the procedures. Student evaluations (**Fig. 3**) indicate that the activity was helpful in learning the principles of the technique and that students were confident they could apply the skills learned in the wet laboratory.

"I liked that the simulation was still sensitive to human error, just like in a real lab setting (e.g. if you didn't change a pipette tip you would contaminate your results). It was also helpful to be able to repeat experiments multiple times without worrying about time pressure or wasting resources. I could experiment with different dilutions and volumes to find the best proportions for the experiment, which was very helpful."

Given the success of this approach, we are working to integrate the LDG more broadly across biochemistry learning and teaching at the University of Sydney. If you would like to learn how these tools can be integrated into your own learning and teaching context, please contact Gareth Denyer or Matthew Clemson.

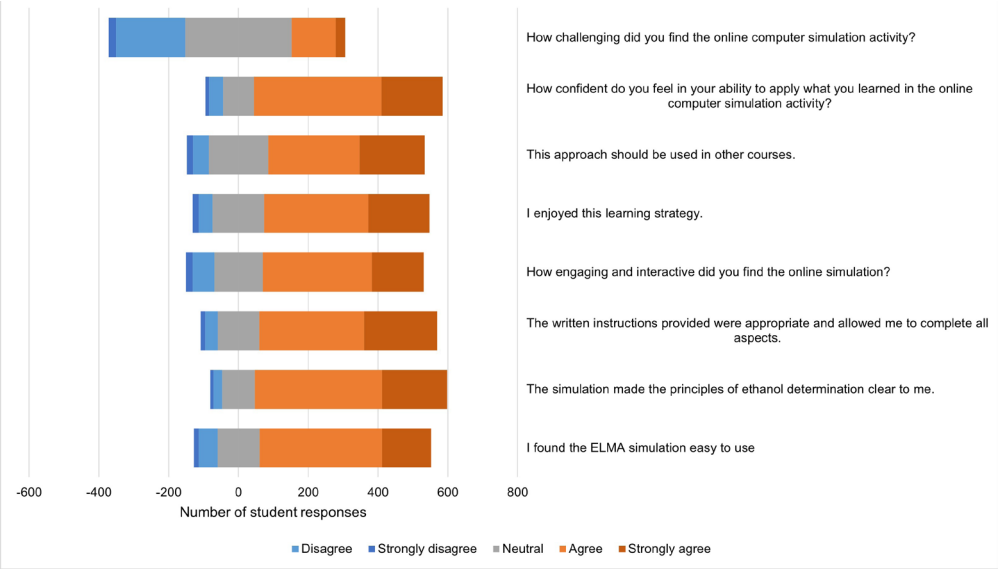

Fig. 3. *Student evaluation of the Laboratory Data Generator assignment.*

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Learning by Design: Combining Experiment and Data Generation for Senior Undergraduate Biochemistry Student Research Projects

Jacqueline Matthews and Gareth Denyer, University of Sydney

We wanted to develop a cost-effective and time efficient research task for senior biochemistry students that would allow them to design their own experiments, generate and interpret their own data and thereby attain student learning outcomes. To do this, we created Laboratory Data Generator (LDG) modules to supplement well-established practical laboratory experiments.

The LDG1 is a web-based program written using Unity, originally developed during COVID to fill gaps left by lack of access to laboratory classrooms. The LDG allows productive struggle by incorporating a decision/consequence moderator. That is, the data generated reflects both the experimental design and implementation, in proportion to the importance of each step. There are no predefined experimental outcomes. Rather, relationships between components and the outcomes are defined, along with how that will be reflected in the readout (e.g., how many colony forming units post transformation, or the migration and appearance of bands following gel electrophoresis).

The aim of the practical laboratory experiment is to determine the molecular basis of human disease caused by a series of mutations in the transcription factor gene, *GATA1*. The experiment uses yeast-two hybrid analysis (Y2H) to determine if the mutations in the encoded protein affect binding to a GATA1 protein partner (FOG), and electrophoretic mobility shift assays (EMSAs) establish if GATA1–DNA interactions are perturbed. Across the three laboratory sessions, students learn the theory and perform the experiments, as well as analyse and interpret the structural consequences of mutations.

https://labdatagen.com

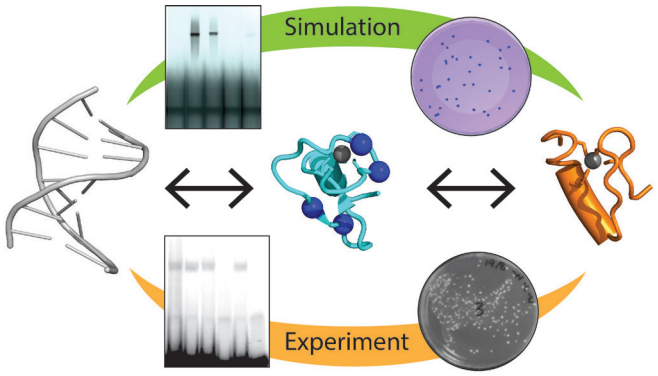

Fig. 1. *Overview of data generated through simulation and experiment to investigate the DNA- and protein-binding effects of mutation of a transcription factor.*

In a subsequent assessment task, pairs of students are challenged to develop a research project to explore any aspect of GATA1–FOG or GATA1–DNA binding using the Y2H and EMSA modules in the LDG. Students can select from a wide range of GATA1 mutants (or propose other mutants), carry out the experiments to generate data, and present their findings. A distinct advantage of the LDG is that the number of possible mutants is virtually limitless, provided somebody with experience in protein structure and biomolecular interactions can predict the outcome. The addition of mutants has been made straightforward by linking a simple database to the LDG, through which a non-coding-savvy academic can quickly add mutants and values for interaction based on a percentage of the wildtype interaction. This database of virtual mutants bypasses the need to generate and maintain a vast pool of experimental resources. Carrying out experiments in the LDG is relatively fast (e.g., less than 20 minutes to run the Y2H and EMSA modules for four mutants), and students can easily access the LDG via a web-based server. Not only do students get the satisfaction of generating their own research data, as the simulated experimental stage is not time consuming, they can focus more on design, analysis and interpretation.

Feedback from students is that most prefer to do the hands-on class experiments, and then use the LDG for the project so that they have a good understanding of the experimental approaches and have had training in how to analyse and interpret data. As students have used the LDG in earlier years, they are quick to adapt those skills to the new modules. It is evident from presentations and student feedback that generating data (rather than simply analysing pre-existing data) gives students a sense of ownership. While many students selected mutants already in the database, about 20% of groups requested additional mutants to explore their hypothesis.

From an academic perspective, marking presentations is now more interesting compared to previous presentation assignments due to the variety in student projects, yet the projects remain on an equal footing. We note that there is additional capacity built into the LDG that students have not yet tapped into (e.g., estimating binding affinities in the EMSA module), but several students implemented additional tools (such as introducing mutations and/or making movies with PyMol, or Blendr) to communicate their findings.

Overall, the combination of hands-on experimentation and implementation of a data generator has been a very positive experience that blends traditional and modern teaching tools.

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Using an Assessment Literacy Module to Improve Scientific Report Writing

Amber Willems-Jones, University of Melbourne

In 2020, a Melbourne School of Psychological Sciences team developed an Assessment Literacy Module (ALM) (1) to respond to tension experienced between academics and students over the clarity of instructions provided for assessments. Many academics would agree that the disparity in outcome expectations often results in complaints by students indicating that while they followed the assignment task brief and marking criteria, their scores were not as anticipated. Since 2021, the ALM has been implemented across many subjects at the University of Melbourne – including my second-year laboratory-based subject, Techniques in Molecular Science – and it has been shown to aid in the development of evaluative judgement skills (2). At ASBMB 2023 in Canberra, I presented on the benefits of using the ALM, and encouraged academics of all disciplines to consider implementing a similar tool if their students struggle in the development of assessment literacy skills.

The ALM is an interactive sequential e-module embedded into a subject's Learning Management System – in this case, Canvas – that allows students to evaluate sample assignments as an assessor (**Fig. 1**). Utilising the assignment marking rubric to guide their application of marks for each criterion, students also provide a written justification for their mark.

During the process, students receive real-time feedback (pre-populated in the module) illustrating how their assigned grade compares to the expert marker with additional comments on why that specific grade was given by the marker, enabling calibration of the student's interpretation of the marking rubric. This is the essence of how students learn and develop judgement (3) through the e-module. Student perceptions of the module indicate students have better understanding of assessment criteria (89%) and that the ALM was helpful in preparing subsequent assessments (89%) (2). Interestingly, only 47% of students reported that they looked at assignment rubrics prior to using the ALM (2). Staff (69%) also felt the ALM both increased students' understanding of marking criteria and their confidence in the execution of assessments (2).

In Techniques in Molecular Science, students who completed assessment evaluations using the ALM were observed to have improved grades in subsequent scientific report assessments in the subject (**Table 1**), supporting the finding that students perceived an academic literacy benefit from using the ALM (2).

Across all three written scientific reports submitted in Techniques in Molecular Science, students who completed the ALM for evaluation of at least one example assignment achieved 4–7% higher grades compared to students who did not use the ALM at all. It is likely that higher grades are due to increased awareness of the marking rubric and a degree of self-assessment and reflection (3) when writing their reports, developed through the practice of evaluation when using the ALM. **Table 1** data are further supported by the literature illustrating that student achievement can be improved through the use of rubrics (4,5) and self-assessment (3), and this is reinforced by student comments:

"[The ALM] gave me an opportunity to critically analyse academic work and insight into how our assessments are marked using the given rubric" and "[The ALM] forced me to perform the task that a marker would do on my work which in turn strengthened my ability to self asses my own work… This in turn helped me to look at my work critically."

However, there are distinct limitations that are likely to have an impact on the data. Firstly, while it is clear that some students actively complete the ALM in order to improve their academic literacy skills, it is unclear from the e-module's completion metrics whether 'use' of the ALM actually equates to authentic engagement for all students. It may be that some students only step through the e-module without truly considering how to apply the rubric and/or without providing valid justifications. Further investigation through interrogation of student comments given at each criterion is required to check for valid/reflective justifications as opposed to nil/gibberish answers. Secondly, as use of the ALM is self-selected and non-compulsory, the data presented likely reflects a bias towards students who are proactive in their

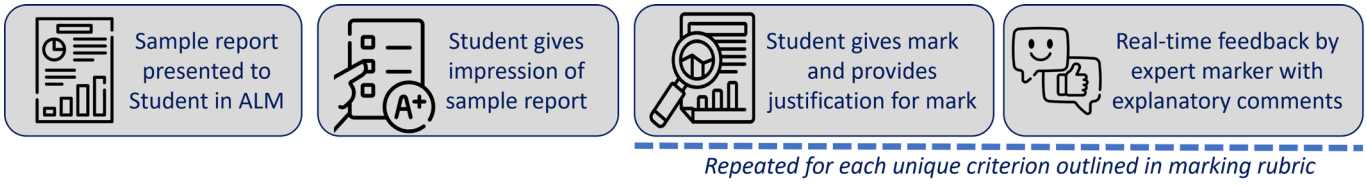

Fig. 1. *Activities completed by the student within the Assessment Literacy Module. Icons created by Freepik, Flaticon.*

Table 1. *Comparison of average written scientific report grades (%) in Techniques in Molecular Science for students who did and did not use the ALM prior to completing associated written assessment items. Data from 2023, Semester 1 and Semester 2,* N=*238.*

ALM completion^	*N*	Report 1	*p**	Report 2	*p**	Report 3	*p**
Students who did not use the ALM to evaluate either sample	58	64.9	NA	75.7	NA	70.5	NA
Students who only used the ALM to evaluate Sample A (the 'poor' report)	30	70.2	0.063	79.5	0 .086	77.5	0.028
Students who only used the ALM to evaluate Sample B (the 'very good' report)	18	73.0	0.018	75.7	0.499	76.3	0.088
Students who used the ALM to evaluate both sample reports	177	72.0	0.008	79.7	0.035	76.3	0.024

^Data obtained from metrics in Canvas.
**p* value from Student's t-test comparing student report grades in row 1 with those from each other category.

studies, and thus the improved grades may not actually correspond to benefit from 'use' of the ALM *per se*, but rather, simply reflect high-achieving students. In any case, comments from students reveal those who actively utilised the ALM were able to reflect on what makes a good scientific report: *"[The ALM] showed me what was relevant and irrelevant. What made for a concise aim, sentences. What made for an adequate report and what was lacking."*

Furthermore, students indicated that the ALM will change the way they approach future assessments for the better: *"[I will] leave more time for editing, as the overall flow of a piece of writing has more of an effect than I thought it did"* and *"[I will have] far more focus on the rubric and rereading to see if what I have written is actually of a high quality."*

While further research is required, the findings presented indicate that an Assessment Literacy Module can be an effective pedagogical tool to (a) set expectations about assessments by providing clear guidelines and criteria to students, and (b) potentially facilitate improved assessment outcomes for students, not just in biochemistry, but across many different disciplines.

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Cells at War: A Game-based Approach to Learning Biochemistry

Reece Sophocleous[1], Danielle Warren[1], Jean-Paul Amore[2], Rosa Da Silva[3] and Tracey Kuit[1]

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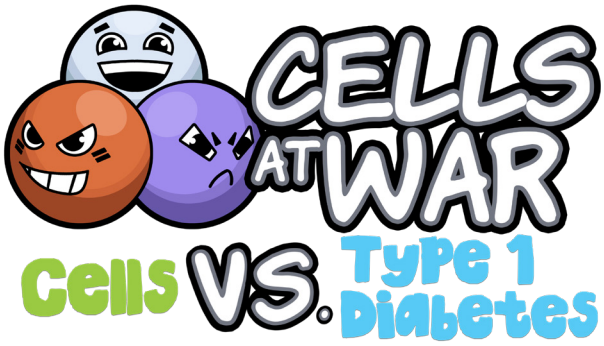
Game-based learning, while not a new concept (1), faces fresh challenges in today's digital era. Integrating biochemistry education with gaming requires a delicate balance to be both effective and engaging. Traditional teaching models in Australian STEM education have yet to fully capitalise on the benefits of this approach, possibly hindered by issues such as limited resources and insufficient R&D funding (2).

In undergraduate science courses, which are expanding both in size and diversity, educators must navigate limited resources, a variety of delivery modes, and the rapid advancement of educational technologies like generative artificial intelligence (GenAI). These pressures are compounded by financial constraints and the need to adapt to varied learning modes, from face-to-face to online and blended environments. Game-based learning emerges as a compelling solution to these challenges, offering a way to motivate students and prepare them for uncertainty (3), as well as allowing for diversified learning paths, focusing on incremental achievements to handle varied student backgrounds and learning styles (4). Such approaches can align with and enhance traditional teaching methods, providing an immersive, engaging learning experience.

The 'Cells at War: Cells vs. Type 1 Diabetes' project, born from an international collaboration, sought to address some of the challenges faced by game-based learning approaches in undergraduate education. By developing a game that doubles as a pedagogical tool, the project aimed to complement traditional teaching, enhance employability skills, and solicit student feedback on game-based learning's effectiveness in biochemistry and molecular biology.

The game's development utilised the PEAR (Pedagogy, Experience, Assessment, Reflection) model and a work-integrated learning (WIL) framework, utilising a students-as-partners approach to bridge the gap between educational theory and practical, professional development. The game offers an innovative approach to studying molecular biology by engaging students directly with the biochemical interactions involved in Type 1 diabetes. Design and development of the game were led by university and college student partners from a range of relevant disciplines, including biochemistry and molecular biology, science education, programming, art and digital design.

Focus groups with student partners involved in game development revealed that the project played a key role in the development of professional skills such as time management, effective communication and collaboration. However, student partners also indicated a need for clearer communication regarding their individual roles and expected contributions. Initially, there was uncertainty among participants about how to engage effectively with the project. The situation improved markedly when specific tasks, such as research compilation and summary card creation, were assigned, highlighting the importance of project management and academic oversight.



The game, in its alpha phase of development, was trialled with first year biology students at the University of Wollongong. Data on student learning habits, their engagement with coursework and student perceptions of game-based learning and the impact of the Cells at War game were also collected. Feedback from 45 participating students revealed half of the respondents as non-gamers, highlighting the need for educational games like Cells at War to engage a broad audience. Students generally perceived game-based learning positively, recognising its potential to connect coursework with prior experiences and deepen conceptual understanding. However, the data did not show a correlation between students' gaming habits and increased motivation to engage with coursework through game-based learning.

ASBMB Education Feature

The survey data from students involved in either the design and development, or initial playtesting of Cells at War gave a compelling snapshot of current attitudes towards game-based learning in the biochemistry and molecular biology disciplines. Students highlighted the importance of careful game design and curriculum integration to meet diverse student needs and maximise the educational impact of such tools. As proponents of this approach in STEMM education, we will continue research and development, with the aim to set new standards for effective teaching methods which not only incorporate the use of game-based learning in curricula but also apply a students as partners approach for their sustainable design, development and implementation.

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ASBMB Education Feature

IUBMB–FAOBMB Education Symposium at the 30th FAOBMB Conference

Nirma Samarawickrema, Monash University

The IUBMB–FAOBMB Education Symposium was a highlight of the 30th FAOBMB Conference (reported on page 45 in this issue of the *Australian Biochemist*). Held on 23 November 2023 at the conference venue, Centara Grand at Central Plaza, Ladprao, Bangkok, Thailand, the symposium was hosted by the BMB Thailand, the Departments of Biochemistry of Chulalongkorn University, Mahidol University and Kasetsart University, and supported by the IUBMB and the FAOBMB.

Chairs and speakers of the Education Symposium, from left: Gracia Fe Yu, Peter Arthur, Annabel Chen, Terry Piva, Julian Tanner and Danaya Pakotiprapha.

The symposium's theme, Lifelong Learning for a Changing World in Biochemistry, was the perfect springboard to successfully bring together researchers and educators in biochemistry and molecular biology to share practices, ideas and innovative ways of teaching and the scholarship of learning and teaching. The symposium was chaired by Professor Gracia Fe Yu (Philippines) and Associate Professor Danaya Pakotiprapha (Thailand), with a plenary session, four talks by invited speakers and a concluding workshop, Tools and Applications for Class Engagement and Formative Assessments, which was run by Nuttee Suree, Suthida Chamrat and Panuakdet Suwannatat (all from Chiangmai University, Thailand).

The plenary address titled New Paradigm for Grooming the Next Generation of Biochemists was originally intended to be delivered by Professor Uri Alon (Weizmann Institute of Science, Israel). However, given the current geopolitical tensions in the region, Uri could not travel. As the incoming Chair of Education of the FAOBMB, Associate Professor Nirma Samarawickrema (Monash University) delivered the keynote address. Nirma talked about the benefits of using contemporary case studies that involved real-world problems, which she embedded within an engaging narrative. Delivered in collaborative learning spaces, this teaching approach required resolution by students in workshops as the learning design compelled students to problem-solve in their groups. The learning design purposefully combined the power of case studies and active learning facilitated through small group learning workshops. Nirma demonstrated how this proved to be a powerful learning strategy to encourage collaboration, communication and critical thinking, thereby making confident student learners – the next generation of biochemists – who were developing lifelong skills necessary to thrive in a changing, uncertain world.

Professor Annabel Chen (Nanyang Technological University, Singapore) started the afternoon session by sharing her findings on the science of learning. Annabel highlighted discoveries from brain research on efficient learning and teaching strategies, the influence of mindsets on learning behaviour, and evidence-based practices to promote brain health and general wellbeing. Associate Professor Peter Arthur (University of Western Australia) shared his experience of using LabArchives (electronic laboratory notebooks) in his classes. He demonstrated their value to students because they provided an electronic copy of their work, which could be readily accessed and provided as evidence of student work to potential employers. From a teaching perspective, LabArchives reduced the administrative load enabling easy access for review and marking. Professor Julian Tanner (University of Hong Kong) presented his work on collaborative two-stage examinations in Biomedical Science. In this two-stage examination, students initially attempt a challenging examination paper. In the second stage, students repeat the examination in teams and collaboratively find the best answer to the challenging questions. The final presentation of the afternoon was

Chairs of Education: past, present and future! From left: Nirma Samarawickrema (incoming Chair), Gracia Fe Yu (current Chair) and Siok Im (past Chair).

delivered by Associate Professor Terry Piva (RMIT). Terry showcased his design of industry-relevant practicals using Labster to contextualise theory in virtual labs. His new practical design stimulated students to solve real-world problems through assessments that were authentic and fun and with the added benefit of transforming the student learning experience, made evident by student evaluations.

The Education symposium was well attended and at the end of the sessions, the room was buzzing with discussions, questions and the sharing of information. The presentations provided all participants with insights, strategies and tips on how best to foster lifelong learning in a changing world.

Associate Professor Nirma Samarawickrema is the Co-Head of Teaching in Biochemistry and Molecular Biology at Monash University, and Chair of the FAOBMB Education Committee.
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SDS Page: Short Discussions for Students Page

How to Prepare and Deliver a Talk for a Scientific Conference

Wessel Burger

Walter and Eliza Hall Institute of Medical Research

Giving a talk at a scientific conference or symposium can be a daunting task. Here are my tips and tricks that have helped me put together an engaging presentation.

The narrative

Develop a story that you want to tell to your audience. What is the biological problem? Why is this interesting scientifically? Then work down from there, how did your experiments or data answer these questions? Try to develop natural transitions between slides so that it comes across as a coherent story that the audience can logically follow.

Slide design (Fig. 1)

- Title with the slide 'take home message'. What is the main point you want to bring across on this slide?
- Use figures, graphs or other cues to fill up blank space that help guide the listener, i.e. an illustration of your compound or protein. This becomes particularly useful when your talk includes similar proteins or compounds and switches from one to another between slides. For someone who is not familiar with your project, this can easily cause the audience to completely lose track of your talk.
- Put references in a consistent location on every slide.
- If the data is a follow-up or inherently linked to data that was presented earlier in the talk, place that data as an inset in the top right-hand corner as a reminder.
- Consistent use of colour. If protein/compound A is green in one slide, make it green in the next.
- Make big figures, two to four per slide. No one likes being confronted with the realisation their eyesight is deteriorating…
- Visual cues (some examples):
  - An upright triangle with a colour gradient if showing increasing concentrations or an increase in biological effect.
  - If one graph pertains to data with a certain protein and another graph pertains to data without that protein, use an image or illustration of the protein to show that visually.
  - If you are mentioning specific positions within a protein or gene sequence, highlight these by circling the corresponding residue or base pair.
- Try to avoid including a lot of text, but a summary slides with bullet points can be helpful to the audience.

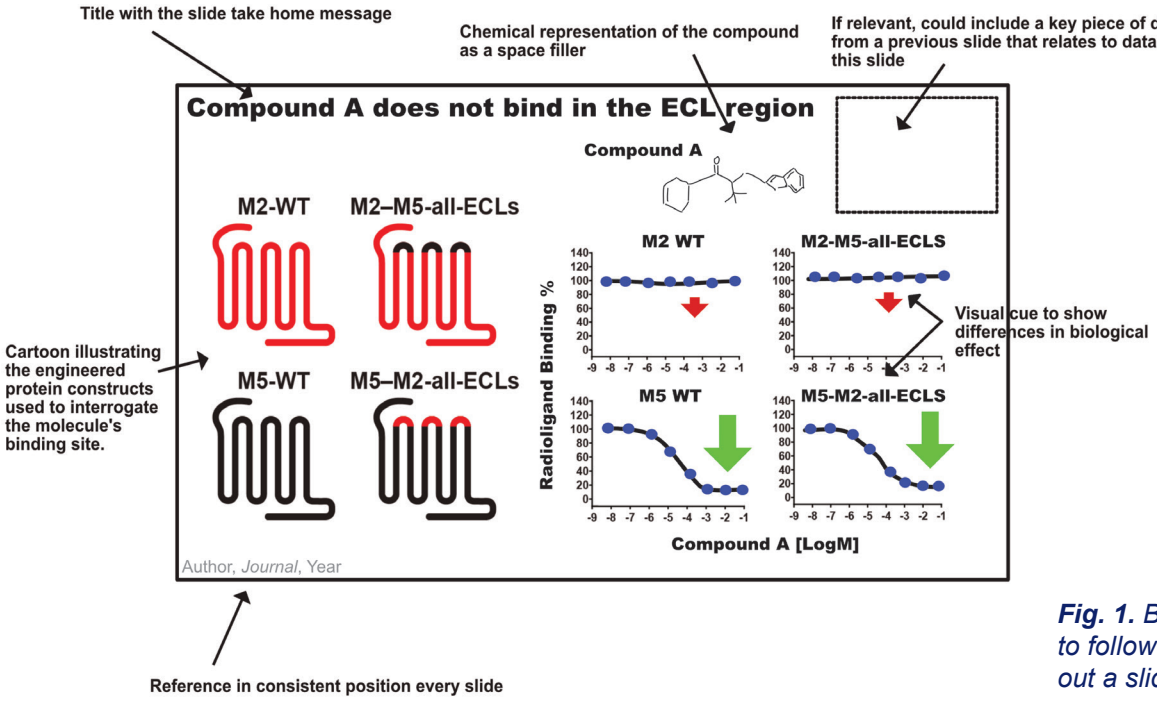

Fig. 1. *Basic concepts to follow when laying out a slide.*

SDS Page: Short Discussions for Students Page

- Colours. As a colour-blind person, I have some experience of this. Unfortunately, it's not as simple as avoiding red and green as that only covers those who have deuteranopia or protanopia, but doesn't help those with blue–yellow colour blindness (tritanopia). There are several online resources to help you choose a colour palette suitable for colour blindness. Adobe has a particularly good one. My advice would be to avoid gradients or shades of colours to distinguish different things. Yellow vs green, blue vs purple or black vs red are also hard to distinguish for colour blind people. A good option is to use symbols in addition to different colours.

Explain yourself

How does the experiment work, and why does this particular experiment help you answer your scientific question? This draws the audience in and helps them interpret the data themselves (and hopefully they reach the same conclusion as you!). Doing this well is particularly important at cross discipline or different discipline conferences.

Knowing your audience is important in this context.. A biochemistry audience doesn't need to be told the principles of size-exclusion chromatography (SEC), yet neuroscientists probably need a brief explanation of a SEC trace in order for them to interpret it.

Less is more

Presenting less and explaining it in more detail/ context is far more valuable than presenting more and underdoing it.

When preparing your talk, aim to talk for about one minute per slide. In general, you will be faster on the day (thank you adrenaline), so if your practice talk is one minute over, it will likely be on-time or under on the day.

Never, ever, go overtime, I can't stress this enough. No one likes a presentation that goes over time, yet everyone remembers a presentation that finishes ahead of schedule. Remember, no matter how good your talk is, it will never top drinks, snacks, coffee or the social event that is scheduled to follow. The added bonus of finishing ahead of schedule is that it leaves more time for questions and discussion. From an audience perspective, I often find question time more interesting and useful than a lot of presentations themselves.

Delivery

If you know that you are a fast talker, or if you notice yourself talking fast on the day, force yourself to breath, swallow or drink some water in between slides. This will force you to slow down and give the audience a chance to breathe, too!

Don't be afraid to make a joke or an offhand remark. Being nervous can often prevent you from being humourous, but audiences usually laugh anyway, even when the joke is not that great.

Practice, but don't overdo it. A natural delivery is far more comfortable and easier to follow than a presentation which has been rehearsed down to the second.

I hope at least some of these points are useful to you. Ultimately, it is all about finding out what works well for your style of presenting and what you're comfortable with. No one size fits all, and until you know your size, keep trying different things!

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Australian Society for Biochemistry and Molecular Biology Inc
PUBLICATION SCHEDULE FOR *AUSTRALIAN BIOCHEMIST*, volume 55, 2024

Issue	ASBMB Content	Copy Deadline	Issue Date
April 2024 55(1)	Profiles of medal, award and fellowship winners Nominations for Executive/Council	Monday 5 February	Tuesday 2 April
August 2024 55(2)	Nominations for medals, awards and fellowships Notice of AGM/proposed constitutional changes	Monday 3 June	Monday 29 July
December 2024 55(3)	Annual reports ASBMB meeting report	Monday 7 October	Monday 2 December

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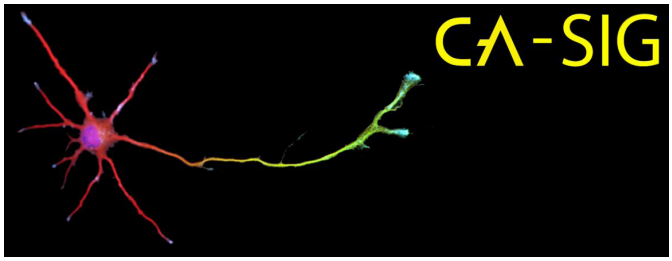
Cell Architecture: an ASBMB Special Interest Group



Established in 2018, the Cell Architecture Special Interest Group (CA-SIG) aims to foster networking among researchers focused on investigating the cytoskeletal regulation of cellular function across various cell types and tissues. One of its key initiatives is organising the Cell Architecture in Development and Disease (CADD) meeting, an annual scientific gathering held at different locations each year. This conference serves as a vital platform for higher degree research students and early- to mid-career researchers to present and discuss their work in cell architecture research. CADD meetings feature presentations spanning diverse disciplines such as cancer research, neuroscience, and mechanobiology, as well as discussions on novel methodologies and cutting-edge technologies in the field.

After a break in 2020–2021, the CA-SIG resumed the CADD meeting series in 2022. The 9th CADD meeting was held on 2 December 2022 as a half-day hybrid meeting that was attended in person at the Macquarie University campus and online via Zoom. The two sessions of the meeting had a major focus on research investigating changes in the cytoskeleton and cell architecture in diseases of the central nervous system, including Alzheimer's disease, amyotrophic lateral sclerosis and Parkinson's disease. Session 1 in the program featured presentations on cytoskeleton-related pathomechanisms of Alzheimer's disease by Professor Lars Ittner (Macquarie University), Dr Ryan Keable (UNSW), Dr Emmanuel Prikas (Flinders University) and Dr Magda Przybyla (Macquarie University). Session 2 opened with a presentation by Dr Ramon Martinez-Marmol (University of Queensland) on exciting new findings on virus-induced cell fusion from his laboratory, followed by talks on actin dysregulation in amyotrophic lateral sclerosis by Dr Cyril Jones Jagaraj (Macquarie University) and protein trafficking dysfunction in Parkinson's disease by Associate Professor Rohan Teasdale (University of Queensland). Dr John Lock (UNSW) complemented the disease-focused talks in session 2 with a discussion of his work on an advanced imaging and deep learning-based quantitative single cell phenotyping.

The CADD series continued with its 10th CADD meeting at the Queensland Brain Institute, University of Queensland on 6 November 2023. In response to the positive feedback regarding the hybrid model of the previous CADD meeting, we continued the series with a hybrid in-person and Zoom meeting. The meeting, supported by the Wiley journal *Cytoskeleton*, went back to a full day meeting format with four sessions and a keynote lecture by Dr Christophe Leterrier (NeuroCyto laboratory, Neuropathophysiology Institute France). Dr Leterrier presented his work on the nano-architecture of the axonal actin cytoskeleton in neurons. The four sessions of the meeting included talks by researchers from across Australia and a presentation by Dr Subashchandrabose Chinnathambi (National Institute of Mental Health and Neurosciences, India). A detailed report of the 10th CADD meeting was published in *Cytoskeleton*.

The 10th CADD meeting was held at the Queensland Brain Institute, University of Queensland.

Keynote speaker at the 10th CADD meeting, Dr Christophe Leterrier.

The CADD series will continue in 2024 as a hybrid meeting, details will be announced on our website soon. We also call for expressions of interest for the vacant CA-SIG positions of Communications Officer, ECR/MCR Representative and PhD Representative, previously held by Nicole Bryce, Catherine Blizzard and Christopher Small, respectively. Please direct your expression of interest to Thomas Fath at thomas.fath@mq.edu.au. We would like to thank Nicole, Catherine and Christopher for their contributions to CA-SIG.

Thomas Fath, Macquarie University
Chair, CA-SIG
Vladimir Sytnyk, UNSW Sydney
Secretary/Treasurer, CA-SIG
https://casig214033823.wordpress.com

Off the Beaten Track

Written by former researchers who have now established careers outside of research, Off the Beaten Track is intended to give the readers insights into the range of alternative careers available to them. Authors describe the paths they have taken to arrive at their present career and provide a detailed description of exactly what the job entails on a day-to-day basis.

Brewing a Startup

Derek Lacey, Founder and CEO, Bluestone Yeast

My academic career began with a PhD at Monash University, where I worked under the guidance of Professor Eric Morant. The primary focus of my research was MIF, a cytokine involved in inflammation, particularly its expression and function in rheumatoid arthritis. My PhD involved many hours of going into theatre and collecting synovial samples during surgery, growing primary cells and countless *in vitro* assays and experiments. Following my PhD, I pursued further research at King's College London, initially intending to work on synovial transplant into SCID mouse models, but eventually engaging in contract research for a Japanese pharmaceutical company.

Upon returning to Melbourne, I joined Professor John Hamilton's lab at the Department of Medicine at the Royal Melbourne Hospital, where my work centred on macrophages and inflammation. This period lasted about seven years, after which I moved to the Walter Eliza Hall Institute, collaborating with Dr Philippe Bouillet on a spontaneous TNF model of arthritis.

A significant turning point in my life was the decision to take a break from my scientific career to embrace the role of a stay-at-home parent. This period, while different, was definitely the best time of my life and provided a much-needed perspective on work–life balance.

While I was enjoying my time as a stay-at-home dad, I got into home brewing. It struck me as a little crazy that we were importing liquid yeast from the United States to Australia. With my background in science, I saw an opportunity to address this gap, and Bluestone Yeast was formed.

Starting a business isn't hard or as daunting as you might think. For me, the first step was to register the business with ASIC, which you can do online for about $550. After that, you take the necessary steps and before you know it, you have created a business. The crucial next steps for Bluestone Yeast were to work with my brother, Damien, to help get the business off the ground, and find a space that we could explore the business idea. This space was the Eastern Innovation centre which is a space for startup businesses to find their feet. It is an invaluable supportive environment run by the Monash Council, in the southeast of Melbourne. This incubator space played a huge role in the success of Bluestone Yeast.

The biggest challenge we faced came at the beginning of COVID-19 when we had to figure out how to remain operational when everything was shutting down. This time was actually a blessing in disguise. When everything stopped, we were able to take stock and streamline our processes and emerged much more efficient. Since 2020, we have been growing 25% quarter on quarter and have launched new products each year. We supply over 100 yeast strains to the brewing industry and ten strains for the retail market (homebrew), with another ten yeast strains due to be released this year.

Derek Lacey.

The transition from science to business was driven by a desire for a new challenge and a change from the grant-writing hamster wheel. I always felt that unless you wanted to work your way up to more senior roles, a career in science would have an expiry date. Luckily, my wife was supportive and encouraged me to become a stay-at-home parent, which allowed me to step away from science on my terms.

In my current role as the founder and CEO of Bluestone Yeast, I am involved in diverse aspects of the business, ranging from development, accounting and strategy, to hands-on tasks like bottle washing and media engagement. Leading a startup is a vastly different experience from traditional employment, where personal effort directly correlates to the company's success.

One of the most valuable skills I apply in my current role is the problem-solving ability honed during my scientific training. In business, just like in science, problems require analysis from various perspectives to devise effective solutions.

Off the Beaten Track

The greatest benefit of my current position is the flexibility it offers, particularly in balancing professional and family life. This allows me to participate actively in my children's lives, which I find deeply rewarding.

However, challenges do exist, especially in managing external collaborations. The most significant of these is ensuring that consultants and engineers deliver as promised, which is critical for maintaining business operations and customer satisfaction. Ensuring consignments are delivered on time is also a challenge and often, we're let down by our couriers.

For those contemplating a venture into the startup world, it's not a path suited for everyone. My advice would be to consider partnering with a co-founder to mitigate the challenges of navigating the startup landscape alone. Alternatively, engaging with an innovation space can provide a supportive environment of like-minded individuals, which can be incredibly beneficial for personal and professional growth.

My true passion is science and discovery! Therefore, my long term goal for Bluestone Yeast is to become an innovation company that is developing new products (yeast strains to begin with) using the latest technology in collaboration with universities. I believe that this is where the long-term future and value lies for Bluestone Yeast.

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Australia Day Honour for ASBMB Member

The late Emeritus Professor William (Bill) Sawyer was posthumously awarded a Member of the Order of Australia (AM) for significant service to tertiary education, and to biochemistry.

Bill Sawyer took his BAgrSc from the University of Melbourne in 1961 and travelled straight afterwards to the University of Minnesota, USA, where he studied dairy chemistry under Robert Jenness. He obtained his MSc in 1962. After returning to Australia, he graduated with his PhD in 1966 from the Australian National University, where he studied under Hugh McKenzie working on milk proteins. In Canberra, Bill also collaborated with Laurie Nichol on protein biochemistry and gel chromatography. After a further year overseas in London, working with Michael Creeth, Bill returned to the University of Melbourne in 1968, where he remained as a member of the Academic Staff until his retirement in 2001, after which he became Professor Emeritus.

Bill made many contributions to biochemistry, especially those aspects amenable to precise quantitative analysis in the domain of physical biochemistry, especially applied to proteins and biological membranes. He received many scientific honours and was involved in various scientific and technical organisations, playing key roles in the Australian Research Council.

Bill was President of the Australian Society for Biophysics from 1986 to 1988, President of the ASBMB from 1990 to 1992 and President of the Federation of National Societies of Biochemistry and Molecular Biology FAOBMB from 1999 to 2001. He was an Honorary member of the ASBMB and the FAOBMB.

Bill was a dedicated academic with a great interest in, and strong commitment to, education and training. He was innovative in the use of computers in education, becoming the first staff member at the University of Melbourne to introduce computer-based exercises into undergraduate Science teaching. Later, he developed workshops to promote the development of early career researchers. He also had an interest in intellectual property law and was engaged in a broad range of activities related to science and other pursuits.

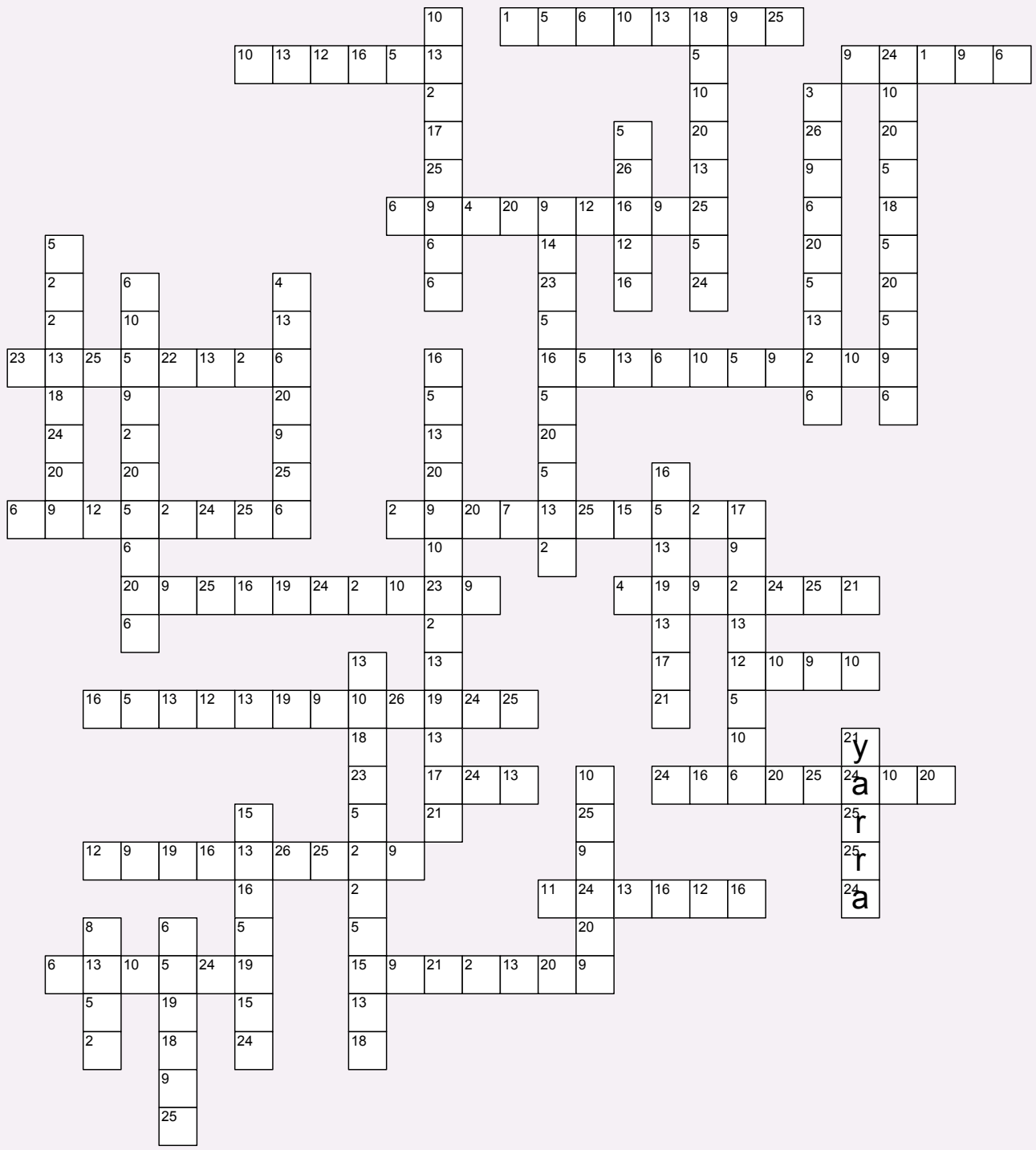
Bill had a special interest in viticulture and winemaking. His winery, Wyuna Park, on Victoria's Bellarine Peninsula, specialised in Pinot Noir and Pinot Gris wines which won several awards.

Bill passed away in August 2023. An In Memoriam tribute to Bill by Leann Tilley was published in the August 2023 issue of the *Australian Biochemist*.

Leann Tilley and Phillip Nagley

Competition: Codeword Puzzle

Presenting the latest competition for members of the ASBMB.
In this Codeword Puzzle, letters have been replaced by code numbers.
Using the letters already provided, work out the remaining letters by identifying the words and completing the Code Key. ***Hint: they are all words or names related to ComBio2024 – Biomolecular Horizons 2024!***
Submit a photo of the completed Code Key to the Editorial Officer by 6 May 2024 to enter the draw to receive a gift voucher. With thanks to Joe Kaczmarski.



Code Key

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ASBMB Medallist and Awardee Profiles

The Lemberg Medal is awarded to a distinguished Australian biochemist or molecular biologist who will present the Lemberg Lecture at the annual ASBMB conference. The Medal is presented in memory of Emeritus Professor MR Lemberg, who was the Society's first President and Honorary Member. Nominees must have been members of the Society for at least five years before the year in which the Medal nomination is to be considered. An honorarium is provided by the ASBMB.

The Lemberg Medal
Anthony Weiss

Tony Weiss is the McCaughey Chair in Biochemistry, NHMRC Leadership Fellow, and Professor of Biochemistry and Molecular Biotechnology at the University of Sydney. He leads Tissue Engineering and Regenerative Medicine in the Charles Perkins Centre. His research is on the biochemistry, molecular and cell biology of the elastic extracellular matrix.

Tropoelastin is the protein building-block that provides human tissue with its elasticity. Tony's work has established tropoelastin as a vital field of research in work that underpins novel applications and clinical translation in wound repair. His lab discovered how to modulate tropoelastin self-assembly and then articulated the rules governing this assembly process to give elastin. He then created intricate elastin architectures tailored to elastic tissue including skin and blood vessels, where it coordinates cell growth and organised tissue repair. In addition to his work on elastin assembly, his scientific leadership has defined tropoelastin's shape, and elucidated how cells respond to tropoelastin through specific integrins and their binding mechanisms.

Tony's awards include the Prime Minister's Prize for Innovation, NSW Premier's Prize for Science and Engineering Leadership in Innovation, Eureka Prize for Innovation in Medical Research, Australian Academy of Technology and Engineering's Clunies Ross Award, Australasian Society for Biomaterials and Tissue Engineering Award for Research Excellence, ASBMB's AMRAD Pharmacia-Biotech Medal, MBSANZ Barry Preston Award, FAOBMB Entrepreneurship Award, and two medals from the Royal Australian Chemical Institute: the Applied Research Medal and Weickhardt Medal. He is a Member of the Order of Australia (AM).

Tony is President of the Tissue Engineering and Regenerative Medicine International Society (TERMIS), was elected Chair of TERMIS Asia Pacific, and President of MBSANZ, and is a Fellow of the Australian Academy of Technology and Engineering, Royal Society of NSW, Royal Australian Chemical Institute, Royal Society of Chemistry (UK), Royal Society of Biology (UK), American Institute for Medical and Biological Engineering (USA), National Academy of Inventors (USA), Tissue Engineering and Regenerative Medicine, and Biomaterials Science and Engineering. He was a NIH Fogarty International Fellow, and Fulbright Scholar at Stanford University, and has served as the NSW State Representative for ASBMB.

Tony continues to be inspired by his former PhD supervisor, Gerry Wake, and other mentors, many of whom were previous recipients of the Lemberg Medal. Tony is deeply appreciative of his extraordinary lab members and scientific collaborators who have enriched and continue to nurture his scientific journey.

ASBMB Medallist and Awardee Profiles

The Shimadzu Research Medal is awarded to an outstanding Australian biochemist or molecular biologist with less than 15 years postdoctoral experience. The successful candidate will present the Shimadzu Medal Lecture at the ASBMB annual conference. Nominees must have been members of the Society for at least two years before the year in which the Medal nomination is to be considered. An honorarium is provided through the courtesy of Shimadzu.

The Shimadzu Research Medal
Thomas Ve

Associate Professor Thomas Ve is an ARC Future Fellow, a NHMRC Investigator and a Research Leader at the Institute for Glycomics, Griffith University.

Thomas completed his Masters degree in Molecular Biology at the University of Bergen, Norway, in 2006. In 2008, he relocated to Brisbane with his young family and started his PhD in structural biology under the supervision of Professor Bostjan Kobe at the University of Queensland. His PhD focused on plant disease resistance, and he used X-ray crystallography to determine 3D atomic structures of a plant immune receptor TIR domain and effector proteins from a fungal plant pathogen. After completing his PhD in 2011, Thomas continued working in the Kobe group as a postdoctoral research fellow and he collaborated with immunologists, cryoEM and single molecule experts to characterise TIR domain proteins involved in mammalian innate immunity.

Thomas joined Professor Mark von Itzstein's group at the Institute for Glycomics, Griffith University, as a Research Scientist in 2015. In 2017, he received an ARC Discovery Early Career Researcher Award (DECRA) and in 2020, he was awarded both an ARC Future Fellowship and a NHMRC Emerging Leadership Investigator Grant. Thomas has established his own independent research group at Griffith University, where he conducts innovative structural and chemical biology focused research across the fields of innate immunity and neurobiology.

Throughout his successful career, Thomas has published over 50 manuscripts in journals such as *Science, Nature Structural and Molecular Biology, Molecular Cell, Neuron, Cell Host and Microbe, Nature Communications, PNAS* and *PLOS Pathogens*.

Thomas' research has been instrumental in providing a better mechanistic understanding of early events in Toll-like receptor signalling, how the pro-neurodegenerative NADase SARM1 is regulated, activated, and inhibited by small molecules, and how bacterial antiphage defence systems are activated by NAD^+ derived secondary messengers. His research has led to new models for signal transduction in response to disease threats and is providing rational avenues for the design of new therapeutics to combat a range of neurodegenerative diseases.

ASBMB Medallist and Awardee Profiles

The SDR Scientific Education Award rewards outstanding achievement in education in biochemistry or molecular biology, especially innovation and creativity in education, with a view to fostering leadership in this important area of the Society's objectives. The Award will enable the recipient to participate in an international conference with a significant focus on education, or to spend a period of time at another institution (in Australia or overseas) for the purposes of undertaking developments in education in biochemistry and molecular biology. The recipient will present a lecture within the Education Symposium at the ASBMB annual conference. Applicants must have been members of the Society for at least two years before the year in which the Award application is to be considered. The contribution to travel expenses is provided through the courtesy of SDR Scientific.

SDR Scientific Education Award
Julian Pakay

I completed my undergraduate studies and PhD in Biochemistry at the University of Western Australia. I then undertook postdoctoral research projects at the Dunn Human Nutrition Unit at the University of Cambridge, the University of Geneva and, returning to Australia, at the Bio21 Institute in Melbourne. While I was initially very much focused on a research career, I always enjoyed teaching, and was fortunate to be involved in undergraduate teaching in all of my appointments. It was this experience that allowed me to transition into a teaching focused role at La Trobe University in 2010.

Though I have taught at all year levels, my main role has been to coordinate and teach third year biochemistry. I enjoy mentoring these students and helping them transition into research and other careers. Much job satisfaction comes from seeing my students succeed and several of my former students now run their own research laboratories. Recently, I took over coordination of a large cohort first year biology subject where I enjoy introducing students into the discipline and I now have the privilege of seeing them develop over the course of their studies.

One of my main goals is to encourage my students to stop thinking of themselves as just 'students', but instead to think of themselves as young professionals with something to offer. When they do this, motivation becomes easier, and learning takes precedence over accreditation. To this end, I focus on teaching them skills and try wherever possible to set authentic 'portfolio friendly' assignments and competency-based learning goals. My students complete diverse projects, including genuine metagenomic analyses, news and views style presentations on current research and science fiction prototyping. I often end up learning a lot from them!

I combine both experience and a scholarly approach to inform my teaching and identify deficiencies in student understanding. One of my main research interests has been to develop strategies to improve teaching of quantitative literacy. This work has earned both internal and international recognition, but importantly has also informed curriculum development and led to authoring an open education textbook on quantitative literacy in biomedical science, *Foundations of Biomedical Science*. This, along with the support I have received from La Trobe University (in particular our Department of Biochemistry and Chemistry and the La Trobe eBureau), as well as the Council of Australian University Librarians has motivated me to continue consolidating my teaching expertise to develop more open education resources.

ASBMB Medallist and Awardee Profiles

The Eppendorf Edman ECR Award is awarded to an ASBMB member with no more than seven years postdoctoral experience (or equivalent taking any career disruption into account), in recognition of their outstanding research work. The Award provides funds to assist the recipient to attend an overseas conference in a field associated with biochemistry or molecular biology or to visit briefly a research laboratory in Australia or elsewhere to access specialised equipment or to learn new research techniques. The recipient will present a lecture within a symposium at the ASBMB annual conference. Applicants must have been members of the Society for at least two years before the year in which the application is to be considered, or must have taken out a three year membership in the year of the application. The contribution to travel expenses is provided through the courtesy of Eppendorf South Pacific.

Eppendorf Edman ECR Award
Praveena Thirunavukkarasu

Dr Praveena Thirunavukkarasu gained her PhD in 2017 in Biochemistry and Molecular Biology from Monash University. Her research was on elucidating the molecular mechanism of recognition of lipid-based antigens by a new class of Natural Killer T (NKT) cells in humans termed atypical NKT cells, and her key findings were published in a joint first-authored paper in *Nature Communications* (2016). She then joined the Monash Biomedicine Discovery Institute as a Research Fellow under the mentorship of Professor Jamie Rossjohn FRS to further explore the recognition mechanism of lipids produced in the human gut microbiota by NKT cells.

Dr Thirunavukkarasu's ability to drive high-calibre research is evidenced by her ten original publications in highly reputed journals, including *Nature, Science, Nature Communications* and *Proceedings of the National Academy of Sciences USA*. Her ground-breaking joint first-authored work published in *Nature* (2021) unravelled the mechanism by which lipids produced by the gut microbe, *Bacteroides fragilis*, are presented by antigen-presenting cells and are recognised by NKT cells, thus shaping the host's immune response. She has been a pivotal player of a collaborative team in the discovery of a novel T-cell lineage (γμ T cells) present in marsupials, which was recently published in *Science* (2021). The significance of her work has been highlighted by commentaries and also has attracted media attention, including featured articles in MedicalXpress, EurekAlert! and ScienceDaily.

Dr Thirunavukkarasu's international standing in the field of structural immunology is evidenced by her publications and selection as a speaker at several national and international conferences. In recognition of her research excellence, she was awarded the prestigious Anders Early Career Researcher Award (Lorne Proteins, 2024). Dr Thirunavukkarasu was recently awarded an ARC Discovery Early Career Researcher Award (DECRA) (2023–2025) to develop her research program on understanding the presentation of gut microbiota-produced novel lipid antigens and their subsequent recognition by NKT cells. Her vision is to reshape our understanding of T-cell immunity within the gut microbiome–NKT cell axis, using a combination of multidisciplinary approaches including protein chemistry, cellular immunology and structural biology.

ASBMB Fellowship Profiles

The ASBMB Fellowships are awarded annually to biochemists or molecular biologists, in their early career and normally resident in Australia, in recognition of their outstanding work in an area of biochemistry and molecular biology. The Fellowships provide funds to assist the recipient to attend an overseas conference in a field associated with biochemistry or molecular biology or to briefly visit a research laboratory in Australia or elsewhere to access specialised equipment or to learn new research techniques. Applicants must be at least in the second year of PhD training and not more than two years subsequent to the award of their PhD degree. Applicants must have been members of the Society for at least one year immediately prior to application or must have taken out a three year membership in the year of the application.

The Collins family kindly established the Fred Collins Award to honour the role that Fred Collins played in the establishment of the Australian Biochemical Society.

Sai Chitti – recipient of the Fred Collins Award for the most outstanding ASBMB Fellowship applicant

Dr Sai V Chitti completed a Master of Science in Biochemistry and Molecular Biology in 2013 at Pondicherry University, India. He received two gold medals as the highest ranked student. After undertaking a Junior Fellowship at the Centre for Cellular and Molecular Biology, India, Sai moved to Australia in 2018 to pursue a PhD under the supervision of Professor Suresh Mathivanan in the La Trobe Institute for Molecular Science, La Trobe University. His PhD focused on the role of extracellular vesicles (EVs) in cancer-associated weight loss, known as cancer cachexia. His work showed that inhibiting EV secretion from tumours could attenuate cancer cachexia.

Upon completion of his PhD in 2022, Sai continued as postdoctoral researcher with Professor Mathivanan to investigate novel therapeutic avenues to treat cancer cachexia. In 2023, Sai won the Australia and New Zealand Society for Extracellular Vesicles ECR Award. In 2024, he secured a CASS Foundation Medicine/Science Grant as sole CI to investigate the novel treatment avenues for cancer cachexia. Sai has published 29 papers (eight first/co-first including articles in *Nucleic Acids Research* and *Nature Communications*, two senior author and 19 co-author) with 1233 citations and h-index 12. Sai is also the recipient of ASMR Best Poster Award, Research Centre for Extracellular Vesicles collaborative grant and multiple travel awards. He currently serves as a Guest Editor for a special issue in *Cells*: Extracellular Vesicles in Health and Diseases.

This ASBMB Fellowship will give Sai the opportunity to learn an advanced research technique from international specialists at PennState College of Medicine and to attend the 17th International Conference of the Society on Sarcopenia, Cachexia and Wasting Disorders in Washington, USA.

Abhimanu Pandey

Dr Abhimanu Pandey completed undergraduate studies in India in 2018. He came to Australia to undertake his PhD at the John Curtin School of Medical Research (JCSMR) at the Australian National University (ANU). In 2022, Dr Pandey commenced a postdoctorate at the JCSMR in the lab of Professor Si Ming Man which studies the role of innate immunity in infection and cancer.

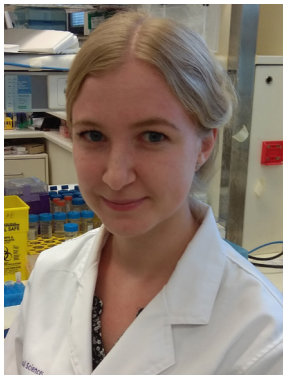
Abhimanu's research investigates the role of the immune system in the development and progression of bowel cancer. During his PhD, Abhimanu identified several immune proteins that work like a surveillance system detecting damaged signals inside the cell and preventing the healthy cells from becoming cancer cells.

Abhimanu's research achievements have been recognised by several awards, including the Royal Society of New South Wales Bicentennial Early Career Research and Service Citations Award (2023), Dewar-Milne Prize for Immunology for the most outstanding PhD thesis in the field of Immunology submitted in JCSMR in 2022, the Australian Capital Territory Private Practice Fund Grant (2023) and two early-career grants from the Bootes Medical Research Foundation (2021 and 2022). He is a recipient of the ANU Early Career Researcher Travel Grant (2023) and the ANU Vice-Chancellor's HDR Travel Grant (2022).

This ASBMB Fellowship will support Abhimanu's travel to the annual meeting of the American Association of Immunologists, IMMUNOLOGY2024.

ASBMB Fellowship Profiles

Yuliia Didan



Yuliia completed her Bachelor of Science in Biology and Master of Science in Biochemistry at the Taras Shevchenko National University of Kyiv in Ukraine. She then went on to obtain a Master of Science degree in Molecular Mechanisms of Disease at the Radboud University in the Netherlands. During her studies in Europe, Yuliia performed multiple internships in research institutes and universities in Ukraine, the Netherlands, Germany, Sweden and Czechia. In 2019, Yuliia started her PhD study at the University of Queensland under the supervision of Associate Professor Dominic Ng. Her PhD project investigates how cells delineate different types of stress stimuli and form an appropriate response for each stimulus. Using optogenetics, she discovered that activity dynamics of c-Jun N-terminal Kinase (JNK) encode information about the types of the stress stimulus and its dose and define distinct cell fates. It was also discovered that changes in intracellular pH or protein network of the JNK pathway can modulate the dynamics of JNK activity.

Yuliia's findings have been published in several well-regarded journals, including *EMBO Journal* and *Molecular Systems Biology*. Her research has also been recognised through multiple awards and scholarships, including travel grants from EMBL Australia and the Royal Society of Biology, Erasmus+ Grant, scholarships from the University of Queensland and the Radboud Scholarship Program, and awards for the best oral presentation at the Conference of Young Scientists in Kyiv.

This ASBMB Fellowship will allow Yuliia to present her latest findings at the FASEB Conference on Dynamics and Encoding in Cell Signaling in New York, USA.

Jascinta Santavanond

Jascinta Santavanond completed her Bachelor of Biomedical Science in 2018 at La Trobe University, attaining First Class Honours under the supervision of Professor Ivan Poon. During this time, she worked to identify novel molecular regulators controlling the fragmentation of apoptotic cells into small membrane bound particles known as apoptotic bodies (ApoBDs) and the functional roles of ApoBDs in intercellular communication. Currently in the final year of her PhD, Jascinta has expanded on this work by developing novel murine and zebrafish models to explore the dynamic relationship between apoptosis, apoptotic cell disassembly and efferocytosis in various (patho)physiological settings. This work has resulted in several national and international collaborations with leading cell death and cell clearance researchers, as well as invitations to speak at international symposiums and special interest groups. She was also awarded highly competitive funding to travel to the University of Virginia to train in zebrafish research and has since established the zebrafish breeding and experimental program within the Poon laboratory at La Trobe University. Jascinta's research has been recognised through several awards and scholarships including poster and oral prizes, travelling fellowships, the La Trobe Institute for Molecular Science Professional Development Award and the Australasian Cell Death Society Professional Development Award.

This ASBMB Fellowship will allow Jascinta to travel to Saint-Jean-Cap-Ferrat, France, to share her recent work at the EMBO Workshop on the Molecular and Cellular Basis of Regeneration and Tissue Repair.

Do I Have a Patent Yet? Distinguishing Patents From Patent Applications

Dr Harriet Manley (Patent Scientist) and Dr Sarah Hennebry (Associate Principal) from FPA Patent Attorneys explain the differences between a patent application and a granted patent.

Harriet Manley (top) and Sarah Hennebry.

Introduction

A common question that individuals ask when travelling the road towards patent protection is, "Do I have a patent yet?" The process to obtain a patent can be a long one, and it is important to recognise when you do and do not have enforceable patent rights.

Filing a patent application (sometimes known as 'patent pending') does not equate to obtaining an enforceable patent. This article aims to clarify the differences between patent applications and granted patents. We outline what can be achieved from both types of documents, in particular the purpose of the claims and description, and limitations of patent applications before they become a granted patent.

What does a patent application give you?

As discussed in our previous articles, filing a patent application establishes a **priority date**. Importantly, the priority date determines the prior art base against which the patent application is assessed for its novelty and inventiveness (as disclosures publically available before the priority date represent prior art). The date when the complete patent application is filed is the date from which your patent rights 'start' (t=0) if the patent is ultimately granted.

A patent application, in a way, can be considered as outlining how you wish to protect your invention with claims that are written in pencil. These 'pencil' claims specify features to initially define the invention (**Fig. 1**).

Before it is granted, a patent application needs to go through an examination process where an examiner at a patent office determines whether the application (including the description and claims) meets the legal requirements to constitute a valid patent. Examination of patent applications can take years with the length of examination depending on the jurisdiction in which the application is being examined. During examination, the 'pencil' **claims** can be amended to address objections raised by the examiner, to increase the chances of the patent application being granted.

In addition to claims, the application specification includes a **description** of the invention (which often includes examples and figures). The description discloses aspects of the invention to help explain the scope of the invention and how to perform the invention.

Once published, the application becomes part of the prior art against which future patent applications will be assessed – and therefore the content of the description can be used to strategically obstruct a competitor from obtaining a patent in the space. In this way, where the claims of the application stake your claim to an invention, the description can be thought of putting up a fence around your stake to help protect it. However, it is important to recognise that the application disclosure also impacts you, the applicant. If you prematurely disclose information in an earlier patent application that you later wish to rely upon to establish novelty and inventiveness, you could also prevent yourself from getting further patents to a new invention.

So whilst a patent application does not give you enforceable rights, it provides you with an initial stake in the ground from which to obtain a granted patent, establishing a priority date and producing a disclosure that may deter or prevent competitors from obtaining patent rights of their own in the same area.

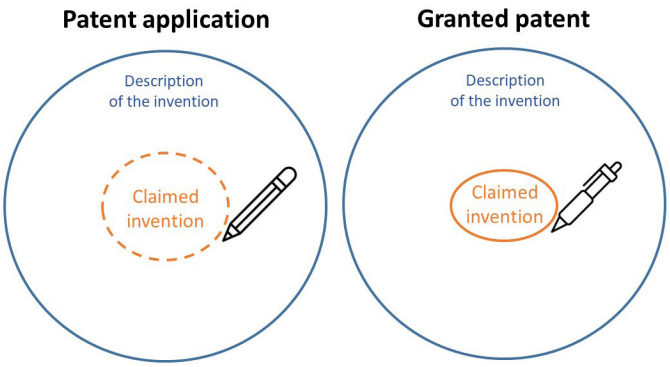


Fig. 1. *Schematic demonstrating a key difference between patent applications and granted patents. For patent applications, the claims are drafted in 'pencil' and the scope of the claims may change. For granted patents, the scope of the claims is now 'written in pen' having been assessed by a national patent office, and the scope of the claims may be narrower than the patent application.*

Do I Have a Patent Yet? Distinguishing Patents From Patent Applications

What does a granted patent give you?

A granted patent gives you the exclusive right to prevent others from exploiting the invention defined in the granted claims. You've now outlined the invention in 'pen', not 'pencil' (**Fig. 1**). Importantly, the rights you get are negative rights. In other words, you get the right to stop others using your invention.

The scope of the granted claims defines the monopoly of the invention you have. For example, if you have described Protein A and Protein B in your patent specification, but only obtain a granted claim directed to Protein A and not to Protein B, then you only have patent protection for Protein A.

Further, the scope of the granted claims may differ in different jurisdictions across a patent family. This is important to remember, as it means that not all the patents in your patent portfolio necessarily have the same breadth of protection. Moreover, because national jurisdictions undertake independent examination of the patent application and are subject to different national patent laws, the outcome of patent examination can result in broader or narrower granted claims in different jurisdictions. For example, in some countries, claims directed to a peptide composition may be permitted to include some degree of sequence variation provided functionality of the peptide is maintained, whereas in other countries the claims are limited to a peptide of an exact amino acid sequence. And some countries will only grant claims directed to composition of matter, and do not permit claims directed to medical uses.

A granted patent does not *automatically* protect you from people using your invention. To enforce the rights of a granted patent, it is necessary to:

(a) identify that a potential infringer is using your invention; and

(b) enforce your rights by taking legal action against the potential infringer.

Identifying potential infringers can be achieved by actively monitoring the activity of your competitors. This may include monitoring their product announcements, clinical trial results, regulatory submissions and patent filings.

Enforcing a patent (or asserting infringement) can be a costly and risky business (because the outcome rests in the court's hands). And exactly how you enforce your patent rights will depend upon in which jurisdiction a potential infringement occurs. However, enforcement can be imperative to ensure that others aren't unfairly reaping the rewards of your intellectual and commercial investment. Commercial partnerships can mitigate the costs of enforcement.

Crucially, a granted patent does *not* give you freedom to operate. In other words, it does not affect whether or not your actions will infringe pre-existing granted patents that belong to other parties. A granted patent only establishes your rights regarding your defined invention, and does not affect your rights to use other inventions.

Why is it important to understand the difference between a patent application and a granted patent?

Understanding the distinction between an enforceable patent and a patent application is helpful for a number of reasons:

- ***Freedom to operate.*** Only the claims of an enforceable, granted patent can restrict your freedom to conduct commercial activities without infringing a third party's granted claims.

  If a competitor has only filed a patent application, this *may* not ultimately impact your freedom to operate. The claims of an application are not set in stone (i.e., in 'pen'), and cannot be infringed. When the application is examined, the competitor may be limited to specific claim scope, and they may not obtain the claim scope being pursued in the earlier claims. Some of the 'pencil' claims might get rubbed out and deleted entirely, or amended, in order for the application to get through examination and become a granted patent. The application may not even been granted.

  Consequently, if you identify a patent *application* that you think may affect your freedom to operate, commonly the best approach to take is to monitor the progress of the application, and see which claims are granted, to see if the patent *will* impact your freedom to operate. If the application is never granted… no worries!

- ***Patent landscape.*** The disclosures of *both* patent applications and granted patents can affect your ability to obtain a patent, by representing relevant prior art for assessing whether or not your invention is novel and inventive. Moreover, patent applications can be unpublished (i.e., not available for public inspection) at your priority date, but still be relevant prior art for novelty assessment if filed before your priority date and published later.

- ***Commercial discussions.*** Investor or partnering discussions are always assisted by clarity of communication, and saying that you have a patent, when actually you have a patent *application*, is misleading. Additionally, having an awareness of key patent concepts can assist in demonstrating that you appreciate the legal steps to commercialise your invention, and that the road to patent protection can be long. Your patent attorney can advise how to convey the value of a patent application, if you are concerned that your lack of a granted patent could affect your commercial attractiveness.

Do I Have a Patent Yet? Distinguishing Patents From Patent Applications

Conclusion

Appreciating the differences between patent applications and granted patents is an important aspect of patent literacy that can significantly aid your filing strategy and commercial discussions. Although patent applications do not provide enforceable rights, they are crucial documents for establishing a priority date for your invention, and commence the process of obtaining a granted patent by describing the invention and defining initial 'pencil' claims. On the other hand, granted patents provide rights to prevent others exploiting your invention, with final 'pen' claims that restrict other people's freedom to operate. Your attorney will be able to advise you how to maximise the benefit of your patent applications, and your granted patent rights.

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Science Teachers' Association of Victoria – Science Talent Search

The Victorian branch of the ASBMB continued its Gold Sponsorship of the annual Science Talent Search in 2023, the 72nd year of the competition. The Science Talent Search, founded in 1952, is organised by the Science Teachers' Association of Victoria and is open to all primary and secondary school students in Victoria. The aims of this program are:

- Encouraging independent self-motivated project work amongst students of science.
- Giving students the opportunity to communicate their achievements to a wider audience.
- According recognition of effort and achievement for their scientific enterprise.
- Promoting the direct involvement of the students in the process of science and its communication.
- Providing the public at large an opportunity to see the quality of work being achieved in science, by both primary and secondary students.

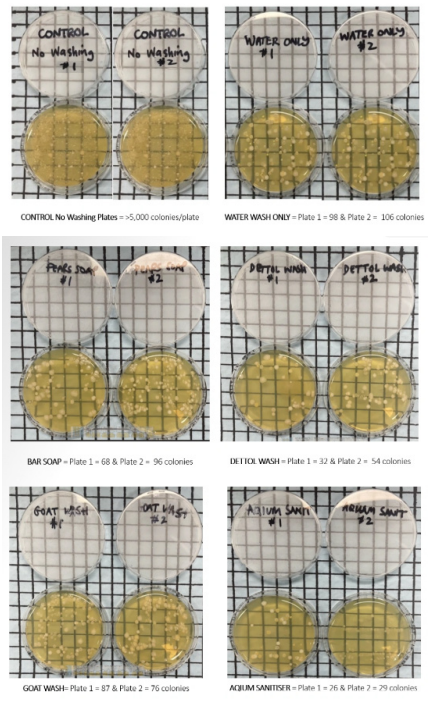
The main theme the competition was 'Innovations: Powering the Future'. ASBMB Victoria was once again delighted to support the event with a $1000 donation in the form of major and minor bursaries to students attending the following primary and secondary schools: Beverly Hills Primary School, Doncaster Secondary College, Fintona Girls School, Haileybury (Berwick Campus), Huntingtower School, Lauriston Girls' School, Lower Hall Anglican Grammar School, Presbyterian Ladies' College, Shelford Girls' Grammar and Wesley College (St Kilda Road Campus).

Project titles included: 'The best daily menu for algae to flourish', 'The effects of spatial arrangement in the storage of bananas on the rate of ripening', 'A replacement for ammonia-based fertilizer', 'How do onions effect bacterial growth', 'What products work best to wash your hands with?', 'Effect of makeup concentration on bacterial growth', 'Plants vs carbon dioxide, 'Producing energy though anaerobic digestion', 'Preservatives: why do some foods and drinks last longer?' and 'Effects of egg substitutes in sponge cake'.

Given these students are primary or secondary school age, the concepts are quite challenging. Hopefully events such as the Science Talent Search will encourage students towards a future career in science! Congratulations from ASBMB Victoria on completing your research projects for 2023.

Laura Osellame
ASBMB Victorian State Representative, 2021–2023
stav.org.au/science-talent-search

Figure 1: Plates following 24 hours of bacterial growth.



Results from the 'What products work best to wash your hands with?' project.

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Eppendorf Edman ECR Award Report

Cologne Conference Chronicles

In late November 2023, I had the opportunity to attend the FEBS-IUBMB-ENABLE conference in Cologne, Germany. Having not attended an international conference since the global pandemic, I was truly excited about this event.

FEBS-IUBMB-ENABLE 2023 conference participants.

The FEBS-IUBMB-ENABLE conferences are International Molecular Biosciences conferences that cover a wide range of areas in Life Sciences and Biochemistry. The conference was organised by PhD students and postdocs and consisted of a scientific symposium on the first two days and a career day on the third. The scientific symposium covered various fields of research, including complex diseases, novel model systems, epigenetics, exposome and computational modelling. I presented my poster on the second day of the conference and received useful feedback from my peers. The networking time between sessions was a valuable element of the conference, providing an opportunity to engage in one-on-one conversations with other scientists and exchange ideas.

The Career Day included intensive courses for small groups aimed at enhancing the personal and professional development of young researchers. I attended workshops on improving transferable skills and coaching sessions to help achieve professional goals. The job fair on the last day provided unique opportunities for junior scientists to meet with representatives from pharmaceutical and biotech companies, editing/publishing companies, academic organisations and scientific societies. There were also career chats highlighting alternative paths besides staying in academia, such as patent lawyers, clinical safety managers and science communicators. The conference, hosted by the University of Cologne, was attended by 250 delegates from 31 countries. It had an overall environmental sustainability theme, and for each participant who attended, a tree was planted in a region in Tanzania.

The conference gala dinner took place at Brauwelt Köln, where two of the oldest breweries and distilleries in Cologne are located. Pre-dinner brewery tours provided an ideal networking opportunity for scientists. Cologne, the fourth-largest city in Germany, is known for the famous Cologne Cathedral, a UNESCO World Heritage Site. Despite having visited the city in 2016, I was once again awestruck by this magnificent Gothic cathedral. I explored many of Cologne's Christmas markets, including the popular one around the cathedral. The market stands offered a wide spectrum of handcrafted gifts, festive delicacies and traditional Christmas decorations. The last two days I spent in Cologne were particularly cold, and the markets were full of people warming themselves up with a mug of hot mulled wine and enjoying the festive atmosphere. I also had the opportunity to visit two other German cities, Bonn, the former capital of Germany and the birthplace of Beethoven, and Frankfurt, famous for its historical market square, Römerberg. Overall, this conference trip was an invaluable experience where I met like-minded individuals from around the world, learned about cutting-edge research and built professional relationships within the field.

Dr Lahiru Gangoda is a postdoctoral researcher in the Ocular Oncology Unit at the Centre for Eye Research Australia.

Right: Poster presentation.

Above: Römerberg historical market square, Frankfurt.

Right: Christmas market in Cologne.

ASBMB SDR Scientific Education Award Report

The Road Less Travelled Leads Us to New Experiences and Destinations

If there had been an award for the furthest travelled, we would have been deserving recipients. We flew 24 hours across the globe as a motley crew of academics and students to attend a conference on Interdisciplinary Learning and Teaching (ILTC) in the UK. Our mission was to share and learn about innovations in university teaching that break down barriers between disciplines.

As a prelude to our talks, we represented the fact that we were from down under to full effect – three presentations supported by three Australian native animals – the platypus to describe interdisciplinarity, drop bears for wicked problems and kangaroos for the power of critical thinking. We described our university breadth subject 'Designer Humans: Prospects and Perils', presenting the culmination of technology, science, social science and humanities in one offering and highlighting challenges in ensuring equitable assessments for students from various disciplinary backgrounds.

In our first talk, we discussed our learnings and improvements over the three years that the subject has run for. Central to this subject is to draw out and train students in critical thinking described in our second talk and to share the student perspective in our third talk on Designer Humans with spin-off offerings – the student-led interdisciplinary journal, Humans 2.0, and its namesake conference. It did not escape us how 'meta' it was to present on a conference in a conference.

In return, we were treated to a host of reflections on interdisciplinary subjects, projects and courses and met with other kindred spirits to break down barriers for students. While the areas of study are different (Masters of Medical Humanities, Da Vinci Project, Tae Kwon Do workshops, to name a few), our goals were the same – to create common ground, to train students to relate to another perspective, to build resilience and address complex challenges. We learnt of braided methods where students use methodologies from one discipline to interpret data in another. It is through this novel thinking and methodologies that students are able to find more comprehensive explanations of big and indeed wicked challenges of the future.

The strong sense of camaraderie exhibited at ILTC allowed us an authentic sharing of challenges in breaking disciplinary boundaries. It was gratifying that we are not alone in this quest. We were heartened by student presenters detailing their initial trepidation and resistance in taking interdisciplinary subjects to be ultimately rewarded with a much broader perspective, leading to self-actualisation and equipping them with translatable skills for the big wide world out there.

We also had the opportunity to visit the Amsterdam Science Park, the European hub for digital innovation and sustainability where we met with University of Amsterdam academics in the Institute for Interdisciplinary Studies – Linda de Greef, Vincent Tijms and Silke van Beekum, to share our combined trials and tribulations in our interdisciplinary journey. It was refreshing to learn of their methods in overcoming challenges.

Right: Max Billington, Saw Hoon Lim, Jiangli Tan and Ger Post at the Interdisciplinary Learning and Teaching Conference at the Anglia Ruskin University, Chelmsford campus in East Anglia, UK.

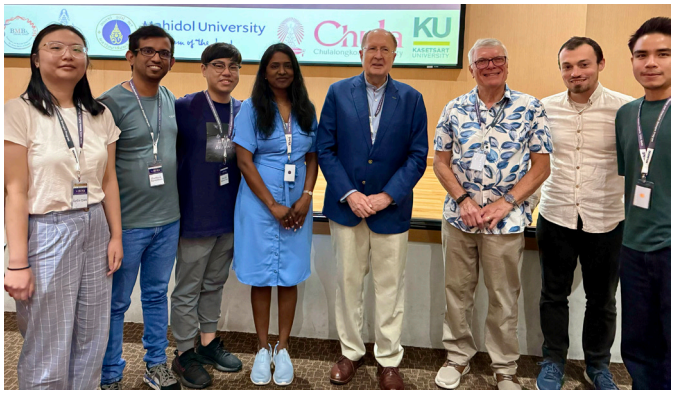
Left: Jiangli Tan, Max Billington, Saw Hoon Lim and Ger Post at the Amsterdam Science Park, University of Amsterdam.

This trip would not have been possible if not for the generous ASBMB Education Award contributed by SDR Scientific which allowed a student from Designer Humans to share their perspectives of the subject, journal and conference, together with the staff. While it is a road less travelled, we are in a leading position to carve a path which we daresay will not be a straight one and neither do we want it to be, as the more we veer away from the beaten track, the more we learn and grow.

Associate Professor Saw Hoon Lim, Teaching Specialist, Department of Biochemistry and Pharmacology, University of Melbourne
Dr Jiangli Tan, Educational Designer, Department of Microbiology and Immunology, University of Melbourne
Ger Post, Lecturer, Department of Anatomy and Physiology, University of Melbourne
Max Billington, former Designer Humans student, University of Melbourne

Young Biochemist and Molecular Biologist Program 2023 Report

It was a great privilege and honour to be selected to attend the Young Biochemist and Molecular Biologist (YBMB) program 2023, which was held in the nice province of NaKhon Pathom prior to the 30th FAOBMB and the 8th Conference of the Biochemistry and Molecular Biology Section of the Science Society of Thailand (BMB Thailand) in Bangkok, Thailand. YBMB 2023 was organised by BMB Thailand and was hosted by Mahidol University. The YBMB program gathered 33 young scientists from the FAOBMB regions, including six bright minds from Australia: Nutpakal Ketprasit (University of Melbourne), Lydia Qian (University of New South Wales), Dr Belal Shohayeb (University of Queensland), Dr Chathura Suraweera (Australian National University), Dr Jing Zhi Anson Tan (University of Queensland) and Dr Praveena Thirunavukkarasu (Monash University).



Australian participants at YBMB 2023 with speakers. From left: Lydia Qian, Chathura Suraveera, Anson Tan, Praveena Thirunavukkarasu, Gregory Winter, Phillip Nagley, Belal Shohayeb and Nutpakal Ketprasit.

The theme of the YBMB program was Multidisciplinary for Sustainability. The major goal was for young scientists to share their knowledge in a fun environment and to open up the possibility for forming new collaborations.

The program kicked off with a warm welcome from the YBMB 2023 Local Organising Committee, led by Associate Professor Kornkamon Lertsuwan from the Department of Biochemistry, Mahidol University. We then had icebreaker activities that helped us to get to know each other and make friendships. The Day 2 started with a stupendous and inspirational lecture from the 2018 Nobel Laureate in Chemistry, Professor Gregory Winter. He detailed his journey that led to the first humanised antibodies and how his team used directed evolution of antibodies for therapeutic purposes. Professor Phillip Nagley then gave a talk on his work and his scientific journey. One important lesson learned from him is that as a scientist, we need to build a career on our skills and experiences, and find a place for lifestyle activities and relaxation.

YBMB participants, speakers and organisers at the Siree Ruckhachart Nature Learning Park.

It was fantastic that the YBMB Local Organising Committee organised an educational tour to the Siree Ruckhachart Nature Learning Park. We had an excellent opportunity to learn about the medicinal benefits of various plants. Subsequently, the young scientists in groups prepared a short presentation on the theme 'sustainability of medicinal plants'. At the end, several awards were handed out to the presenting groups in recognition of their innovation and creativity. In addition to the inspiring scientific environment, we all enjoyed the delicious Thai cuisine and the time together making friendships leading to new collaborations.

The cultural activity organised on Day 2 involved making of kra-thong, a bamboo boat decorated with flowers, which was a lot of fun. Overall, the YBMB program was an enriching experience that involved exchange of scientific ideas and fostered relationships among young scientists for future collaborative research. We thank the organisers, ASBMB, FAOBMB and BMB Thailand for giving us this wonderful opportunity to participate in this program that we will cherish for many years. Nutpakal would also like to thank the IUBMB for the Travel Fellowship.

Nutpakal Ketprasit, University of Melbourne, and Praveena Thirunavukkarasu, Monash University

Making kra-thong at the Thai cultural night. From left: Praveena Thirunavukkarasu, Lydia Qian and Nutpakal Ketprasit.

30th FAOBMB Conference

Nirma Samarawickrema reports on the FAOBMB Conference held in Bangkok, Thailand, and the FAOBMB Council meeting.

The 30th FAOBMB Conference and 8th Conference of the Biochemistry and Molecular Biology Section of the Science Society of Thailand (BMB Thailand) was held in Bangkok, Thailand, from 22–25 November 2023. The event also marked the 50th anniversary of BMB Thailand. The four-day conference, held at the Centara Grand at Central Plaza Ladprao, was conveniently located in the heart of Bangkok with all the amenities for a successful meeting. Prior to the conference, BMB Thailand hosted a Young Biochemist and Molecular Biologist program for early career scientists, which took place from 19–21 November at Mahidol University, Salaya campus (reported on page 44 in this issue of the *Australian Biochemist*).

The theme of the conference was Biochemistry and Molecular Biology – In the New Normal Era. It was co-hosted by the BMB Thailand and the Departments of Biochemistry from Chulalongkorn University, Kasetsart University and Mahidol University. Attracting over 400 participants from 25 countries across the region, this vibrant conference was a good mix of local and international participants, including 23 participants from Australia. A highlight of the conference was that participants could meet in person, after three years of missing such connections due to the COVID-19 pandemic.

FAOBMB Council meeting

The FAOBMB Council meeting was held on 21 November at Centara Grand, before the commencement of the conference. Twenty-five participants from 20 countries represented their countries either as members of the Executive Committee (EC) or as delegates to the Council of Constituent Member Societies/Groups. Australia was represented by Professor Paul Gleeson, Chair of the Fellowships Committee; Associate Professor Terry Piva, FAOBMB Regional Ambassador of IUBMB; Professor Phillip Nagley, Archivist/Public Officer-Secretary; and Associate Professor Nirma Samarawickrema, the ASBMB Representative to FAOBMB. The Council meeting was chaired by Professor Joon Kim (President) and Professor Sheila Nathan (Secretary General). In his President's report, Professor Kim emphasised that the annual FAOBMB meetings (including the triennial Congress) continued to advance biochemistry and molecular biology through the promotion of research and collaboration of creative experiences within and beyond the FAOBMB region. He reiterated the importance of closer ties between the member societies and with the IUBMB, and shared his hopes for achieving this through the in-person 30th FAOBMB conference.

Professor Shannon Au (Treasurer) provided a comprehensive report on the financial status of all FAOBMB accounts, the subscription status of constituent members and the budget plan for 2024. In addition to the FAOBMB Travel Fellowships, Professor Paul Gleeson also reported on the categories of Education Special Travel Fellowships: the generic award for attendance at an educational event that is not part of an FAOBMB meeting and an award to attend an FAOBMB-specific meeting. Professor Gracia Fe Yu (Chair of Education) provided updates on the 2023 IUBMB–FAOBMB and the 2024 IUBMB–FAOBMB–ASBMB Education Symposia. In addition, reports from the 29th FAOBMB Conference, Shenzhen, China (2022), the 30th FAOBMB Conference, Bangkok, Thailand (2023), the 26th IUBMB–17th FAOBMB Congress, Melbourne, Australia (2024), the 31st FAOBMB Conference, Busan, Korea (2025), were noted. Bids to host the 32nd FAOBMB Conference in 2026 in Hong Kong and the 18th FAOBMB Congress in 2027 in Malaysia were discussed.

Since the terms of office of both the Chairs of the FAOBMB Fellowships Committee and the Education Committee, as well as that of the Secretary-General, were due to end in December 2023, the Executive had called for nominations and invited the Council members to vote earlier in 2023. The new Chairs for

Twenty-five participants from 20 countries represented their countries at the FAOBMB Council Meeting.

the Fellowship Committee and Education Committee are, respectively, Professor Rasika Perera (Sri Lanka) and Associate Professor Nirma Samarawickrema (Australia). Expressions of interest will be called for in 2024 for the post of Secretary-General.

30th FAOBMB and 8th BMB Thailand Conference

The conference was declared open with much pageantry by Her Royal Highness Princess Chulabhorn Krom Phra Srisavangavadhana, herself a Professor in Organic Chemistry at Mahidol University. The FEBS Worldwide Lecture was then delivered by Professor Sir Gregory Winter, Nobel Laureate in Chemistry (2018), on antibodies and antibody mimics as potential pharmaceutical drugs. The second plenary lecture was presented by George Gao (Chinese Academy of Science) on the molecular basis of virus entry as seen by crystallography and cryo-EM studies. Following the opening ceremony and the two plenary lectures, participants were invited to the Welcome Party which included a lavish buffet dinner and a cultural pageant featuring many talented artists depicting traditional Thai costumes, dance and culture, including a Thai kickboxing session!

Thai kickboxing display.

Professor Yongyuth Yuthavong (right) with Professor David Craik who delivered a lecture commemorating the 50th anniversary of BMB Thailand.

Professor Jisnuson Svasti (left) and the FEBS Worldwide Lecturer, Professor Gregory Winter.

Professor Joon Kim (FAOBMB President, left), presents the FAOBMB Award for Research Excellence to Professor Merlin Crossley.

Professor Yang Mooi Lim (IUBMB Chair of Education and Training, left) with the IUBMB–FAOBMB Education Plenary lecturer, Associate Professor Nirma Samarawickrema.

There were five plenary lectures (including an IUBMB–FAOBMB Education Lecture), two invited speakers to commemorate the 50th anniversary of BMB Thailand, two FAOBMB Awards, two BMB Thailand Award Lectures and 29 invited speakers. The conference was delivered across 11 parallel sessions covering a variety of different aspects including: structural biology, chemical biology, immunology, host–pathogen interactions, cell signalling, systems biology in medicine, cell metabolism, molecular medicine, biotechnology and biochemistry engineering, plant molecular biology and education. There were 172 posters on display. There were several Australians who made significant contributions to the conference. As winner of the FAOBMB Award for Research Excellence, Professor Merlin Crossley (University of NSW) presented his work on the use of CRISPR-gene editing techniques as a cure for

beta-hemoglobinopathies. Associate Professor Nirma Samarawickrema (Monash University) talked about embedding the immersive experiences of real-life case studies in active learning workshops to nurture future biochemists in her plenary lecture that proceeded the IUBMB–FAOBMB Education Symposium. Professor David Craik (University of Queensland) was invited to deliver the lecture commemorating the 50th anniversary of BMB Thailand. He spoke on the use of cysteine-rich peptides as tools in drug design. Professor Paul Gleeson chaired the FAOBMB Fellowship Symposium, a session that consisted of nine presentations by each of the awardees of FAOBMB Travel Fellowships.

Twenty-four sponsors of the meeting had a variety of booths promoting their companies or organisations. This included a booth promoting the 26th IUBMB–17th FAOBMB Congress in Melbourne from 22–26 September 2024. This event, Biomolecular Horizons 2024, was also advertised with a short presentation by Professor Gleeson at the closing ceremony.

The conference featured an IUBMB–FAOBMB Education Symposium, chaired by Professor Gracia Fe Yu (Chair of the FAOBMB Education Committee)

Professor Paul Gleeson promotes the 26th IUBMB –17th FAOBMB Congress to take place in Melbourne in September 2024.

Thai dancing classes for the conference participants, including Professor Phillip Nagley.

and Associate Professor Danaya Pakotiprapha. As well as the Plenary Lecture by Nirma, this symposium included invited presentations, including by two Australians, Associate Professor Terry Piva (RMIT) and Associate Professor Peter Arthur (University of Western Australia), presentations from submitted abstracts, plus an active workshop on tools used to foster classroom engagement.

The conference dinner was held at the Centara Grand Hotel on Day 3 of the conference. Guests were treated to a feast of Thai cuisine, dance and culture, with the highlight being Thai dancing classes!

The conference was truly an exceptional platform for researchers, academics, educators, and students to come together to share their work and make connections; the in-person interactions were certainly the key to the success of this meeting.

As the incoming Chair of the FAOBMB Education Committee, I will be stepping down from my role as the ASBMB Representative to FAOBMB. Thank you to the ASBMB for giving me the opportunity. I welcome Professor Marc Kvansakul (La Trobe University) as the incoming ASBMB delegate to the FAOBMB.

Two new Honorary Members of FAOBMB

At its recent Council meeting, FAOBMB appointed two new Honorary Members, Professor Phillip Nagley (Australia) and Professor Piamsook Pongsawasdi (Thailand). This honour is bestowed by FAOBMB Council on individuals who have made significant contributions to the Federation.

Professor Nagley served as Secretary General of FAOBMB from 2012 to 2017, after which he became Archivist of the Federation. Phillip continues to manage the webpage of FAOBMB and is involved in preparing and checking documentation relating to constitutional matters of the Federation and its various activities, including Guidelines for the various Fellowships and Guidelines for Organizers of FAOBMB Congresses and Conferences.

Phillip Nagley (left) and Piamsook Pongsawasdi.

Professor Pongsawasdi was Chair of the FAOBMB Fellowships Committee from 2008 to 2013, after which she became FAOBMB Treasurer from 2014 to 2019. Amongst her many other roles, Piamsook was Chair of the Organizing Committee of the 13th FAOBMB Congress, held in Bangkok in 2012.

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Erratum

The *In Memoriam* tribute to William Hugh Sawyer published on pages 39–41 of the December 2023 issue of the *Australian Biochemist* incorrectly named Bill's PhD supervisor. Bill's PhD supervisor was Dr Hugh A McKenzie, Australian National University.

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Monitoring spheroid evolution using current methods is also difficult due to issues surrounding sample handling. Alveole have overcome this by employing a well-organised 3D tumour invasion assay techniques that allows a perfect organisation of experiments in space. This allows easier subsequent imaging and data analysis.

These applications clearly demonstrate that PRIMO can be a powerful tool to generate reproducible 3D cell aggregates, control their shape, and organise them in space for a precise automated data analysis and characterisation.

To download the AppNote, visit www2.axt.com.au/ASBMB-Spheroid

Election of Council 2025

Nominations are called for the following positions on the Council of the Australian Society for Biochemistry and Molecular Biology Inc for 2025: President Elect, Secretary, Treasurer, Editor, Education Representative, FAOBMB Representative, Secretary for Sustaining Members and State Representatives.

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The ASBMB Council for the period 1 January 2024 to 31 December 2024 is composed of the following members:	President	R Hannan
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	Secretary	D Ng #
	Treasurer	K Quinlan §
	Editor	T Soares da Costa #
	Education Representative	T Kuit #
	FAOBMB Representative	M Kvansakul #
	Secretary for Sustaining Members	S Parsons
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	WA	A Van Dreumel §

Nomination forms are available on the ASBMB website and are to be submitted online: https://www.asbmb.org.au/asbmb/council-nomination/Site/Register. Nominations for all vacant positions must be signed and seconded by members of the Society. The nominations must be signed by the nominee to indicate his/her willingness to stand. If more than one nomination is received for any position, a ballot will be held at the Annual General Meeting. All members will be notified of any elections and members not attending the Annual General Meeting may submit a proxy form available from the Secretary.

NOMINATIONS MUST REACH THE SECRETARY BY 5PM 11 SEPTEMBER 2024
(PRIOR TO THE ANNUAL GENERAL MEETING TO BE HELD ON 25 SEPTEMBER 2024).

ASBMB Council 2024

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