Lab+Life SCIENTIST

Isotopic analysis
volcanos and ancient history

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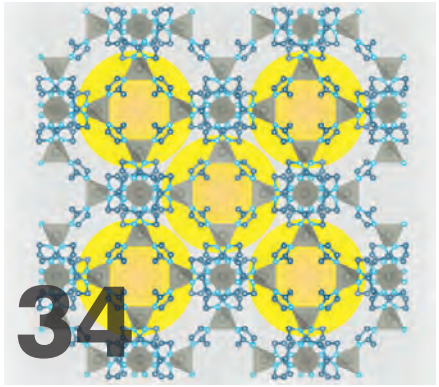

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Five ways the Budget may impact Australia's scientists

With the Australian Government having released its 2016–17 Budget on 3 May, Science Industry Australia (SIA) has pulled together the top five items that may impact its members.

Small business tax reform

From 1 July 2016, businesses with annual turnover less than $10 million will have a company tax rate of 27.5%. The company tax rate will be progressively lowered to 25% by 2026–27 for all companies.

The government will also extend a range of concessions already available to small businesses with turnovers less than $2 million to all businesses with turnovers less than $10 million from 1 July 2016.

Innovation and Science Agenda

Whilst not necessarily a new initiative, the Budget release continued to support the government's Innovation and Science Agenda. This includes an investment of $1.1 billion in the Innovation and Science Agenda to support a culture of ideas and innovation to encourage commercialisation, reward enterprise and facilitate investment.

For more detail on specific programs, please refer to the portfolio budget statement for Industry, Innovation and Science.

Jobs and job seekers

The Budget supports the development of an internship placement program that links young people with businesses, providing valuable work experience and allowing them to trial the job seeker's fit in the workplace. Interns will receive an incentive payment of $200 a fortnight paid in addition to their income support, and businesses will receive an upfront payment of $1000 to host them.

Entrepreneurship

The government is encouraging entrepreneurship, including through expansion of the New Enterprise Incentive Scheme (NEIS).

Eligibility for NEIS will be broadened to allow access to self-employment training and mentoring for job seekers who are not on income support, including those not in employment, education or training. An additional 2300 NEIS places each year will also be funded, making a total 8600 places available annually.

Legislative reform

The government is planning to amending section 46 of the *Competition and Consumer Act 2010*. This proposed reform will prevent the misuse of market power by dominant firms. The government is hoping that by improving the law's clarity, effectiveness and force, it will improve choice for consumers and support innovation by new businesses.

For further information on any of these issues, please go to http://budget.gov.au/.

Science Industry Australia
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For more coverage of the 2016–17 Budget, see Lab Online's news items Preventing carp-ageddon and CRCs and Budget confusion.

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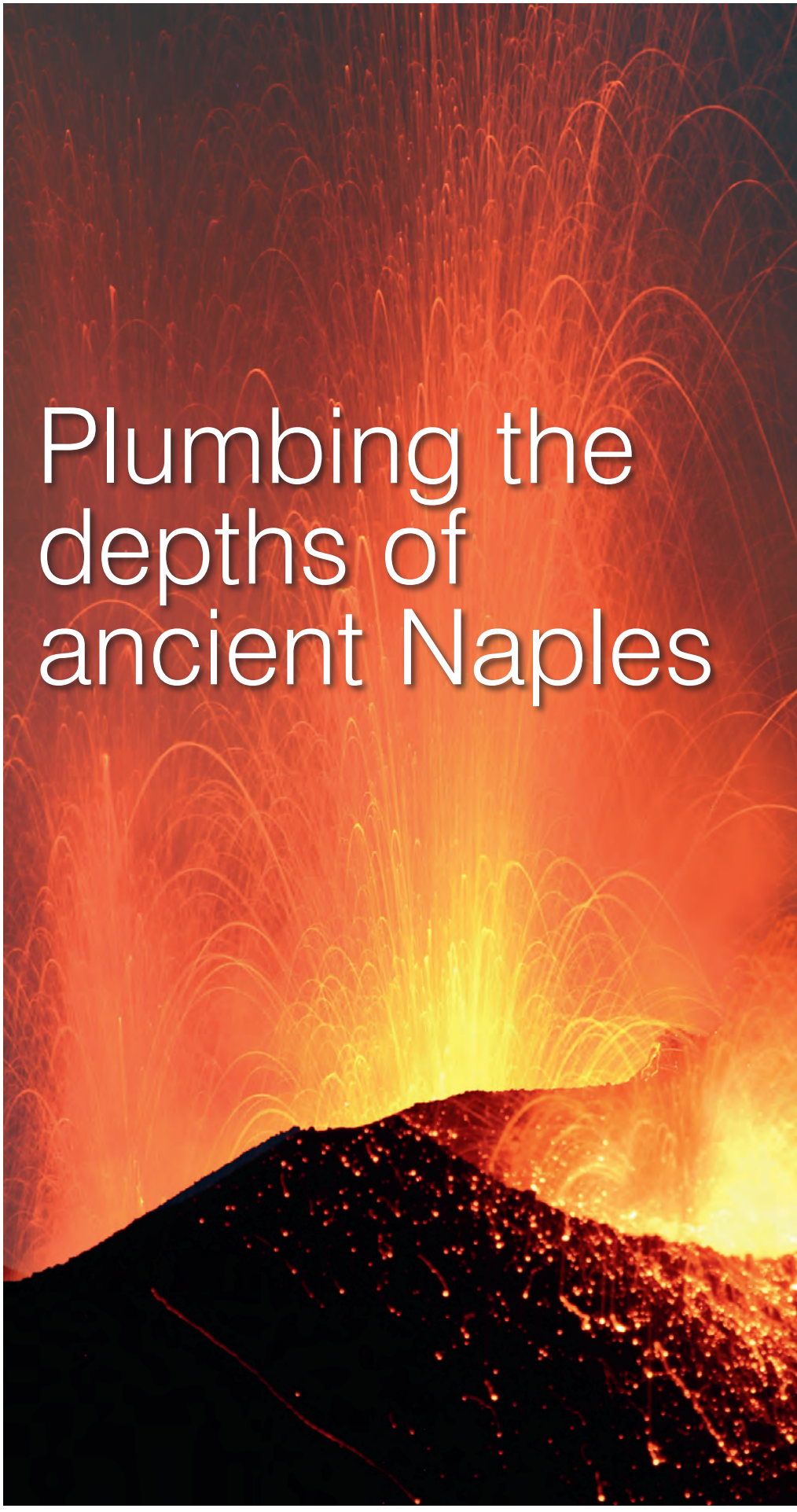
Lauren Davis

If you have a passing interest in ancient history, you're probably familiar with the eruption of Mount Vesuvius in 79 AD and the devastating effect it had on the cities of Pompeii and Herculaneum. But have you ever wondered how the volcano's eruption impacted other parts of the Roman Empire?



Plumbing the depths of ancient Naples

By examining lead isotopes taken from the harbour at Naples, a multidisciplinary team of geoarchaeologists, archaeologists and geochemists has revealed the hidden history of an ancient Roman water distribution system. Published in the *Proceedings of the National Academy of Sciences*, the study was led by Hugo Delile from France's National Centre for Scientific Research (CNRS), in collaboration with University of Glasgow, University of Southampton and The University of Naples Federico II. Financial support was provided by researchers from Australia's own Macquarie University.

The researchers set out to discover the impact of the 79 AD eruption on the water supply of Naples (then known as Neapolis) and the surrounding region, which was at the time supplied with water in lead pipes extending from the 140 km-long Aqua Augusta aqueduct. As part of this, Delile and his colleagues measured lead isotopic compositions of a 5.5 m-long sedimentary sequence from Naples, recently excavated during the construction of a new underground line. The sequence records the history of the city during the first six centuries AD, with each centimetre of the sediment representing approximately one year's build-up during the period of interest.

"The sedimentary deposits of the ancient harbour cannot be fully appraised without extensive knowledge in geomorphology, a related discipline of geography," said Delile, who added that these deposits have been dated via archaeological materials (wrecks, anvils, shoes, etc) found in harbour muds. The sediment corresponding to the eruption, located between

> "In the case of the ancient port of Naples (as in Rome), we did not expect to find that the excess of lead was associated with the use of the pipes and the water supply system more generally."

486 and 436 cm below sea level, was easily recognisable, Delile and his fellow researchers explained, "by shell debris, abundant fragments of wood, Posidonia, and pottery, as well as large number of rolled pumice pebbles".

In total, 61 samples were taken and analysed for lead (Pb) concentrations and isotopic compositions, using quadrupole inductively coupled plasma mass spectrometry (Q-ICP-MS) and multicollector inductively coupled plasma mass spectrometry (MC-ICP-MS) at the Ecole Normale Supérieure de Lyon. Lead isotope compositions were measured on the sediments to separate the local environment lead background residing in minerals from imported components. Samples were leached in chloroform and dilute hydrogen bromid (HBr), and lead isotope ratios were measured on the leachates and their residues.

Lead has four stable isotopes: ^{204}Pb, ^{206}Pb, ^{207}Pb and ^{208}Pb. The researchers found that the isotopic composition of leachates from the harbour sediments differed from those of lead native to the region, suggesting contamination from imported lead used in the ancient plumbing. The origin of the imported lead has since been placed in Western Europe (Spain, the Alps, France, Germany and England).

"As with over 75% of the research carried out, when we think to look for something, it's totally something else comes out," Delile told *Lab+Life Scientist*. "In the case of the ancient port of Naples (as in Rome), we did not expect to find that the excess of lead was associated with the use of the pipes and the water supply system more generally."

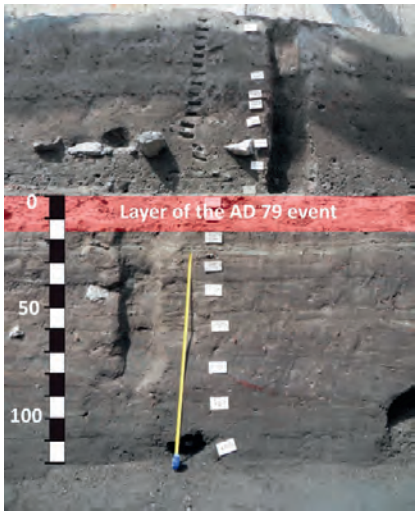
Interestingly, the authors observed an abrupt change in isotopic composition in a sediment layer 15 cm above the layers associated with the 79 AD eruption (-421 cm), thus postdating the eruption by approximately 15 years and suggesting a switch to different pipes. "The transition is sharp," they said, revealing "a major shift" in the source of the water flowing into the harbour.

So why might this shift have occurred? The authors report that the eruption of Vesuvius likely damaged the Neapolitan water supply network in one of three ways:

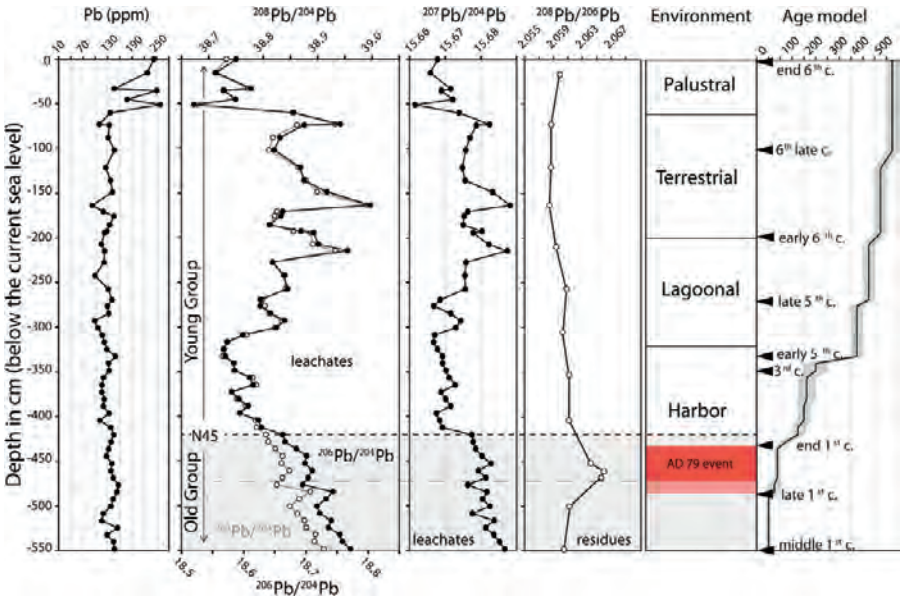
- The ground uplift on the flanks of the volcano before the eruption may have deformed the slope of the channel of the section of the Aqua Augusta located on Vesuvius, or broken the channel itself, necessitating its replacement.
- Earthquakes may have caused damage. However, the authors concede that while damage to the aqueduct masonry of the Aqua Augusta channel is conceivable, lead is robust and malleable, enabling it to withstand earthquake damage.
- Fine ashes emitted during the eruption may have entered the aqueduct through any open access shafts, clogging its network of lead pipes.

Whatever the exact cause of the damage, the researchers say there is little doubt that "after the disaster of the AD 79 volcanic eruption, the Aqua Augusta required major repairs and replacement of multiple lead pipe conduits" — repairs which would have taken approximately 15 years to carry out if begun immediately. It is therefore likely that the old, likely damaged system kept bringing water to the harbour while the new network was being constructed.

The study goes on to reconstruct the water network from the first to sixth centuries AD. Lead is found to be increasingly present in the sediments, suggesting an expansion of the hydraulic network or its intensification in the areas already supplied. The researchers stated, "A spectacular trend of decreasing ^{206}Pb/^{204}Pb and ^{208}Pb/^{204}Pb isotope ratios with time attests to a steady increase of the imported component, even through the AD 79 eruption, until -325 cm (the first half of the fifth century AD)."



An example of the harbour stratigraphic section investigated in the study. ©Hugo Delile



Downcore variations of $^{208}Pb/^{204}Pb$, $^{206}Pb/^{204}Pb$ and $^{207}Pb/^{204}Pb$ in leachates, $^{208}Pb/^{206}Pb$ in residues and Pb concentrations. The tephra unit of the AD 79 event is indicated by red shading. The parallel drift of $^{208}Pb/^{204}Pb$ and $^{206}Pb/^{204}Pb$ through time towards geologically old Pb reflects an increasing influence of pollution by the Pb pipe network and is a measure of urban development.

'Vesuvius in Eruption' — a watercolour painting by Joseph Mallord William Turner (between 1817 and 1820). ©Yale Center for British Art, Collection Paul Mellon.

From the beginning of the fifth century, the sediments become less contaminated. This is attributed to a number of factors, including barbarian invasions (the aqueduct was seized so as to cut off the town's water supply), new eruptions of Vesuvius in 472 and 512 AD, epidemics and the city's economic and administrative collapse, all contributing to the final breakdown of the Aqua Augusta somewhere between 399 and 472 AD.

While the authors suggest that a reduced peri-urban water distribution system was brought back to use, the dramatic decrease in contamination shows that "these repairs were much slower and of more limited extent than those in the aftermath of the AD 79 eruption, reflecting the comparatively much weaker administration and resources of the fifth century Bay of Naples". It was only at the end of the sixth century that there was a final increase in contamination, owing to the donation of a stamped lead pipe to the town. This suggests "renewed attention to the water distribution system of Neapolis", the researchers wrote, "occasioned by the expanding territory and power of the town and possibly an influx of inhabitants from neighboring declining towns".

By studying metal pollution in ancient sediments, Delile and his colleagues have shown how lead isotopes can be used to retrace the history of a region. Not only could this method be applied to other civilisations and geographical areas, it could also provide new perspectives on the dynamics of the human footprint on the environment. It is thus a valuable tool for archaeologists, historians, geographers and scientists alike.

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Rapid identification of CRISPR-Cas system PAMs

Image credit: Rodolphe Barrangou and Allie Briner.

CRISPR-Cas systems are the latest generation of genetic tools, but these tools require researchers to identify the protospacer-adjacent motifs (PAMs) that unlock each system's functionality. Scientists from North Carolina State University have developed a set of techniques to identify these PAMs, with the results published in the journal *Molecular Cell*.

CRISPR-Cas systems protect bacteria from invaders, such as viruses, by creating small strands of RNA that match DNA sequences specific to a given invader. When those CRISPR RNAs find a match, they unleash proteins that chop up the invader's DNA, preventing it from replicating. But the first step in the process isn't comparing the RNA to target DNA — it's PAM recognition and binding.

PAMs are short genetic sequences adjacent to the target DNA in viruses or other invaders. When the protein in a CRISPR-Cas system identifies a PAM, that identification tells the protein to bind to that DNA and begin comparing the adjacent DNA sequence to the CRISPR RNA. If the DNA and RNA match, the protein cleaves the target DNA.

"For researchers to make use of a CRISPR-Cas system for gene editing, gene regulation or other techniques, you first need to identify the relevant PAM sequences that trigger that specific CRISPR-protein combination," explained Chase Beisel, a senior author on the NC State paper.

"For example, the CRISPR-Cas9 tool derived from *Streptococcus pyogenes* has a different PAM than the CRISPR-Cas9 tool derived from *Staphylococcus aureus*," Beisel said. "There are thousands of potential CRISPR tools out there; to make use of them, we need an efficient way to identify their PAMs. And we think we've developed tools to do that."

It is difficult to predict which genetic sequences function as PAMs for a given CRISPR-Cas system. And the genetic sequences that function as PAMs vary widely, even between closely related CRISPR-Cas systems. For example, the PAM that triggers the Cas9 protein from *S. pyogenes* consists of only three nucleotides, but the PAM that triggers the Cas9 protein from *S. aureus* contains six nucleotides — none of which overlap with those from *S. pyogenes*.

"To address this challenge, we developed a tool called PAM-SCANR," said Ryan Leenay, lead author on the paper. "PAM-SCANR allows us to identify PAM sequences for any given CRISPR-protein combination."

First, researchers start with a CRISPR-Cas system they want to find the PAM for. The relevant CRISPR-protein pair is then used as the reactive agent in a high-throughput screen that exposes the CRISPR-protein pair to many different gene sequences simultaneously. The gene sequences are part of a genetic construct engineered to light up when the CRISPR-protein pair binds to them. This can only happen if a functional PAM is present.

"One thing that makes this tool unique is that it could be used to screen and identify PAMs across a wide range of CRISPR-Cas systems," Leenay said.

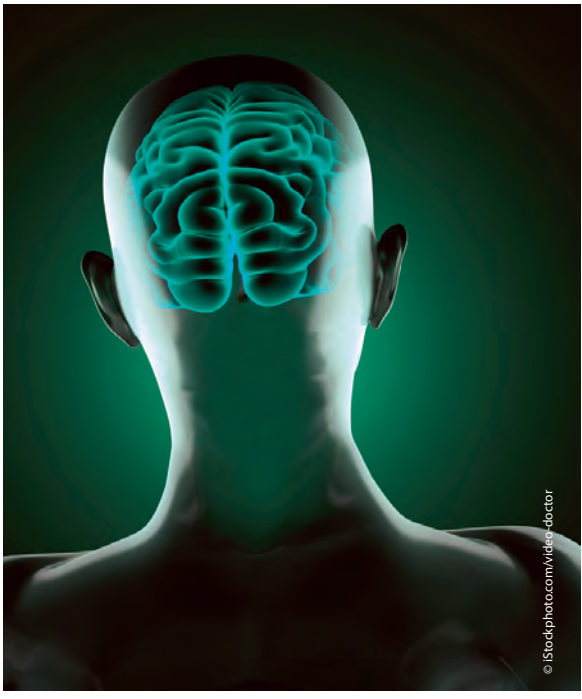
Scitech named distributor for behavioural biology company

Imaging specialist Scitech has been appointed an authorised distributor for R&D company PhenoSys, a Berlin-based company that engineers cutting-edge technology for automated animal behaviour research.

The news comes just a few days after Scitech announced its appointment as the authorised distributor for the Photometrics range of imaging products in Australia and New Zealand.

The PhenoSys team uses its extensive expertise in electrical and mechanical engineering, computer science and behavioural biology to create experimental systems used for behavioural phenotyping, brain research, experimental psychology and diagnostic characterisation of animal models for translational medicine. The company's range of automated instrumentation includes specialised applications of virtual-reality spherical treadmills, touch-screen technology for animal behaviour environments, animal sorters, systems for activity measurements and automated home cages.

Scitech states that its partnership with PhenoSys will empower neuroscience researchers to facilitate faster and more cost-effective research, with the imaging specialist's multidisciplined applications team offering knowledge, advice, installation, training and technical support and commitment to its customers.



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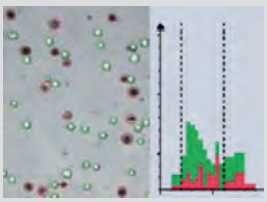

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Universal flu vaccine under development

Oxford University spin-out company Vaccitech has received £10 million from Oxford Sciences Innovation to take a universal flu vaccine, as well as a number of other vaccines that trigger the immune response needed to prevent or treat a range of serious diseases, through clinical trials.

Currently, no single vaccine can give immunity against even a majority of circulating flu virus strains. Instead, flu vaccines are manufactured in advance of each flu season using complex forecasting, based on data from the preceding year. However, predicting flu strains is difficult; for instance, records from the US Centers for Disease Control show that in 2013–14 the rate of protection dipped as low as 3.4%.

Vaccitech's most advanced program is a universal vaccine designed to improve the protection provided by the seasonal flu vaccination for people over 65. Development of the vaccine is taking place at the Jenner Institute, a partnership between the University of Oxford and The Pirbright Institute, where Professor Sarah Gilbert says clinical trials are showing great promise.

"To create a vaccine which works against every flu virus, we've targeted two proteins inside the virus which do not change, even as the virus mutates the proteins on its surface," Professor Gilbert explained. "This also means the vaccine should work against all human, avian and swine influenza strains.

"The vaccine has proven safe and shown good clinical responses, including enhanced protection against the flu detectable in older adults even one year after vaccination. It has performed well when given with the standard flu vaccine."

Professor Gilbert said the institute is currently planning a phase IIb, 1500-patient trial scheduled to begin later in 2016 — the next step towards regulatory approval. Vaccitech is also developing a therapeutic cancer vaccine, initially targeting prostate cancer.

"Vaccitech's vaccine stimulates the body to mount an immune attack against a unique tumour-specific protein found on the most common types of solid cancer, including prostate, renal, colorectal and lung cancers," said the Jenner Institute's Professor Adrian Hill.

A phase I/II study to assess safety and efficacy of this vaccine in men with low- or intermediate-risk prostate cancer is underway.

Image credit: John Cairns.

Breath markers for malaria

A CSIRO research team will spend the next 18 months field-testing its newly developed breath markers for malaria in locations such as Malawi, Bangladesh, Malaysia and Sudan.

The validation trials follow on from last year's discovery by scientists at CSIRO, the QIMR Berghofer Medical Research Institute and the Australian National University of distinctive chemicals that can be detected in the breath of patients infected with malaria.

"Our initial research really opened our eyes to the potential for a new test, because the chemicals that we found in the breath of patients could be detected at the very early stages of infection," said CSIRO Research Group Leader Dr Stephen Trowell.

Thanks to a $1.4 million research grant from the Bill & Melinda Gates Foundation, CSIRO can now test the accuracy and effectiveness of the breath markers under real-world conditions. With the help of national and international collaborators, the team will ask people with suspected malaria to provide a breath sample, in addition to the normal testing and treatment they receive at health clinics. Some 'control' patients who are not suspected to have malaria will also be asked to donate a breath sample for comparison.

All the chemicals present in the breath will be stabilised in special sample tubes and transported to Canberra or St Louis, USA, for chemical and statistical analysis.

"If this phase of the research pans out, we intend to move onto developing a simple, painless and cheap breath test to help identify people who have malaria but don't know it," said Dr Trowell.

"This would enable better targeting of treatments to stop transmission of the disease."

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The genes behind non-identical twins

An international research collaboration has identified the gene variants that increase a woman's chance of giving birth to non-identical (dizygotic) twins by almost a third.

The study was conducted by researchers from the Queensland University of Technology (QUT), in collaboration with colleagues from Iceland, the Netherlands and the US. The results have been published in the *American Journal of Human Genetics*.

Unlike identical twins, which share the same genetic make-up because they are the result of one embryo splitting in half, non-identical twins develop from two separate eggs that have emerged from separate ovarian follicles at the same time and been fertilised by separate sperm cells. Two thirds of twins are non-identical pairs and are as genetically alike as their other siblings.

With spontaneous dizygotic (DZ) twinning occurring in only 1–4% of women, exactly what makes some women more susceptible than others? According to Associate Professor Dale Nyholt, from the QUT Institute of Health and Biomedical Innovation (IHBI), it's all in the genes.

"We found one variant is close to the gene coding for the secretion of the hormone that stimulates ovarian follicles to release an egg and the second variant is in a location likely to be involved in the ovaries' response to follicle stimulating hormone," he said.

"When both variants are present, a woman has a 29% greater chance of having non-identical twins."

Professor Nyholt noted that one of the gene variants also had significant effects on other fertility measures, including the age of a girl's first period, age at menopause, number of children and the age at first and last child.

"It also affects the genes behind polycystic ovary syndrome, which is a major cause of female infertility," he said.

"This discovery will help research on the response to hormone stimulation for assisted reproduction such as IVF."

Professor Nyholt believes that in future, a simple gene test could be developed to identify women at risk of a strong response to hormonal treatment. This could prevent the serious complication of ovarian hyperstimulation syndrome.

Image courtesy of Donnie Ray Jones (via Flickr) under under CC BY 2.0

Image courtesy of Chen Wu (via Flickr) under under CC BY 2.0

Natural antibodies could combat devil facial tumour disease

For the past 20 years, Tasmanian devils have been under threat from devil facial tumour disease (DFTD) — a cancer that is spread from devil to devil via biting and has caused massive population declines.

Now, scientists believe they can stop the cancer using natural antibodies derived from a surprising source — the devil's own immune system.

Writing in the journal *Scientific Reports*, Dr Beata Ujvari and colleagues explained that immunoglobulins such as IgG and IgM have been shown to induce antitumour cytotoxic activity in humans and animals. With this in mind, they set out to investigate the differences in molecules found in devils' immune systems, comparing those that had DFTD and those that didn't.

"We know from human and animal studies that certain natural antibodies are able to recognise and kill cancerous cells, so we wanted to see whether the presence of these molecules would also determine tumour development in Tasmanian devils," said Dr Ujvari, from Deakin University's Centre for Integrative Ecology.

The researchers' analyses revealed that IgM and IgG expression levels, as well as IgM/IgG ratios, decreased with increasing devil age. Neither age, sex, IgM nor IgG expression levels affected devil DFTD status; however, devils with increased IgM relative to IgG expression levels had significantly lower DFTD prevalence.

"We can deduce, then, that devils with a higher natural antibody ratio are therefore less susceptible to the contagious cancer," Dr Ujvari said.

Dr Ujvari said the results could potentially enable new treatment options, noting, "Antitumour vaccines that enhance the production of these natural antibodies, or direct treatment of the cancer with natural antibodies, could become a solution to help halt this disease.

"This process, known as 'active immunotherapy', is becoming more and more accepted in treating human cancers, and we think it could be the magic bullet in saving the Tasmanian devils from extinction."

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PC2 lab space for rent

A partnership between G3Lab and WOTSO WorkSpace is bringing PC2 lab space within reach of a broad range of lab users, catering to an emerging trend to outsource premium lab space.

Biotech and science start-ups often struggle to find commercially viable lab space that is secure, self-contained and built to the relevant lab industry standards. The WOTSO lab space is a PC2 lab facility that is particularly suited to start-up ventures.

The labs will be built to a minimum PC2 level, which is the high level of 'physical containment' required for most labs — particularly in biology, food, QA, pharma and general research applications. To achieve PC2 design, the labs incorporate best practice fresh air change rates and high-end surface finishes inside the lab space, along with user-specific features such as fume cupboards, laminar flow, specialty gases and pure water equipment as required.

The building also houses shared office areas, breakout zones and a cafe for a collaborative environment in which science thrives.

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With method conditions, compound lists and MS/MS libraries, the user can perform several applications all on the one system. Due to the SCIEX OS acquisition and processing workflows, including IDA, MRMHR and SWATH Acquisition, the user can enjoy highly specific targeted quantitation and non-targeted screening capabilities as well as capabilities for retrospective data mining. There is also an option to upgrade to SCIEX's IonDrive Technology for a sensitivity boost, making the product future-ready.

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Standard IHC methods provide essential clinical data but provide limited information in both the research and clinical setting. The ability to detect, measure, visualise and compare multiple cell phenotypes and cell populations (eg, immune cells, cancer cells, etc) simultaneously in a single FFPE tissue section or TMA is now becoming a critical requirement both for researchers and clinicians.

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The automated quantitative pathology imaging system is available as a 6-slide or 200-slide configuration. Vectra 3 and inForm software analysis, including Phenochart, combine the power of multiplexed biomarker imaging, annotation capability and quantitative analysis within a familiar digital pathology workflow. In combination with Spotfire for Quantitative Pathology, the ability to mine data in an easy-to-use visual environment will accelerate research with a real potential to influence clinical treatment options.

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Adam Florance

Education genes

linked to neuroticism

The latest research by the Social Science Genetic Association Consortium (SSGAC) has confirmed that our genes can affect our educational attainment by as much as 20% and those same genes appear to be associated with conditions like schizophrenia, dementia, Alzheimer's disease, bipolar disorder and dyslexia.

Published in *Nature*, the SSGAC study analysed the genomes of nearly 300,000 people in the world's largest study of its type, identifying 74 genes that can influence how long an individual will pursue formal education.

Professor Peter Visscher from the Queensland Brain Institute at the University of Queensland was one of hundreds of scientists worldwide who contributed to the SSGAC research. He noted, "Educational attainment is a complex phenomenon, and mostly influenced by social and other environmental factors, but we knew that genes play a role too."

The known associations between educational attainment and health outcomes were a deciding factor in pursuing this line of research, which has already caused some controversy. Professor Visscher explained that the findings of this research are "a tiny piece of the puzzle as to why some people complete more years of education than others... But it's an intriguing piece of the puzzle and definitely opens new doors for research."

The study's authors have been at pains to downplay any determinative role that their findings could lead to, but critics say that such broad-based research is not useful in understanding normal individuals and could be used inappropriately.

"Policymakers and funders should pull the plug on this sort of work," said anthropologists Anne Buchanan and Kenneth Weiss of Pennsylvania State University in response to the study. "We gain little that is useful in our understanding of this sort of trait by a massively large genetic approach in normal individuals."

The study's authors agree with their critics that when it comes to determining educational attainment, factors such as health, parenting and access to quality schools have a far larger impact than genetics. Of particular interest is some Swedish data covering a period when there was a large-scale overhaul of the country's educational system, resulting in far better academic outcomes across the population.

"Crucially, this latest finding does not show that your educational attainment is something determined at birth. There are many other factors that come into play," said Professor Visscher.

The 74 genetic markers uncovered by this research comprise a mere 0.43% of the total genetic contribution to educational attainment. But their apparent correlation to a variety of psychiatric conditions may be useful in establishing future research.

"These tiny genetic differences may ultimately help to understand why some people are more susceptible to early cognitive decline than others," said Professor Visscher.

Industrial gas analyser for glove boxes

Glove boxes are used extensively to handle hazardous or sensitive materials, often with a protective or highly controlled atmosphere. Michell's XGA301 industrial gas analyser provides a method to monitor for air leaks combined with moisture measurement. The instrument is one of the most adaptable in the company's range, offering a choice of zirconia or electrochemical sensors for measuring oxygen with optional moisture measurements via a built-in Easidew transmitter.

Glove boxes often have an inert gas, such as nitrogen or argon, introduced as an atmosphere. The analyser's electrochemical sensor can be calibrated to detect trace oxygen from 0.1 to 10,000 ppm to alert users early to any leaks of air into the system. Where a dry atmosphere is also needed, the option of moisture measurements using an Easidew enables users to monitor for moisture ingress.

Applications for glove boxes are numerous, including electrochemical experiment handling, chemical and sample storage, welding, semiconductor manufacturing, pharmaceutical handling and photovoltaic research.

AMS Instrumentation & Calibration Pty Ltd
www.ams-ic.com.au

In situ TEM systems

DENSsolutions in situ TEM systems are now available in Australia and New Zealand. The systems utilise MEMS-based technology, effectively converting the user's conventional TEM from a static imaging system into a powerful multifunctional nanolaboratory.

The in situ systems enable the real-time study of sample dynamics under thermal, electrical, gas and liquid stimuli. Applications include reaching an elevated temperature of >1300°C in a stable and controlled environment to observe phase transformations or precipitation growth in real time.

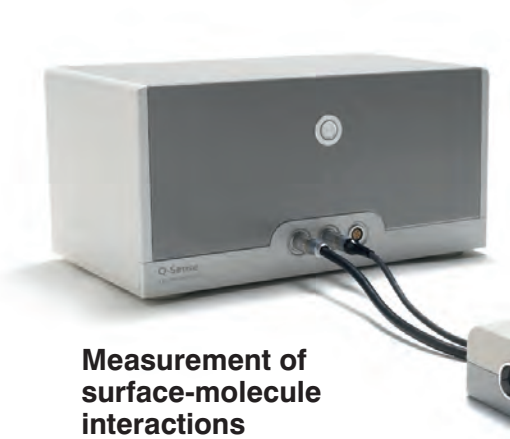
CLEM technologies have changed optical and scanning electron microscopy by allowing researchers to quickly and easily marry the two technologies together, gaining additional information about their samples. Similarly, adding additional modalities to a TEM enables users to accelerate their research and speed up their workflow.

With TEM sample preparation being a time-consuming undertaking, conventional TEM requires multiple samples to be produced and investigated before and after a stimulus is applied to the sample. Using DENSsolutions' in situ TEM systems, all sample dynamic information can be captured with a single sample, in a single TEM experiment.

The systems allow users to apply heat, bias, gas and liquid to the sample environment. This enables users to observe how their specimens behave in the real-world working or native environment. The systems are suited to a range of applications, including high-temperature alloys, semiconductor materials for failure analysis and biological specimens kept in their native state.

The systems can be installed into existing TEMs.

AXT Pty Ltd
www.axt.com.au



Measurement of surface-molecule interactions

The Q-Sense Initiator enables surface scientists to gain access to Q-Sense technology at an entry level.

The product maintains the core Q-Sense functions and quality while focusing on users who have a need for an introductory Q-Sense system capable of fundamental analysis. The Q-Sense Dfind analysis software simplifies data handling and reporting through an intuitive interface and powerful tools for complex analysis.

Quartz Crystal Microbalance with Dissipation (QCM-D) monitoring enables real-time measurements of both mass/thickness (frequency) and structural properties (dissipation) of molecular layers. By measuring the dissipation parameter (D), QCM-D allows for the analysis of soft films that do not obey the linear relation between change in frequency and change in mass. In this way, the dissipation parameter provides novel insights regarding structural (viscoelastic) properties of adsorbed layers.

The product enables the user to access information such as mass, thickness, viscoelastic properties, adsorption rates, etc, and to quantify, compile and compare data from start to end. Other features include: real-time, label-free technology; the ability to analyse surface-molecule interactions at the nanoscale; and the ability to simultaneously combine the system with, eg, ellipsometry, electrochemistry or microscopy.

ATA Scientific Pty Ltd
www.atascientific.com.au

Ultrapure water system

The arium mini is a compact, ultrapure water system from Sartorius. With a width of only 28 cm and designed for labs needing less than 10 L per day, the product easily integrates into nearly any lab environment and is suitable for users currently buying HPLC- or WFI-grade water for laboratory use.

The system is equipped with a high-resolution, intuitive, easy-to-use, touch-activated colour display. The Favourites function automatically stores the last volume dispensed, making it easy to repeatedly dispense the same volume.

The unit contains a 5 L pharmaceutical-grade bagtank integrated into the side of the system for storing prepurified water prior to polishing. Easy exchange of the bag facilitates system upkeep, reduces maintenance time and eliminates the use of hazardous chemicals when compared to conventional tank systems, according to the company.

There are two versions available. The standard arium mini uses a built-in pump to fill the bagtank with prepurified (RO-grade) water and produces ultrapure water using the specially developed arium Scientific pack purification cartridge. The arium mini Plus connects directly to a tap water supply and contains a pretreatment cartridge (activated carbon and RO module) that partially purifies the water. This is stored in the system's bagtank before final polishing using the arium Scientific pack purification cartridge.

For analytical chemistry applications such as HPLC, both versions can be ordered with an optional UV lamp (185/254 nm) to ensure production of ultrapure water with low TOC levels.

Sartorius Stedim Australia Pty Ltd
www.sartorius-stedim.com

Exploding bacteria

Microbiologists have discovered that the superbug *Pseudomonas aeruginosa* causes infection in a most unusual way — by blowing itself up.

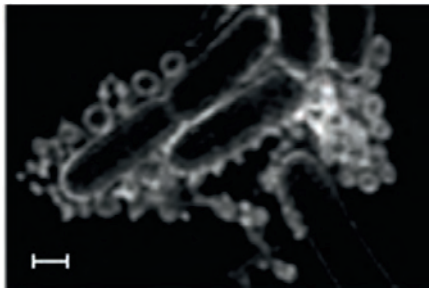
P. aeruginosa infections present a growing risk in hospitals, where people with compromised immune systems are vulnerable to infection. The multidrug-resistant superbug survives in biofilms — groups of cells or microorganisms that stick to each other and adhere to a surface.

Associate Professor Cynthia Whitchurch and Dr Lynne Turnbull, from the ithree institute at the University of Technology Sydney (UTS), have spent years researching *P. aeruginosa* to understand how bacteria release virulence factors such as DNA, proteins and membrane vesicles (MVs) into their environment. Once released, the contents are used by the remaining bacteria as a 'glue' to build the biofilm, as a food source and as virulence factors that contribute to the infection process.

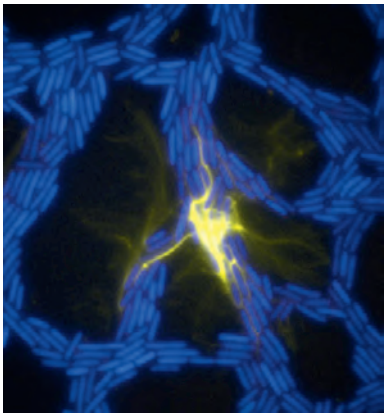
"We originally thought the extracellular DNA (an important biofilm component) might have been produced through a process where the cells die and slowly leak out their genomic DNA," said Dr Turnbull. "But by using a special stain that lights up fluorescently when it detects extracellular DNA, we saw cells that were exploding like starbursts or fireworks of DNA."

Dr Turnbull said the *Pseudomonas* cells undergo an incredible transformation before exploding, with the whole process taking place in as little as six seconds.

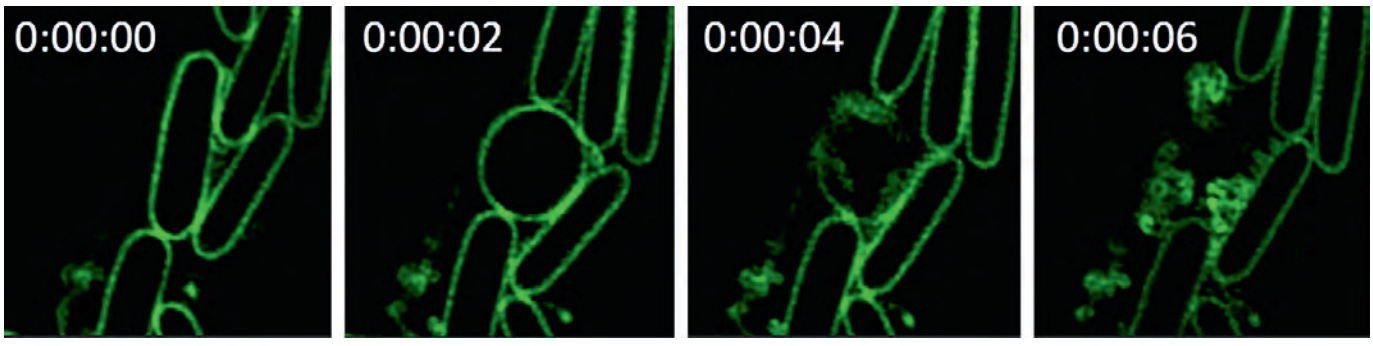
"The normal bacteria look like little rods or pills," she said. "One day, as we looked under the microscope, we saw one of the cells turn from a hard,



Membrane vesicles produced by exploding bacteria decorate cells of the bacterial pathogen Pseudomonas aeruginosa. Scale bar is 500 nm. Image credit: L Turnbull, the ithree institute, University of Technology Sydney.



Extracellular DNA (yellow) is released by exploding bacteria in biofilms of the bacterial pathogen Pseudomonas aeruginosa (blue). Image credit: E Gloag and L Turnbull, the ithree institute, University of Technology Sydney.



Time series showing a cell of the bacterial pathogen Pseudomonas aeruginosa exploding and producing membrane vesicles. Image credit: L Turnbull, the ithree institute, University of Technology Sydney.

structured rod into a round, soft ball. Within a few more seconds, it then violently exploded. It's amazing how quickly it happens and is likely the reason it hasn't been observed before."

The researchers looked to bacteriophage — viruses that infect bacteria — and identified a gene specifically involved in the process of *P. aeruginosa* cells rounding up and exploding. They then used a sophisticated microscope, the DeltaVision OMX Blaze from GE Healthcare, to see exactly what happens after a bacterium explodes.

"The explosive cell lysis of a sub-population of cells accounts for the liberation of cytosolic content in *Pseudomonas aeruginosa* biofilms," the researchers wrote in the journal *Nature Communications*. "Super-resolution microscopy reveals that explosive cell lysis also produces shattered membrane fragments that rapidly form MVs."

The researchers will now turn their attention to understanding the specific role of exploding cells in infection. They predict it will be important not only in biofilm infections, but also in tackling the global problem of antibiotic resistance.

"We think there will be a two-pronged approach: one is to prevent the biofilms being produced by stopping bacterial explosions, but if we can't prevent it, then the second approach will be to induce the process that causes the bacteria to explode, so they all die en masse, causing the infection to clear," Associate Professor Whitchurch said.

"We know we can induce this explosive cell death pathway through antibiotic treatment, so maybe we can use this to kill whole populations of bacteria — it's a potential therapy. We know certain classes of antibiotics can induce this pathway; however, now that we know about how cells explode, we have an opportunity to directly target that process more specifically, perhaps with new types of antibiotics or by finding drugs or chemicals that cause this process to be turned on."

Scientific CCD camera

The Retiga R1, a CCD scientific camera from QImaging, uses an efficient 1.4 MP CCD sensor for routine fluorescence imaging and documentation. It is available in both monochrome and colour versions.

Inside the camera, the company introduces Intelligent Quantification — on-camera intelligence features that correct for defective pixels, remove accumulated dark current and make high dynamic range imaging available. Fast 50 MHz pixel digitisation increases camera frame rate to give the user the speed required for laboratory imaging.

The camera generates large amounts of data and handles it smoothly via the fast USB 3.0.interface. It is suitable for applications that require fast, sensitive imaging and documentation, as well as those that require detection and quantification.

SciTech Pty Ltd
www.scitech.com.au

On-site strip test for soy detection

With the launch of the improved Romer AgraStrip Soy kit, the total assay time of the product's lateral flow device is reduced to 11 min while maintaining high standards of analytical accuracy. In addition, an extraction reagent will allow for the recovery of processed soy protein.

The kit uses a monoclonal antibody that allows low amounts of soy to be detected in a short period of time. The first incubation step has been reduced from 20 to 5 min, leading to a total assay time of 11 min. Furthermore, the AgraStrip Extraction Reagent for Processed Soy improves the recovery of processed soy proteins, which are often difficult to detect, and thereby helps to avoid false negative results.

The test can be applied to a variety of finished food products, as well as rinse water and environmental swab samples.

Australasian Medical & Scientific Ltd
www.amsl.com.au

Desktop SEM for automated gunshot residue analysis

Gunshot residue (GSR) analysis is an important part of forensic investigations to determine if a firearm has been used in a crime. Whenever a gun is fired, particles from the bullet, propellant, gun and primer are deposited on objects in the immediate vicinity of the weapon (eg, on the shooter's hand, clothes, etc). These particles range in size and are primarily composed of lead, barium and antimony and possibly lead-free primers containing titanium and zinc.

The Phenom GSR Scanning Electron Microscope (SEM) is a vital tool in crime labs for gathering forensic evidence. The user can quickly search for GSR particles automatically and characterise and classify them using energy dispersive spectroscopy (EDS) analysis. The back scatter detector enables evidence of GSR to be quickly realised with atomically heavier elements appearing brighter compared to other particles such as dust, dirt, fibres, flakes of skin, etc. Further details of surface morphology can be examined using the optional secondary electron detector.

The Phenom GSR is based on the Phenom XL desktop SEM. Both software and hardware are fully integrated to enhance user-friendliness and analysis speed. The Phenom XL does not require any special facilities and is easy to set up and transport. It can also be used for many other forensics applications, such as ballistics, paint analysis, fibre characterisation, etc.

Other features include: a fully motorised stage; fast time from loading sample to SEM image (<1 min); fully integrated X-ray analysis (EDS) for element ID; large sample size (up to 100 mm); 'never lost' navigation; a voltage range of 4.8 to 20.5 kV; and conformity to ASTM standards.

ATA Scientific Pty Ltd
www.atascientific.com.au

Portable pH meter

OHAUS precision is now available in the form of a portable pH meter. The portable meter offers convenience and durability in one compact design.

The intuitive software and an easy-to-read LCD display work in tandem to make operating straightforward. The compact, ergonomic design means the pH meter fits comfortably in the palm of the hand.

Ohaus Australia
www.ohaus.com

Microfluidic platform for live cell analysis

The Merck CellASIC ONIX 2 Microfluidic Platform enables simplified, dynamic and precise live cell analysis. The platform allows researchers to monitor responses to perfusion, temperature and gas environment changes in live cells and track individual cell responses over time for truly dynamic cellular analysis.

The product also offers constant, stable imaging conditions while maintaining the health of cells. It combines high-precision controls, good functionality and a simple user interface to offer a good quality live cell analysis experience.

Merck Pty Ltd
www.merckmillipore.com

Microbiological sampler

The Lighthouse ActiveCount 100 is a high-performance portable microbial air sampler suitable for use in cleanrooms and aseptic environments.

Continuous and periodic sampling enables complete control on sampling cycles and intervals. An autoclavable impactor head and a sanitisable stainless steel enclosure ensure the unit does not contaminate the sampling environment. The user can even use the optional gas sampler to monitor compressed gases.

The product is suitable for the following applications: pharmaceutical, hospital, food and beverage; cleanrooms, biological safety cabinets and isolators; museums and libraries; cosmetics, textiles, agricultural and environment; and additional aseptic environment monitoring applications.

LAF Technologies Pty Ltd
www.laftech.com.au

Scientific CMOS camera

Photometrics introduces the Prime 4.2 MP camera — an intelligent scientific CMOS (sCMOS) camera that actively defeats the negative impact of Poisson noise in low-light images.

The camera packs a formidable FPGA-based embedded signal processing engine, ESP, which enables powerful signal restoration and feature detection for localisation-based super-resolution microscopy. These capabilities increase low-light image clarity and provide ways to address data glut, a common problem when imaging at high frame rates.

The product features PrimeEnhance, which quantitatively increases the signal-to-noise ratio by 3–5X, thus increasing the clarity and quality of images. It also includes PrimeLocate, which dynamically evaluates acquired images and reduces the surplus of data generated during high-speed super-resolution imaging.

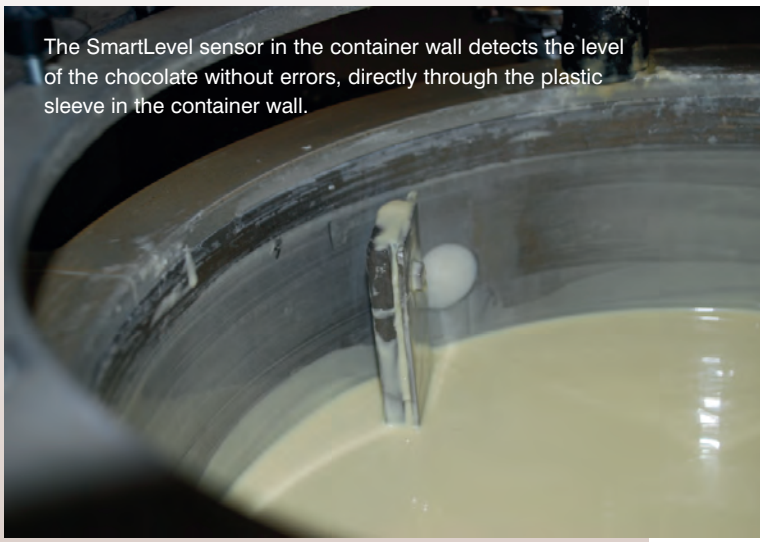
Designed using sCMOS sensor technology, the instrument is a versatile life science imaging solution. It is a high-resolution camera with good sensitivity, low noise, high frame rates and an impressive dynamic range. The large field of view is suitable for microscopy, maximising the usefulness of the imaging area.

Suitable applications include super-resolution microscopy, light sheet microscopy, high-speed ratiometric imaging, TIRF microscopy and confocal microscopy.

SciTech Pty Ltd
www.scitech.com.au

Sensors in chocolate paradise

Capacitive sensors are a fine thing in and of themselves: they can detect levels of liquids, powders and granular materials through nonmetallic container walls without the sensor coming into contact with the media. However, conventional capacitive sensors also have a number of disadvantages.



The SmartLevel sensor in the container wall detects the level of the chocolate without errors, directly through the plastic sleeve in the container wall.

The sensitivity of the sensor must be adjusted in a time-consuming process so that the signal is triggered not by the container itself, but by the container wall together with the medium. And if you ever try to accurately detect the level of chocolate, ketchup, etc, using a conventional capacitive sensor, you will discover that these media do not drain without leaving residue, and deposits regularly lead to sensing errors, which make error-free measurement impossible.

This challenge was faced also by Swiss chocolate manufacturer Gysi when seeking to equip the agitators of various tempering machines for heat treatment of chocolate when retrofitting new sensors for level regulation. The previous level detection system based on measuring the pressure difference was getting up in years and repeatedly had to be checked and cleaned at regular intervals, which incurred considerable effort and downtime. Therefore, Gysi looked for a new solution.

First attempts with a built-in sensor from the machine manufacturer, however, did not look promising. "We couldn't leave the application unattended," said Ulrich Streit, who is responsible for the technology at Gysi. "The container kept overflowing. That was caused by sensing errors right in the temperature range from 45 to 28°C, in which the tempering machine operated. All it took was a temperature change of a few degrees to change the permittivity of the medium in use enough that the sensor no longer switched correctly.

"Then we looked for an alternative and decided on a sensor with SmartLevel technology from sensor specialist Balluff. In making this selection, we could completely rely on Balluff.

"Thomas Zumbrunn, the responsible sales engineer of the Balluff subsidiary, provided us with comprehensive consultation. Together we chose the right sensor based on the polarity of the medium to be measured — the chocolate — and then checked it in a test installation in real-world operation. It worked right away. Now we have a solution that works without any errors whatsoever, even in long-term operation."

"The new SmartLevel sensors of the M18 design also operate according to the capacitive principle," explained Zumbrunn. "But with strongly conductive media, they open up new application fields while being significantly easier to handle. Thus they are capable of independently compensating for container walls and deposits, which enables error-free measurement without elaborate readjustments.

"At the same time, they are also compatible with all sensors used for level measurement of media having a dipole character. This applies to immersion applications and level detection through nonmetallic walls with a maximum thickness of 10 mm. As a result, even detection of chocolate through the 3 mm-thick membrane of the plastic sleeve into which the sensor is screwed is an easy task."

This is possible because SmartLevel sensors operate at an oscillator frequency significantly higher than conventional capacitive sensors. In addition, the patented electronic processor unit gathers more information than is usually the case with capacitive level measurement. It evaluates not only the capacitance, but also the conductivity value of the medium. Since compact media have high, thin films of the same medium, but only low conductivity values, the new sensors have no trouble distinguishing between thin deposits and the real level. This means that sensing errors with media that do not drain without leaving residue, such as chocolate, are largely prevented.

Gysi now has six machines retrofitted with the new sensors, and there are already plans to retrofit additional systems. "Since we do the conversion ourselves," said Streit, "the expenses are low. To do it, the sensor is simply inserted into a sealed plastic sleeve and rotated into a separate metal container in the container wall such that it is flush with the wall."

The SmartLevel sensor is easy to adjust with a potentiometer, which has to be done only once after the installation. Furthermore, it operates without needing any maintenance whatsoever. Now cleaning procedures for just the sensor are entirely unnecessary; they are taken care of as part of the regular maintenance cycle.

The sensor in the container wall detects the level of the chocolate directly through the end face of the plastic sleeve in the container wall. If the chocolate falls below a certain fill level, the sensor triggers and after 30 seconds liquid chocolate is refilled until the optimum fill level is reached.

Unlike conventional capacitive sensors, these fill-level indicators do not have to be readjusted, neither during operation nor when changing the recipe. Thus the switch point between white and dark chocolate, for example, differs by only 3 mm.

"It is somewhat more expensive than a standard capacitive sensor," said Streit, "but when you find a perfect solution that works permanently, the price plays only a subordinate role. The device pays itself off within a very short time."

Balluff Pty Ltd
www.balluff.com.au

Mechanical pipette

Tacta has been designed to feel good in the user's hands. Due to its ergonomic handle and finger hook, there is no need to grip the pipette tightly.

Easy, safe and comfortable to use, the product meets the most demanding pipette requirements, delivering consistent results time after time. It minimises the manual force required for a complete pipetting cycle, from tip attachment to dispensing to tip ejection.

The pipette's optiload feature with spring-loaded tip cones ensures good tip sealing without any effort. Its optiject function further enhances effortless, controlled tip ejection. Simple volume adjustment and intuitive volume locking add even more convenience.

The pipette excels at protecting the user from RSI and work-related upper limb disorders, even during extended pipetting sessions. With only three parts to disassemble, the unit is easy to clean.

The light-touch pipette also features a calibration dial that has values associated with it, making in-house calibrations easier. The dial to change volumes clicks quickly and smoothly, enabling the user to comfortably change the volume with just one hand.

Pathtech Pty Ltd
www.pathtech.com.au

Lab washers

The lab washers in the PG85 range, from Miele Professional, are said to require less water, electricity and process chemicals than other lab washers while being more powerful.

The product features a water circulation system that combines high capacity with a reduced use of resources. A variable-speed circulation pump adjusts water pressure to requirements in the various program phases, saving both water and electricity.

Any valves not used by docked baskets are sealed automatically in order to avoid any unnecessary drop in pressure in the remaining system and to reduce water consumption. Automatic spray arm monitoring and spray pressure monitoring ensures proper reprocessing and issues a warning if readings are out of range.

When it comes to drying laboratory glassware, the machine combines efficiency with convenience. After the last rinse cycle, steam is drawn into the steam condenser at the rear of the unit, where it condenses back to water. An efficient HEPA Class H13 particulate filter prevents airborne particles from the ambient room air from entering the drying system and being deposited on the instruments.

The door is automatically drawn closed by the AutoClose function and the high-end control panel doubles up as a door handle. Touch-on-steel technology makes for simple operation and ease of cleaning. A quick tap on the screen is sufficient to select and launch programs.

An updated system of baskets and inserts is available for use on all models. Depending on individual needs, a handful of modules can be combined. In order to facilitate the complete documentation of process data, lab washers can be hooked up to a laboratory network or to a printer.

Miele Australia
www.miele-professional.com.au

Refrigerated centrifuge

The refrigerated Centrifuge 5920 R from Eppendorf delivers high capacity in a compact and ergonomic product design. It has similar dimensions as other refrigerated 3 L models and yet features a capacity of up to 4 x 1000 mL, thus making it a suitable instrument for high-throughput applications.

The product features a powerful state-of-the-art refrigeration system with temperature management to keep samples safe. The unit also offers flexible rotor and bucket options to maximise versatility and capacity for tubes, plates and other vessels.

Eppendorf South Pacific Pty Ltd
www.eppendorf.com.au

Adam Florance

Soap, light and clean water

Contaminated water sources are a rapidly escalating global problem, but the latest research from Monash University may have found a unique and cost-effective solution using light, soap and graphene.

Graphene is a two-dimensional honeycomb lattice of carbon that is just one atom thick. First recognised in the 19th century, it is only in recent decades that large-scale graphene production has become practicable. It has now found its place in a wide variety of industrial applications, such as composites, batteries and semiconductors.

Dr Rico Tabor of Monash University has been exploring the unique structure and properties of graphene, which is believed to have a potentially huge range of diverse technological opportunities. He said: "Among its many potential uses, the prospect of using graphenes for the purpose of water purification is extremely promising. Because the structure is essentially two-dimensional and only an atom thick, graphene 'sheets' have the highest surface area possible, meaning their capacity to mop up contaminants in water surpass that of any currently used materials or membranes."

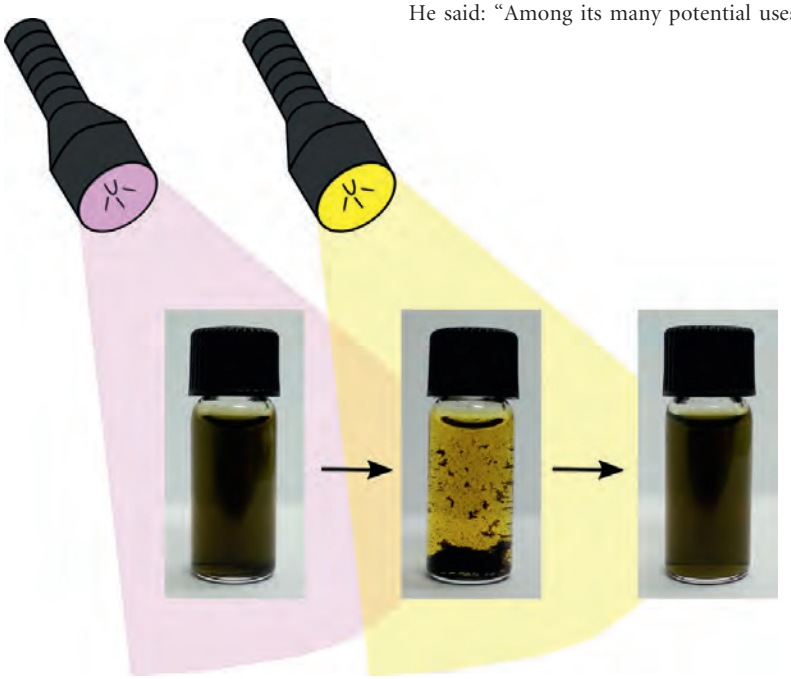
The theoretical specific surface area of graphene is 2630 m^2/g — substantially larger than carbon black at around 900 m^2/g — and its unique 2D structure means it is the only form of carbon where every atom is exposed on two surfaces. It is also self-repairing when exposed to external sources of carbon atoms.

While it has been known that graphene can be used to extract contaminants from water, traditional approaches have been costly due to the use of expensive polymers or the large amounts of energy required for centrifugation.

The Monash team found that the addition of a small amount of light-sensitive soap to contaminated water may be the answer. The soap reacts to different coloured lights, changing its molecular structure and the way it interacts with carbon materials. By shining a particular colour light on the contaminated water the graphene separates out, taking the contaminants with it. Once the contaminants are removed, a different coloured light causes the graphene to redisperse for future use.

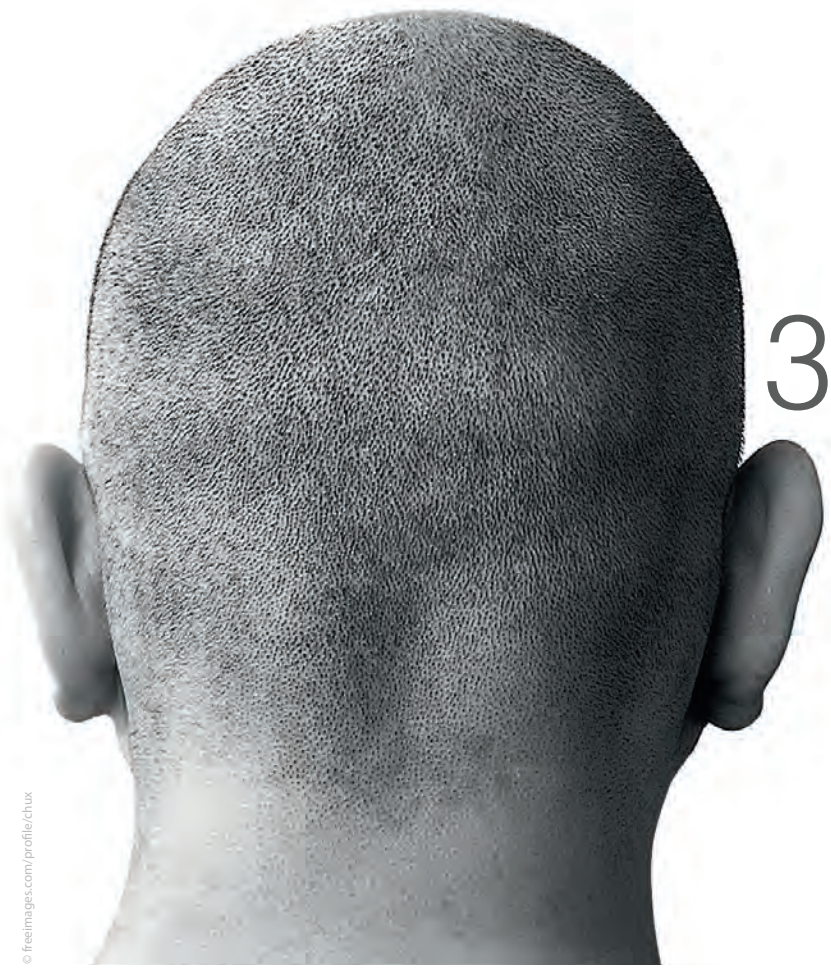
As co-researcher Thomas McCoy said: "Light is appealing as it is abundantly available, simple and low cost when compared to most separation methods." McCoy believes that this research could have "significant implications for cost-effective, large-scale water treatment".

The Monash University research was published in *Nanoscale*, the journal of the Royal Society of Chemistry.



By simply shining the right colour of light on the graphene, contaminants and light-sensitive soap mixture, the graphene clusters together and sinks; shining a different colour of light re-disperses it for re-use.

Adam Florance



3D printing human tissues

Using a combination of 'smart' polymeric water-based gels and biodegradable plastics, a team of US-based scientists has 3D-printed muscle, bone and cartilage that has survived, matured and developed functional blood vessels when implanted in mice.

Completed ear structure printed with the Integrated Tissue and Organ Printing System. Image credit: Wake Forest Institute for Regenerative Medicine.

Developed over 10 years with funding from the Armed Forces Institute of Regenerative Medicine, the Integrated Tissue and Organ Printing System (ITOP) uses a custom-designed 3D printer built by a team of regenerative medicine scientists at Wake Forest Baptist Medical Center in Winston-Salem.

Previous attempts to 3D-print human tissues have failed due to a lack of blood vessels, but the ITOP tissues have been made with a lattice of microchannels that allow oxygen and nutrients to penetrate throughout the structures and eventually develop a system of blood vessels. The water-based 'ink' used in the 3D printing process has been optimised to promote cell growth and survive the printing process, while the plastic-like materials that form the strong but temporary outer structure are biodegradable. These factors help the implanted structures survive long enough to integrate with the body, a major challenge in tissue engineering.

Dr Anthony Atala, senior author of the study and director of the Wake Forest Institute for Regenerative Medicine, said: "Our results indicate that the bio-ink combination we used, combined with the microchannels, provides the right environment to keep the cells alive and to support cell and tissue growth."

The ultimate goal of the project is to use data from CT and MRI scans to bioprint tailor-made muscle, bone and cartilage for individual patients to replace diseased or injured body parts.

The latest proof-of-concept experiments utilising the ITOP system bioprinted human-sized ears, which were implanted under the skin of laboratory mice. Within two months, blood vessels and cartilage tissue had formed while maintaining the shape of the implanted ear.

Similar tests with bioprinted muscle tissue showed vascularisation and nerve formation within two weeks, while bioprinted jaw bone fragments formed vascularised bone tissue after five months.

Closer to home, scientists at the University of Wollongong's Australian Institute for Innovative Materials have been 3D printing artificial human brains in order to study the mechanics of human-specific diseases such as schizophrenia and also developing a growth factor-rich bio-ink from seaweed extracts. Already proving useful in regrowing damaged cartilage, the next stage is to bioprint tissues that can mimic human organs.

Biopharmaceutical manufacturing products

Merck is launching three Mobius products that deliver improved efficiency and ease of use for biopharmaceutical manufacturing workflows. The products include a 1000 L single-use bioreactor, a 2000 L mixing system for difficult-to-mix biopharm ingredients and a large-volume liquid transport system for aseptic and non-aseptic substances.

The Mobius 1000 L single-use bioreactor completes the comprehensive Mobius stirred tank portfolio of 3 to 2000 L sizes, delivering greater flexibility and continuity for scale-up. With a bottom-loading drawer for easy and safe bag installation, the bioreactor is designed to achieve homogenous and fast mixing for consistent performance, especially at large scale.

The Mobius Power MIX 2000 creates a strong vortex to handle difficult-to-mix buffers, media and other biopharm ingredients. Powerful mixing is achieved from an impeller design and motor based on magnetically coupled NovAseptic technology, a suitable mixing technology for stainless steel tanks. The product provides accessible, sterile zero deadleg sampling directly from the mixing container. A Probe Port allows insertion of either a re-usable standard probe for non-aseptic processes or a pre-sterilised, single-use sensor for in-process pH measurement of aseptic processes.

The Mobius single-use 3D large liquid transportation system's single-use bags and stainless steel transporter bins facilitate the safe and convenient road transport of aseptic and non-aseptic media, buffers, in-process intermediates and final bulk drug products at cold or ambient temperatures. The system offers four single-use bag assemblies with working volumes of 100 to 500 L. All bags are constructed from PureFlex Plus film with a low extractable profile and gas barrier properties.

Merck Pty Ltd
www.merckmillipore.com

CGH labelling kits

Comparative genomic hybridisation (aCGH) is a powerful diagnostic tool for detecting DNA copy number gains and losses associated with chromosome abnormalities. aCGH provides an understanding of genetic disorders, cancers and other genomic aberrations.

With optimised reagents, Enzo's CYTAG CGH Labeling Kits produce high-quality data using as little as 0.25 μg of genomic DNA. The kit contains the restriction enzymes AluI and RsaI, plus PCR and gel clean-up columns. A bulk quantity kit with 2 x 1000 reactions is available on request.

Compatible with CGH and CGH+SNP arrays, the kit has the ability to perform total genomic DNA analysis without amplification or complexity reduction. It provides good dynamic analytical range for challenging and complex, heterogeneous samples.

The product has been QC benchmarked and validated using high-resolution arrays. It offers high DLR scores (0.09–0.12) exceeding industry standards.

United Bioresearch Products Pty Ltd
www.unitedbioresearch.com.au

Measuring device for foam analysis

The Ross Miles Analyser (RMFA), from Kruss, integrates the standardised vessels according to ASTM D 1173 in a measuring device for electronic foam height measurement.

An LED bar and a sensor bar are fitted along the intake vessel, which allows the foam height to be detected based on the difference in brightness at the foam-air boundary. The electronic height detection is said to ensure improved repeatability of the measurement and achieves a resolution of 0.4 mm.

The initial foam height measurement does not have to be manually coordinated with the discharge of the reservoir solution.

As well as the foam height, the instrument also records the height of the liquid. In this way, the raw data documents whether the filling level specified in the norm has been accurately maintained.

Electronic data measurement is said to result in improved reproducibility and saved time, as the measurement no longer has to be followed live.

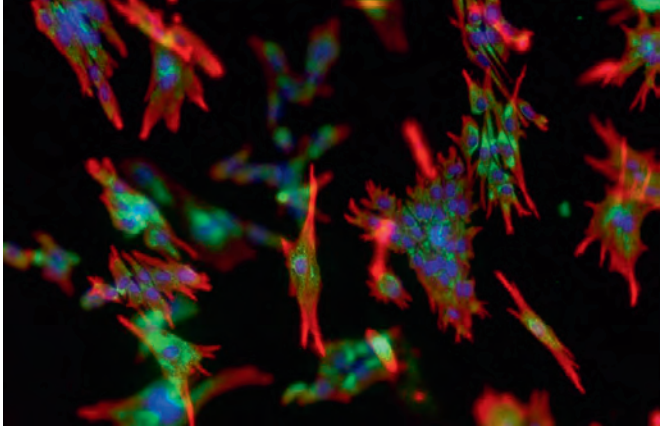
Scientex Pty Ltd
www.scientex.com.au

Automatic mass comparator

The AX1007CP automatic mass comparator allows fast and accurate mass comparisons to enable national measurement institutes to disseminate traceability from their national standard at high resolution. Up to four 1 kg artefacts can be automatically compared with 0.1 μg resolution at a constant pressure to reduce measurement uncertainty when calibrating against national or industry standards.

The product represents a complete mass determination solution comprising a mass comparator, a controller unit and AX control software. Software control facilitates both automatic operation and traceable, secure results. Direct data export to laboratory information management systems and automatic climate data acquisition enable compensation calculations for air buoyancy correction, providing secure results of high accuracy.

Mettler-Toledo Ltd
www.mt.com



3D cell culture system

The RAFT 3D Culture System, from Lonza, allows researchers to overcome some of the challenges previously associated with working with 3D cultures. The cell culture system uses a high-density collagen scaffold to closely mimic the extracellular matrix of native tissues.

Cancer cells can be embedded in the collagen matrix, and many of them form tumour-like structures. The translucent properties of the system enable visualisation of these tumour-like structures with subcellular resolution under a fluorescence microscope.

The system permits different cancer cell types to show distinct morphologies, as well as characteristic tumour migration and invasion patterns. This can help researchers understand how to maximise the therapeutic potential of drugs in a more in vivo-like cell culture system.

Lonza Australia Pty Ltd
www.lonza.com

Safety storage cabinets with drawers

Asecos safety storage cabinets with drawers are said to provide lab designers and users with more storage options than ever before.

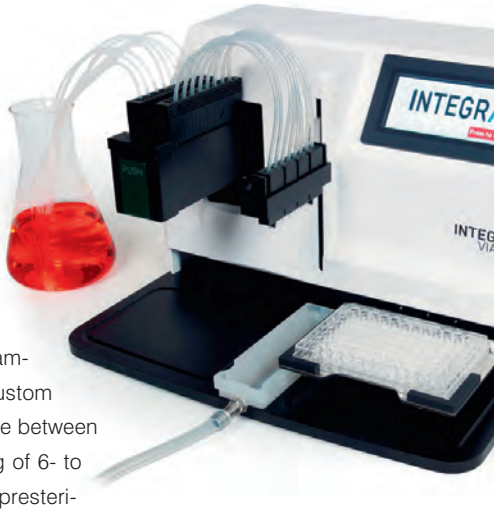
When designing modern labs, a key concern is to store the corrosive and flammable liquids in the most space-effective and ergonomic manner while meeting all relevant design criteria and regulations. Safety cabinets with drawers offer a smart way to store hazardous chemicals safely under the lab bench, enabling users to reach all containers easily with no compromise on safety.

In addition to the under-bench cabinets, the larger Asecos flammable and corrosive stores are commonly used to store flammable, toxic and corrosive liquids in support and storage areas. The drawers allow a storage capacity of 250 L per cabinet in a footprint of less than 0.75 m^2 (depth of 600 mm).

An added advantage of using such cabinets is the safety of retaining spills on every level, due to the fact that each drawer is a liquid-tight sump. In the case of corrosives cabinets, the drawers are removable for cleaning.

G3Lab
www.g3lab.com

Rapid reagent dispenser



INTEGRA has announced the latest version of its VIAFILL reagent dispenser. The product is suitable for applications including compound storage/addition, ELISA, genomic/proteomic studies and screening as well as cell-based and kinetic assays.

It features an intuitive touch-screen user interface, programming of repeat dispenses, variable volume dispenses and custom programming is both fast and easy. Users can quickly alternate between 8- and 16-channel dispensing cassettes, enabling rapid filling of 6- to 1536-well microplates. All dispensing cassettes are supplied presterilised and can be autoclaved, allowing multiple uses.

The touch-screen user interface features intuitive graphics, allowing users to quickly edit predefined programs and to create, store, name and recall up to 99 individual programs. For complete walk-away functionality, users can add the optional VIAFILL stacker that offers 25- or 50-plate chimneys for filling bulk quantities of plates. The stacker is designed for standard or deep well plates of varying height and is compatible with most brands of lidded plates.

BioTools Pty Ltd
www.biotools.com.au

Nucleic acid purification kits

Omni Bead Mill Nucleic Acid Purification Kits are suitable for use with the Omni BeadRuptor range of bead mill homogenisers in order to extract RNA or DNA from bacteria cells, fungal cells or tissues. The kits contain spin columns, capture columns, prefilled nuclease-free bead beating tubes and reagents.

The optimised reagents are designed specifically for sample dissociation through bead milling and ensure high yields of nucleic acids. The prefilled bead tubes contain bead media appropriate to the tissue and an optimised amount of lysing matrix and are certified DNAse/RNAse-free to ensure the purified DAN/RNA is high quality.

Nucleic acids purified using the kits are ready for downstream applications such as PCR, RT-PCR, Southern blots, Northern blots and enzyme digestions. Each kit contains 50 preps. The kits can be used with any of the BeadRuptor range of bead mills from Omni: the BR24, BR12 or BR4.

Capella Science
www.capellascience.com.au

Portable infrared spectrometer

Scientists can now benefit from a portable infrared spectrometer designed to provide continuous measurement of isotope ratios and CO_2 concentrations in air and in containers. The Thermo Scientific Delta Ray Isotope Ratio Infrared Spectrometer (IRIS) with URI Connect extends the continuous measurement of isotope ratios and concentrations of CO_2 in air to discrete samples, such as headspace analysis or direct injection of small amounts of CO_2.

The instrument was designed with field portability and operational simplicity in mind so that scientists can place it right at the point of the research interest. By simultaneously detecting 13C and 18O, the system allows scientists to measure both isotopolgues and concentration in one step, without destroying the sample.

The URI Connect system lets the user interface with samples containing as little as 80 μg of CO_2, such as in vials, syringes or bags, which can then be analysed with the Delta Ray IRIS analyser. The interface balances the concentration of reference gases against that of the sample, targeting accuracy with minimum effort from the user.

Thermo Fisher Scientific
www.thermofisher.com.au

Rotary screw compressors

With free air deliveries from 3.16 to 5.53 m³/min at 8.5 bar, and capable of 15 bar maximum operating pressure, the Kaeser ASD series rotary screw compressors are suitable for users who require small volumes of compressed air.

At the heart of every ASD compressor is a Kaeser rotary screw compressor block equipped with flow-optimised Sigma Profile rotors. The compressor block and the drive motor are directly coupled and turn at exactly the same speed. The drive power is transmitted from the motor to the compressor block without the losses incurred by gearing or drive belts. The use of IE3 electrical motors contributes to additional energy savings.

The Sigma Control 2 internal controller not only enables demand-oriented performance matching and dependable monitoring, but also ensures flexibility through its numerous interfaces and innovative plug-in communication modules. Connection to energy-saving master control systems, computer networks and/or remote diagnostics and monitoring systems becomes easy. The addition of an integrated RFID reader ensures service continuity, increases security and raises service quality.

The rotary screw compressor is optionally available with an integrated refrigeration dryer and/or frequency control module, allowing the compressor system to be precisely tailored to meet the user's exact requirements. Models featuring an integrated compressed air dryer are also equipped with a centrifugal separator and an electronic Eco Drain condensate drain, ensuring efficient condensate separation and drainage and aiding effective operation of the downstream refrigeration dryer.

The ASD series rotary screw compressors are available with drive power 18.5 to 30 kW, maximum working pressure 8.5 to 15 bar and free air delivery of 2.63 to 5.53 m³/min.

Kaeser Compressors Australia
www.kaeser.com

Associate Professor Charlene Kahler, chair of the local organising committee for ASM Perth 2016

Antimicrobial resistance and the good, the bad and the useful

ASM 2016 has something for everyone

The Australian Society for Microbiology's 44th Annual Scientific Meeting and Trade Exhibition is being held in Perth from 3–6 July.

This year, the ASM's annual conference is themed 'New Frontiers' and is focusing on two main areas:

- Antimicrobial resistance: impact, mechanisms and solutions to a growing healthcare crisis
- The good, the bad and the useful: microbes in healthy ecologies, disease and industry

The antimicrobial resistance theme is being led by Professor Peter Hawkey (University of Birmingham), Professor Dan Andersson (Uppsala University) and Dr Brian Conlon (Northeastern University, Boston). Together they will tackle the issues of increased prevalence of antimicrobial resistance in the community and hospitals, the burden to our healthcare systems and what research is currently being undertaken to reverse antimicrobial resistance or to discover new therapeutic treatment options.

The good, the bad and the useful theme is being explored by Associate Professor Susan Lynch (University of California San Francisco), who will explain the importance of a healthy microbiome to establish a healthy life, while Professor Victor Nizet (University of California San Diego) and Associate Professor Anna Durbin (Johns Hopkins) will examine models of infection immunity and vaccines.

Starting with a Sunday workshop

The conference meeting starts with a full Sunday workshop program, held at the School of Pathology and Laboratory Medicine (University of Western Australia) at the Sir Charles Gairdner Hospital and the Perth Convention Centre. The two sites are easily accessible by a bus route from the Perth Convention Centre, which takes about 10 minutes and runs frequently between them.

The workshop program includes sessions titled 'Disease detective: an interactive hypothetical', 'Identification of bacteria from fish and other aquatic animals', 'QC and QA of media used in food and water microbiology' and 'Calibrated Dichotomous sensitivity users', as well as a bioinformatics workshop.

Industry-sponsored workshops

Thermo Fisher Scientific is offering a day-long workshop on flow cytometry.

Illumina will hold 'Next Generation Sequencing: Microbial Fundamentals: An Illumina Ignite Educational Programme' at the Perth Convention Centre. For more information, please visit the meeting website.

Clinical day

A full clinical day scientific session on Monday has been designed to attract members of our delegation who are interested in diagnostic clinical microbiology and the challenges facing this sector, in particular the introduction of new technologies

into pathology diagnostic laboratories. An exciting and affordable package for attending the workshop program and clinical day is being offered, so please have a look at this!

Open to the public

Two events are open to the general public: the opening public lecture on Sunday afternoon and the Rubbo Oration on Wednesday night.

This year, the public lecture series is titled 'WHO global alerts and the traveller!' and has three eminent speakers. They are Dr Chris Baggoley AO (Chief Medical Officer, Australia), Dr Paul Effler (Communicable Disease Control Directorate, WA Dept of Health) and Professor Tania Sorrell (Marie Bashir Institute and Westmead Millennium Institute).

Emerging and re-emerging epidemic diseases pose an ongoing threat to global health security. The World Health Organization (WHO) works to provide expert guidance and lead global networks and systems to anticipate, prevent and control epidemic and pandemic diseases. When a significant public health event takes place, WHO's comprehensive global alert and response system ensures that information is available and response operations are coordinated effectively. To do this, the organisation works closely with national governments. Invited speakers will discuss the threat of introduced infectious disease to Australia and how WHO contributes to disease prevention and control. And yes, the Zika virus will be discussed, along with many other emerging infections.

Rubbo Oration

This year, the Rubbo Oration is also open to the public and is a ticketed event. The oration recognises and celebrates outstanding career achievements in microbiology. The award honours Professor Sydney Rubbo's contribution to Australian microbiology and is made possible with the continued support of the Rubbo Trust at the University of Melbourne. Our awardee this year is Dr Anne Kelso, the CEO of the NHMRC, presenting an essential and exciting topical talk given the federal election is on the same weekend. Her presentation will be 'Balancing national research needs — is there a bug in the system?' and will be essential listening for everyone in the university and healthcare sector. Tickets for non-conference delegates are $75 and can be ordered through the meeting website.

Bazeley Oration

The official scientific program opens with the Bazeley Oration, which is an award supported by the Commonwealth Serum Laboratories. The ASM is very grateful for the continuation of this award by CSL over many years and is excited to have it placed in the opening session.

This year, Professor Ulrike Holzgrabe (University of Würzburg, Germany) will present her work in 'New drugs against old bugs — old approaches and new concepts'. She is currently the chairperson of Pharmaceutical and Medicinal Chemistry, Institute of Pharmacy & Food Chemistry, a member of the German Pharmacopoeia Commission and a member of the scientific board of the Federal Institute of Drugs and Medical Devices. We look forward to an exciting seminar on the continued interaction of various disciplines involved in undertaking drug design in the current decade.

Career advancement events

Students and early-career researchers are invited to a host of career advancement events, including the Nancy Millis Student Mentoring Breakfast and Lunch. This activity is held to honour the contribution of Professor Nancy Millis to Australian microbiology. In addition, this year we have organised a three-minute thesis session for students presenting posters. This will enable these students to direct interested viewers to their posters on Tuesday and Wednesday and will enhance their conference experience significantly. Poster prizes are also on offer.

Now more than ever, scientists must be able to deliver clear and scientifically accurate communication that can be understood by the general public. A three-minute thesis competition gives students an opportunity to present their research in a concise way and is a great opportunity to refine early science communication skills.

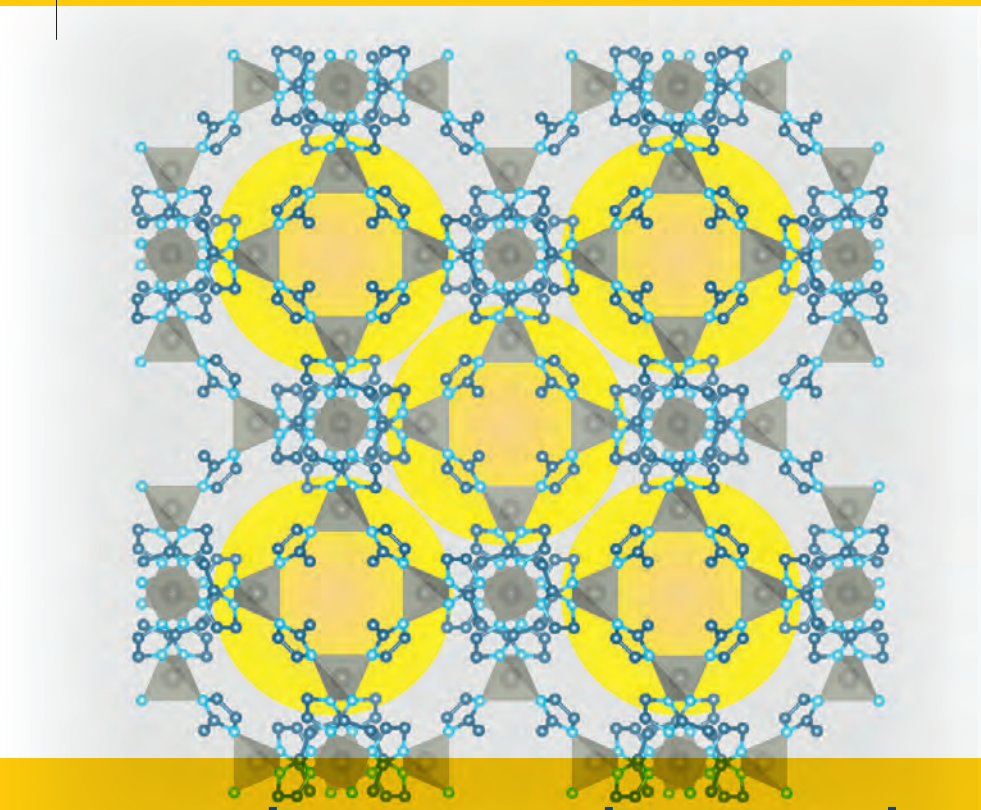
EduCon 2016

Perth ASM 2016 will be run in conjunction with EduCon 2016, a day-long conference on Saturday 2 July, which will discuss new and innovative methods of teaching microbiology. EduCon is open to educators at all levels and is a great way to meet others and to discuss and formulate strategies to meet the challenges of teaching microbiology in the 21st century.

In summary, the Perth LOC is very proud to present an absolutely fantastic scientific and workshop program for conference delegates and to welcome the public to attend our open events.

While in Perth, spend a little extra time to enjoy the beautiful city with its riverfront views, beaches and islands — all within easy reach of the city centre using public transport. A wide array of day trips, including the Margaret River and Swan Valley wine regions and Rottnest and Penguin islands, can also be enjoyed.

Australian Society for Microbiology
www.theasm.org.au



Vapour-based method

for making crystals

An international team of scientists, led by KU Leuven in Belgium, has developed a method of producing crystals called metal-organic frameworks (MOFs) — said to be the world's most porous materials — using vapour rather than liquid.

CSIRO's Dr Mark Styles.

As explained by CSIRO researcher Dr Mark Styles, MOFs have the potential to significantly boost the processing power of microelectronic devices. They are like "bird cages that can be tailor made to be different shapes and sizes", he said, featuring a regular pattern of tiny holes (nanopores) which contribute the crystal's extremely large surface area.

"One gram of MOF crystals has a surface area of over 5000 m^2 — that's the size of a football field," Dr Styles said.

"Crucially, we can use this vast space to trap other molecules, which can change the properties of a material.

"In the case of electronics, this means we can fit a lot more transistors on a microchip, making it faster and far more powerful."

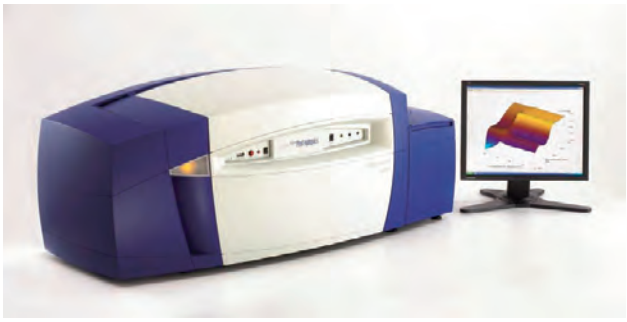
But up until now, these crystals could only be grown and applied using a liquid solvent, making them unsuitable for electronics applications. As explained by KU Leuven's Professor Rob Ameloot, "The conventional method involves lab-scale wet chemistry — the traditional chemistry with solutions and solvents. The end result is a powder. For integrated, nanoscale applications, the particles of that powder are too large, while a method with solutions is not pure enough."

Now, researchers have developed a vapour-based method of production that is analogous to steam hovering over a pot of hot water. The KU Leuven team, led by Professor Ameloot and his colleague Ivo Stassen, drew on specialist X-ray analysis techniques from CSIRO and the Australian Synchrotron to understand how the vapour process can be used to grow the MOF crystals.

"Vapour-phase deposition is already a common method to produce high-tech devices," said Stassen, "[but] we are the first to use this method for the production of these highly porous materials. We first deposit layers of zinc and let them react with the vapour of the organic material. The organic material permeates the zinc, the volume of the whole expands and it is fully converted into a material with a regular structure and nanopores."

It is believed that the alternative production method, published in the journal *Nature Materials*, opens up several new possibilities for MOFs in terms of applications and industries. Stassen explained, "Chemical vapour deposition is a common technique in nanofabrication; therefore, new MOF applications can be developed relatively quickly: gas sensors, nanochip components and improved batteries."

CD spectrometer



The qCD (quantitative CD) spectrometer from Applied Photophysics is said to extend the capabilities of CD spectrometry. The product reflects a number of novel capabilities that improve performance and enable absolute CD measurement.

Absolute CD calibration is achieved using a multipoint optical standard, with absolute CD accuracy to within 1%. Precision error bars are available with each CD measurement.

The product has sensitivity equivalent to a synchrotron-CD in the 170–260 nm region. This is claimed to be higher sensitivity than all other CD spectrometers.

Thermal ramping modes mean that structural, stability and aggregation information can be obtained in one 75 min experiment. There is a low nitrogen purge requirement of just 5 L/min at 170 nm, compared to 20 L/min on other CD instruments.

The spectrometer features preset/auto start-up and switch-off of N2 purge and lamp ignition. This means the instrument can be ready for use when users reach the lab and can be left on to complete an experiment when they leave.

Scientex Pty Ltd
www.scientex.com.au

Automated live cell imager

BioTek Instruments announces the launch of the Lionheart FX Automated Live Cell Imager with augmented microscopy. The product is optimised for kinetic live cell imaging, with up to 100x air and oil immersion magnification in a variety of slides, dishes, microplates and flasks. Imaging channels include brightfield, colour brightfield, phase contrast and fluorescence, with both image-based and laser autofocus.

An environmental control cover is said to provide convenience beyond that of typical digital microscopes, allowing for incubation up to 40°C and gas control, while the optional humidity chamber and dual reagent injectors enhance environmental support for live cell imaging workflows. Gen5 3.0 Software provides automated image capture and analysis, plus annotation and movie maker functions, offering ease and simplicity across a broad range of live and fixed cell applications.

The product is suitable for live and fixed cell applications.

Millennium Science Pty Ltd
www.mscience.com.au

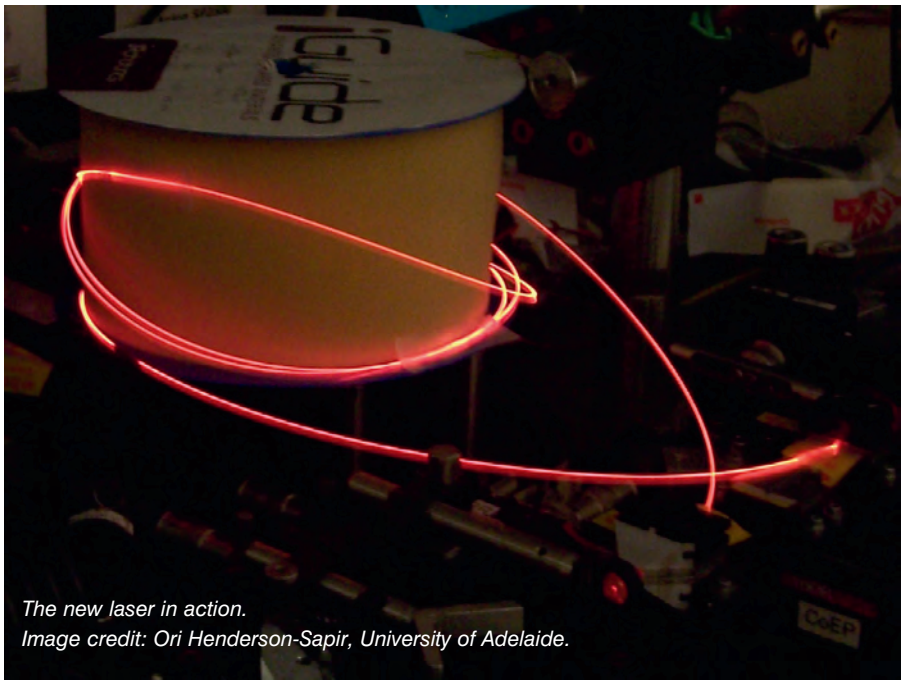
Adam Florance

An amazing laser

A team of Australian researchers has developed a revolutionary new type of optical fibre laser that is cost-effective to produce, portable and can be tuned to operate over a wide range of the infrared spectrum. Potential applications include remote sensing of organic molecules such as greenhouse gases and medical diagnostics.

Lasers generally work at one wavelength, but this new laser can be tuned into a wide range of wavelengths over the infrared light spectrum, according to lead author and postdoctoral fellow at the University of Adelaide Dr Ori Henderson-Sapir. "In fact," he said, "this laser has the largest wavelength tuning ever demonstrated by a fibre laser, and reaches further into the mid-infrared than ever achieved before from a fibre laser operating at room temperature."

The research was a joint effort between Macquarie University and the University of Adelaide with support from the Australian Research Council and the South Australian Premier's Research and Industry Fund.



The new laser in action.
Image credit: Ori Henderson-Sapir, University of Adelaide.

Project leader David Ottaway is an Associate Professor at the School of Physical Sciences and the Institute for Photonics and Advanced Sensing at the University of Adelaide. He explained that the obvious and immediate application of this new laser is in detecting the "molecular fingerprints" of organic molecules, such as hydrocarbon gases, which absorb light at varied frequencies. "By changing the wavelength of our laser, we can measure the light absorption patterns of different chemicals with a high degree of sensitivity," he said.

Remote sensing of greenhouse gases, including ethane and methane, at considerable distances will enable researchers to focus on areas of concern involving various emission sources from agriculture and industry.

The new laser also has potential applications in the medical field. The analysis of trace gases in exhaled breath can be used to diagnose diseases such as diabetes, but the bulk and expense of the requisite equipment has limited its use in the past.

Macquarie University's Associate Professor Stuart Jackson explained: "The main limitation to date with laser detection of these gases has been the lack of suitable and affordable light sources that can produce enough energy and operate at the correct part of the light spectrum."

Using a less cumbersome and more cost-effective optical fibre, the new laser has the potential to become a very useful sensing tool in medical diagnostics with "incredible potential for scanning for a range of gases with a high level of sensitivity", according to Dr Ottaway.

"We hope this laser will open up opportunities for lasers in the mid-infrared in a similar manner that titanium doped sapphire lasers revolutionised lasers operating in the visible and near-infrared," he said.

This research was published in the journal *Optics Letters*.

ComBio 2016 Brisbane

Brisbane Convention & Exhibition Centre
3 to 7 October 2016

Overseas Plenary Speakers

ComBio2016 Confirmed Plenary Speakers

- **Andrea Ballabio** (Telethon Institute of Genetics and Medicine, ITALY)
- **Isabel Bäurle** (Institute of Biochemistry and Biology Plant Epigenetics, University of Potsdam, GERMANY)
- **Xiaofeng Cao** (Centre for Genome Biology, Institute of Genetics and Developmental Biology, Chinese Academy of Science, CHINA)
- **Jennifer Elisseeff** (Translational Tissue Engineering Centre, John Hopkins University, Maryland, USA)
- **Harsha Gowda** (Institute of Bioinformatics, INDIA)
- **Dave Jackson** (Cold Spring Harbor Laboratory, New York, USA)
- **Shigeru Kondo** (Faculty of Frontier Bioscience, Osaka University, JAPAN)
- **Xia Li** (Centre for Agricultural Research, Institute of Genetics and Developmental Biology, Chinese Academy of Science, CHINA)
- **Patrick Lupardus** (Department of Structural Biology, Genentech, California, USA)
- **Gene Myers** (Max-Planck Institute of Molecular Biology and Genetics, Dresden, GERMANY)
- **Joseph Thornton** (Departments of Human Genetics & Ecology and Evolution, University of Chicago, USA)
- **Shubha Tole** (Tata Institute for Fundamental Research, INDIA)
- **Jennifer Van Eyk** (Cedars-Sinai, California, USA)
- **Rajeev Varshney** (International Crops Research Institute for Semi Arid Tropics, INDIA)

Themes of the conference will include:

1. Plant Cell and Developmental Biology and Genetics
2. Plant Physiology and Ecology
3. Developmental, Stem Cell & Regenerative Biology
4. Proteins & Proteomics
5. Genomes & Bioinformatics
6. Cell Biology
7. Cell Signalling
8. Biochemistry & Metabolism
9. Education & Career Development

FOLLOW US ON:

Early registration/abstract deadline:
Monday, 27 June 2016

Combined ASBMB, ASPS and ANZSCDB Annual Meetings

- Australian Society for Biochemistry and Molecular Biology
- Australian Society of Plant Scientists
- Australia and New Zealand Society for Cell and Developmental Biology

Further information:

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www.asbmb.org.au/combio2016

UV spectroscopic analysers

Water engineers responsible for municipal or industrial water and wastewater will find the single- or dual-parameter CA-6 UV family of spectroscopic analysers from Electro-Chemical Devices (ECD) can monitor any two selected parameters in separate measurement ranges for ammonia, nitrate or chemical oxygen demand (COD 254 nm).

The UV analyser family is an online sampling system that's designed with UV absorption sensor technology to monitor harmful pollutant parameter levels. The analyser's sensors are available in multiple parameter measurement ranges: ammonia from 0–10 mg/L or 0–1000 mg/L; nitrate from 0–30 mg/L, 0–100 mg/L or 0–250 mg/L; and COD 254 nm from 0–200 mg/L or 0–20,000 mg/L. Accuracy is 5% for the measurement of ammonia, nitrate and COD with the analyser based on a sample temperature range of 0 to 80°C, so long as the sample is liquid and not frozen.

Each model is easy to order with either a single parameter or dual parameters in the factory-precalibrated measurement ranges. Everything needed comes in one box ready to install and start up. A single technician can complete the installation process in 15 min by connecting the sample, waste and cleaning solution (reagent) lines and powering up the analyser. Accessing the chosen precalibrated parameter data or customising an analysis routine is easily done with user-friendly intuitive menus and a touch screen display.

The versatile analyser is designed with four alarm relays. A single 4–20 mA analog output is included with 12-bit resolution. RS232 communications are provided for data download to a CSV file, with an optional RS485 MODBUS communication module available.

AMS Instrumentation & Calibration Pty Ltd
www.ams-ic.com.au

Nampt ELISA kit

AdipoGen Life Sciences has released the Nampt (Visfatin/PBEF) (human) intracellular ELISA kit.

Nampt is considered a key player in inflammatory arthritis and is also of interest in diabetes, obesity, sepsis, IBD, Crohn's disease and pre-eclampsia research. It is the rate-limiting enzyme of the mammalian nicotinamide adenine dinucleotide biosynthesis pathway from nicotinamide to nicotinamide mononucleotide. It shares homology with Visfatin, which is found in human sera and secreted from differentiated adipocytes.

The Nampt ELISA kit is a sandwich-based colorimetric assay that is suitable for the in vitro quantitative determination of human Nampt, within the range of 0.25 to 16 ng/mL, in cell lysates or cell-based assays (screening). Nampt is recognised by the addition of a purified polyclonal antibody specific for Nampt in a 96-well plate.

Sapphire Bioscience
www.sapphirebioscience.com

Manual pipette range

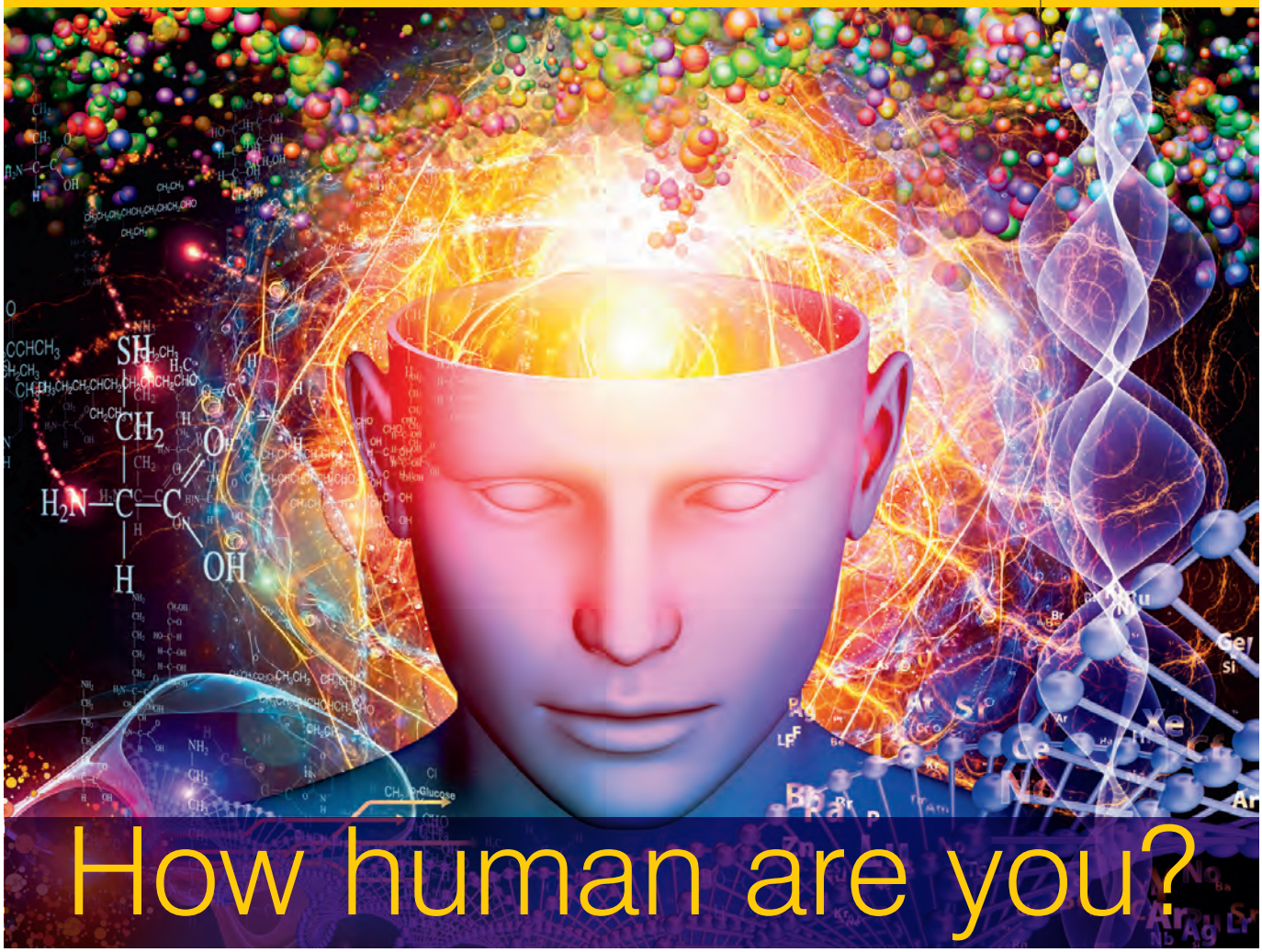
INTEGRA has launched the EVOLVE manual pipette range. Available in single-, eight- and 12-channel formats, covering a volume range of 0.2 to 5000 μL, the product has an ultralightweight, well-balanced design in order to enhance productivity and comfort even during prolonged pipetting sessions.

Unlike traditional pipettes, which utilise a single rotating plunger to set volumes, the EVOLVE features three adjustable dials for setting each individual volume digit. Simply depress and twist the plunger to unlock the volume dials. Once unlocked, freely adjust the three dials to rapidly set the desired volume. This approach allows users to set volumes more than 10 times faster, according to the company.

The pipettes are optimised for use with the company's range of GripTips pipette tips. GripTips snap into place with minimal tip loading effort, providing a secure connection. GripTips never fall off and are said to be perfectly aligned, resulting in accuracy and precision.

The INTEGRA linear stand can accommodate up to 13 EVOLVE pipettes. Users can simply add up to four charging/communication stations to convert the linear stand into a charging stand to charge any of the company's electronic pipettes.

VWR International Pty Ltd
au.vwr.com



How human are you?

Maybe not as much as you thought

Think all your DNA is all human? Think again.

Nineteen new pieces of DNA — left by viruses that first infected our ancestors hundreds of thousands of years ago — have been found lurking between our genes. One stretch of this newfound DNA, found in about 50 of the people studied, contains an intact, full genetic recipe for an entire virus.

The findings, published in the *Proceedings of the National Academy of Sciences*, add to what science already knows about human endogenous retroviruses (HERVs) — ancient infectious viruses that inserted a DNA-based copy of their own RNA genetic material into our ancestors' genomes. Over generations, the virus-generated DNA kept getting copied and handed down when humans reproduced. That's how we've reached the stage we're at today — with about 8% of what we think of as our 'human' DNA actually coming from viruses.

The study was conducted by researchers from Tufts University and the University of Michigan (U-M) Medical School, who examined the genomes of 2500 people from around the world. Some came from the 1000 Genomes Project, an international collaboration, while another set came from the Human Genome Diversity Project, with a focus on DNA samples from African volunteers. The latter samples showed more signs of HERVs, in line with the high level of genetic diversity in African populations.

The new HERVs are part of the family called HERV-K. The intact whole viral genome, or provirus, recently found was on the X chromosome. Dubbed Xq21, it's only the second intact provirus found to be hiding in human DNA.

"This one looks like it is capable of making [an] infectious virus, which would be very exciting if true, as it would allow us to study a viral epidemic that took place long ago," said senior author and virologist Dr John Coffin, from the Tufts University School of Medicine. "This research provides important information necessary for understanding how retroviruses and humans have evolved together in relatively recent times."

"This is a thrilling discovery," said co-first author Dr Julia Wildschutte, who began the work as a PhD student in Coffin's lab at Tufts. "It will open up many doors to research. What's more, we have confirmed in this paper that we can use genomic data from multiple individuals compared to the reference human genome to detect new HERVs. But this has also shown us that some people carry insertions that we can't map back to the reference."

"These are remnants of ancient events that have not been fixed in the population as a whole, but rather happened in the ancestors of some people alive today," added U-M genetics researcher Dr Jeffrey Kidd. "There have been a number of examples of other HERVs that insert themselves next to human genes or near them, and have impact on their expression. We're interested in applying these methods to find other types of viral or mobile element insertions."

Cataloguing all the HERV insertions in humans will require even more scanning of whole human genomes, which are becoming easier to come by as technology improves and becomes less expensive.

Exome research panel

Integrated DNA Technologies (IDT) introduces its xGen Exome Research Panel v1.0 for insightful analysis of the human exome via next-generation sequencing.

A total of 429,826 probes span 39 Mb of the human genome, providing deep and uniform coverage of 19,396 genes. This leads scientists directly to relevant mutations, aiding advances in clinical and companion diagnostics research. By using the research panel with xGen Lockdown Reagents and the optimised protocol, scientists can obtain reproducible exome data in a single day, minimising the need for added downstream analysis.

Each probe within the research panel is individually synthesised and undergoes a rigorous manufacturing and quality assessment process in accordance with GMP standards. Missing or truncated probes are identified by mass spectrometry and OD measurements and are eliminated before pooling. This approach selects for full-length probes, enabling uniform coverage. Batch-to-batch variation is also minimised, ensuring consistent results between panels. The product provides scientists with the data they need to thoroughly interrogate their genomic sample of interest.

The research panel is the latest addition to IDT's expanding genomics portfolio. The versatile technology is compatible with common sequencing platforms, including Illumina and Ion Torrent sequencers.

Integrated DNA Technologies
www.idtdna.com

Correlative RISE microscopy system

The WITec RISE microscopy mode for correlative Raman-SEM imaging is now compatible with the scanning electron microscope ZEISS MERLIN. The hybrid system enables users to benefit from high-quality and sophisticated system components for research in the fields of nanotechnology, life sciences, geosciences, pharmaceutics, materials research and more.

Correlative microscopy involves using two or more microscopy techniques. RISE correlative microscopy combines a confocal Raman imaging and scanning electron (RISE) microscope in a single system. Raman microscopy, as a label-free, non-destructive technology for the identification and imaging of the molecular composition of a sample, serves to complement SEM (scanning electron microscopy), which visualises the surface structure of a sample, and the often-associated EDX (energy-dispersive X-ray spectroscopy) that can only identify elemental constituents.

The integration of both techniques into one system improves ease of use and accelerates the experimental workflow. It places both the objective and sample stage required for Raman microscopy within the SEM's vacuum chamber. Thus, the sample can remain under vacuum for both measurements and is simply transferred between the Raman and SEM measuring positions by a software-driven, push-button mechanism using a precise scan stage.

The combined system provides all functions and features of a standalone ZEISS SEM and a WITec confocal Raman microscope. In Raman imaging mode the sample can be scanned through a range of 250 x 250 x 250 μm^3. The microscope enables software-driven quick and convenient switching between Raman imaging and SEM, transformation of the Raman spectra into an image and the ability to overlay both images to produce the RISE image. RISE microscopy pairs ease of use with good analytical power.

Alphatech Systems
www.alphatech.co.nz

Filtration bin

The Smart Sinks filtration system removes particulate waste from cleaning water so that the solids can be disposed of in a bin or skip, leaving clean, potable water that can be released to the drainage system. The multistage filtration and collection system eliminates fine matter from entering normal liquid waste disposal areas.

The latest version of the product is the Smart Sinks Filtration Bin, a fully mobile system suitable for both indoor and outdoor applications. The unit is suitable for tradespeople needing to clean equipment when working in high-rise construction sites or remote locations.

Based on a standard 'wheelie bin', the product comes with its own water supply that is recirculated back through the unit, making it environmentally friendly. It can also be used in conjunction with a 'wet vac' when cutting concrete or using a hole saw; the wet vac is emptied into the filtration bin and solid waste is separated from the wastewater.

The design incorporates three disposable bags, a valve and visual indicators that simplify the use of the system. The filtration bags concentrate the solid material so that the bags from each of the three stages of filtration can be simply lifted out and disposed of as standard rubbish. The primary filter collects up to 92% of waste material, with subsequent filters ensuring that all waste is removed.

Smart Sinks can be used to dispose of trade waste from professions such as plastering, tiling, concreting and rendering, and other industries that potentially release pipe-blocking solid waste into the environment through waterways, sewerage and drainage systems.

Smart Sinks
www.smartsinks.com.au

Automated controlled laboratory reactor

Asynt has announced an agreement with Mettler-Toledo to integrate the latter's RX-10 automation system with Asynt ReactoMate Controlled Laboratory Reactor (CLR) systems. The CLR systems enable precise control of reaction variables, simple manipulation of vessels and connected apparatus and safe working conditions. Compact in design, they offer the flexibility to accommodate reaction vessels from benchtop to pilot plant scale.

The Mettler-Toledo RX-10 automation system provides an interface connecting any type and volume of ReactoMate CLR to circulating thermostats, stirrer motors and sensors. This allows researchers precision automation, control and monitoring of chemical reactions and processes in the lab or kilo lab environment. The intuitive RX-10 touch screen automates the most commonly used unit operations; data acquisition utilising the automation system enables scientists to make informed decisions quickly.

Manufactured to strict quality standards, ReactoMate CLR systems are simple to set up and easy to use. The ReactoMate Datum system offers simple interchangeability with vessels from 250 up to 5000 mL. For larger scale reactions using a ReactoMate CLR system there is the Super Safe Support System, which enables easy raising and lowering of even heavy fully loaded vessels with a single hand.

A wide range of single and vacuum jacketed reaction vessels can be exchanged on ReactoMate CLR systems, allowing chemists to quickly change between reactor vessel sizes, thereby accelerating synthesis scale-up. A novel mounting mechanism ensures stability and alignment every time.

The CLR systems are compatible with leading brands of overhead stirrers. Built to operate over a wide temperature range from -70 to +220°C, they use a PT100 temperature probe linked directly to the heating/cooling circulator to ensure temperature control.

LabFriend
www.labfriend.com.au

Inverse gas chromatography instrument

The Inverse Gas Chromatography-Surface Energy Analyser (iGC-SEA) is part of the Surface Measurement Systems UK (SMS) product range of dynamic vapour sorption (DVS) technology and inverse gas chromatography instrumentation and solutions.

The system is specially designed to determine the surface energy heterogeneity in many applications. Suitable for measuring different surface and bulk properties of solid materials, it can be used for characterising particles and powders, nanomaterials, films, fibres, composites and bulk solids.

The second-generation inverse gas chromatography instrument is based on the IGC principle. The SMS injection scheme provides a wide range of injection concentrations with good reproducibility. Data includes acid/base properties, heat of sorption, glass transition temperature and solubility parameters.

The system features fully automated operation with comprehensive data analysis software, which is wizard based. It also includes up to 12 different probe gas molecules, optional humidity control and in situ sample pre-conditioning.

Particle & Surface Sciences Pty Ltd
www.pss.aus.net

Nanopositioning actuators

Queensgate Instruments' Digital Piezo Translator (DPT) series of actuators incorporates capacitive sensors in order to deliver precise positioning and rapid settling. The actuators can be implemented in a wide variety of applications, including interferometry, semiconductor mask-wafer chuck alignment, beam alignment, cavity tuning, adaptive optics, scanning probe microscopy and a multitude of different metrology tasks.

The DPT-D series is said to feature best-in-class positioning performance, while the more compact DPT-E is a low-voltage replacement for the previous generation DPT-C series. Air and ultrahigh-vacuum variants are also available.

The units' Super-Invar construction provides good thermal properties (with a thermal expansion coefficient of 0.25 nm/K), which enhances position stability. Position resolutions down to 0.09 nm (RMS) are offered as each unit delivers <2 ms response time, 0.5 nm (RMS) repeatability. They are able to move loads of up to 60 kg across their entire closed-loop range, with closed-loop ranges from 20 to 110 μm.

DPT devices benefit from a built-in calibration function derived from the Queensgate ID chip arrangement. The ID chips store calibration data on the actuator itself and thereby facilitate plug-and-play operation with the digital controller. Controllers and actuators can be interchanged as required, avoiding the need for recalibration, which is important when the actuator is incorporated into a mechanism or is inaccessible.

Accessories include various end pieces, mirror holders and mounting blocks. An operational temperature range of -30 to 80°C is supported, but higher temperature variants can be offered.

Queensgate Instruments
www.nanopositioning.com

Surface area and porosity analyser

Surface area and porosity are important physical properties that influence the quality and utility of many materials and products; therefore, it is important that these characteristics be accurately determined and controlled. Likewise, knowledge of surface area and porosity is often important to understanding the formation, structure and potential application of many natural materials.

The Particle and Surface Sciences & Micromeritics Tristar 3030 system is a fully automated, three-station surface area and porosity analyser designed for quality control and research organisations. The instrument can collect up to 1000 data points and fine details of the isotherm can be observed and recorded, providing high resolution and revealing pore structure details. Containing all the capabilities of previous Tristar models, the product also features an updated dewar design and isothermal jacket technology, ensuring extended hours of continuous temperature control.

The corrosion-resistant stainless steel manifold is designed for accurate gas management. The dedicated saturation pressure (P_0) port enables the measurement of saturation pressure on a continuous basis. The three analysis ports operate simultaneously and independently of one another. The instrument also features a krypton option, allowing precise measurements in the very-low surface area range.

By simply moving the calculation bars, the user is immediately updated with textural properties. User-selectable data ranges through the graphic interface allow direct modelling for BET, t-Plot, Langmuir, DFT interpretation and much more.

Particle & Surface Sciences Pty Ltd
www.pss.aus.net

Optical measuring devices

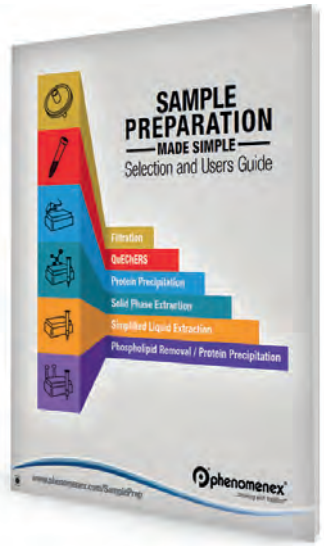
SIGRIST is a developer of optical measuring devices that monitor the quality of process variables in numerous industries. The devices feature a true, non-contact, free-fall measuring system which ensures that maintenance is kept to a minimum.

The company's range of photometers — which measure turbidity, dissolved substances, colour, oil or particulates — are used in water treatment, the food industry, industrial processes, environmental protection and the monitoring of air quality in roads and rail tunnels. The ProDetec range of photometers includes oil trace monitors, single- and multiparameter turbidity meters, and colour- and phase-monitoring instruments.

The SIGRIST OilGuard measures mineral oils in water. Based on the fluorescence principle, the device uses a free-fall measuring system that eliminates contact between the sample and the flow cell. Various types of oil can be detected by the product's calibration curves. The equipment is suitable for use in the chemical and pharmaceutical industry, crude oil production, machine and metal industry, petrochemical and refinery industry, power plants, the ship industry and wastewater treatment.

SIGRIST turbidity meters measure turbidity and other parameters in water and liquids, including DOC levels, colour and oil concentration. The meters detect any impurities or flaws in the treatment process so they can be rectified. Specifically, the SIGRIST AquaScat HT Online Turbidity meter measures the turbidity of potable water according to IEC 27027 in a free-falling water stream. The device features a contactless design which eliminates foiling and minimises servicing. It is suitable for monitoring turbidity in the food and brewing industries, chemical and pharmaceutical industry, crude oil production, dairy industry, drinking water treatment, machine and metal industry, petrochemical and refinery industry, power plants, pulp and paper industry and wastewater treatment.

Prodetec Pty Ltd
www.prodetec.com.au



Sample preparation guide for chromatographic analysis

Phenomenex has published a sample preparation guide and selection tool to help scientists produce cleaner samples for more efficient chromatographic analysis. Sample preparation is said to produce good results, deliver savings and reduce wear and tear on LC, GC and MS instruments.

The guide includes useful tools and resources to help select the most appropriate technique for any sample type. It provides specific product recommendations, general methods and protocols for easy method development. A handy selection tool is also available for quick reference.

Phenomenex offers a complete range of sample preparation techniques, including filtration, protein precipitation, QuEChERS, phospholipid removal, simplified liquid extraction and solid-phase extraction. Sample preparation techniques can be tailored for many matrices and are used in a variety of industries, including forensics, environmental analysis, food quality and safety, and clinical and pharmaceutical research.

The 50-page guide is available to download from the Phenomenex website. Researchers may also request the print version.

Phenomenex Australia
www.phenomenex.com

DC motor position controller

maxon motor has released the latest generation of position control units — the EPOS4. Available as a module for OEM designs and also with connectors for easy integration, there are two continuous power ratings of 8 and 15 A.

With tiny dimensions of 60 x 62 mm and able to drive both brushed and brushless DC motors up to 1500 W with 98% efficiency, the position controller has the highest power density ratio for maxon motor controllers. These attributes make it particularly suitable for space- and power-critical applications in the electronics, manufacturing, process control, robotics, communications, aerospace and oil and gas fields.

The easy-to-use motor position controller has been designed with intuitive set-up in mind via freely downloadable configuration software. A modular system allows for selection between various communication preferences, and additional functionalities like safe torque off and field-oriented control have been included.

maxon motor Australia Pty Ltd
www.maxonmotor.com.au

Temperature control systems

JULABO's PRESTO models W50 and W50t provide a high dynamic temperature control system that can handle temperature ranges of -50 to +250°C. Covering such a broad temperature range means the equipment is suited to demanding temperature applications such as reactors, mini-plants, pilot plants, material testing stands, micro-reactors, and material and component tests in the auto industry.

The W50 provides a heating capacity of 6 kW, while the W50t provides double the heating capacity at 12 kW. Both instruments have a cooling capacity of up to 7.5 kW. They are suitable for compensating exothermic and endothermic reactions quickly and have rapid heat-up and cool-down times.

High-performance, maintenance-free pumps deliver up to 3.2 bar or 76 L/min. Both models ensure high flow rates at constant pressure and can interactively compensate changes in the viscosity of the tempering medium. The integrated 5.7″ industrial colour touch screen provides high functionality and intuitive user guidance.

Clear and well-structured displays showcase values and graphics, all important information at a glance, detailed and easily understandable warning and help texts. Extensive interfaces enable flexible usage, such as control and regulation via USB interface, data logging via USB or SD Card, integration in process bus solutions (ie, Profibus), remote control via ethernet networks or wireless control through JULABO's WirelessTEMP application.

John Morris Scientific Pty Ltd
www.johnmorris.com.au

Adam Florance

From pest research to driving policy

Danielle Butcher, Executive Officer of Science Industry Australia, tells *Lab+Life Scientist* journalist Adam Florance a bit about herself and what she hopes to achieve in her new role at SIA.

Building bridges between researchers, commercial interests, government departments and the not-for-profit sector may seem like a tough call but that is precisely the aim of the newly appointed executive officer of Science Industry Australia, Danielle Butcher.

A biologist by training, Butcher also has considerable experience in the political arena and sees her new role as a point of contact between these often disparate worlds: "I want our association to be the connection point between the science industry and government; I want our association to promote the value of the science industry to government and the wider community."

Butcher wants to see the SIA's role grow through an all-inclusive approach: "SIA represents the professional science industry in Australia; to do this we need to be truly representative. Under my leadership I want to see SIA and ALMA (Australasian Laboratory Managers Association) expand its membership and representation; I want to work with our members to be active participants in the association and realise that their contributions can make a difference."

The SIA has recently undergone a renewal process and Butcher expects it will take time to embed these changes in the association: "We have a very small team, a dedicated membership base and supportive board; these combined give SIA a solid grounding for growth of our association. I am enthusiastic about the future possibilities for both SIA and ALMA."

Butcher's career has encompassed both hands-on research and the more delicate arena of policy work, giving her an ideal range of experience to liaise between the various stakeholders that the SIA deals with: "I have a passion for science, innovation and the not-for-profit sector. I strongly believe in the vision of SIA and wanted to use my unique skillset to help drive this agenda. For me the role at SIA was a natural fit and a challenge I wanted to take on."

She also sees her new role as expanding the influence of the local scientific community: "Given my direct experience with lobby groups, advocacy and policy development, I can see a major focus of my role at SIA will be to expand our influence in the government agenda."

To achieve this aim she will be focusing on increased contact with members so she can take their concerns directly to policymakers and provide the industry with a mouthpiece on government reforms.

Growing up in Sydney, Butcher's interest in science was sparked from a young age: "I was always interested in biodiversity, the theory of evolution and how the body worked… I was the type of child that would always have some sort of 'science experiment' set up in my room."

She moved to Central Queensland to complete her science studies, majoring in biology, which led to an early career in applied research in commercial agriculture: "I spent a lot of time in safety boots and overalls climbing up and down grain silo complexes counting insects on handrails or trying to figure out the best type of micro-encapsulated impregnated tarpaulin to use that would limit bird damage… not your standard white coat laboratory research."

This early work in grain storage entomology, pest control, fumigation and export quarantine control led to a government policy position assessing the pest risk of exotic plants and animals imported into Queensland: "In this role I found myself not only developing my policy and legislative reform skills but further developing my understanding of quarantine, imports and keeping standards for everything from a fungal sample through to a polar bear."

Her time in government service also led to a brief run-in with the late Steve Irwin in an unusual locale: "In this role I also had the responsibility to complete on-site assessments of facilities to ensure compliance with keeping standards — this included checking everything from quarantine laboratories through to lion enclosures."

The move from research to policy may seem a stretch, but she found that the two areas actually complemented one another: "Having a research and science background was very advantageous for policy work — it allowed me a fairly easy transition to develop evidence-based policy approaches to government decision-making."

This government experience also exposed her to an area that is of particular significance in the Australian environment.

"Whilst I started my career in the government in the pest management area, the majority of my career has focused on water. From drought management, quality control, contamination and regulation, restrictions, efficiency, behavioural change management, infrastructure, development, customer standards, concession and rebate schemes, etc."

Butcher is optimistic about the future of science in Australia despite some of the difficulties that researchers today face: "Being part of the science community for longer than I like to admit, I have seen many changes. I have seen many qualified people struggle to obtain suitable roles in the science sector. Funding models have changed and I have seen the commercial sector shrink, amalgamate or move offshore. Science can be a great career path — it can be exciting, challenging and rewarding! I want scientists to be truly recognised for the contributions they make to our life and our economy."

Users Meeting at ASMS 2016
June 5, Texas
sciex.com/events/asms2016

ANR
June 19–24, Cairns
www.anr2016.org

ANZCHOG Satellite
June 23–25, Cairns
www.anr2016.org/anzchog

MASCC/ISOO 2016 Annual Meeting on Supportive Care in Cancer
June 23–25, Adelaide
www.mascc.org/annual-meeting

ASM
July 3–6, Perth
www.asm2016.asnevents.com.au

SMBE
July 3–7, Gold Coast
www.smbe2016.org

IVIS
August 17–20, Gold Coast
www.ivis2016.org

Reproductive Immunology
August 17–20, Cairns
www.reproductiveimmunology2016.org

ESA Clinical Weekend
August 19–21, Gold Coast
www.esaclinicalweekend.org.au

ESA-SRB-ANZBMS
August 21–24, Gold Coast
www.esa-srb.org.au

ICI 2016
August 21–26, Melbourne
www. ici2016.org/

ENSA
August 22, Gold Coast
www.ensa.org.au

ADS-ADEA Roche Educators Day
August 23, Gold Coast
www.ads-adea.org.au

ADS-ADEA
August 24–26, Gold Coast
www.ads-adea.org.au

ASFB
September 5–8, Hobart
www.asfb.org.au

AACB AIMS 2016 Combined Scientific Meeting 2016
September 13–15, Brisbane
www.aacb.asn.au/eventsinfo/aacb-aims-2016

AGITG
September 13–16, Melbourne
www.agitg.org.au

APHIA Conference 2016
September 14–16, Perth
www.aphia.org.au

International Congress of Tropical Medicine and Malaria 2016
September 18–22, Brisbane
www.tropicalmedicine2016.com

ComBio2016
October 3–7, Brisbane
www.asbmb.org.au/combio2016

ANZOS
October 15–17, Brisbane
www.anzos.com

ABSANZ Conference 2016
November 7–11, Melbourne
www.absanz.org.au

ASMR NSC
November 13–16, Gold Coast
www.asmr-nsc.org.au

COSA-ANZBCTG
November 14–17, Gold Coast
www.cosa2016.org

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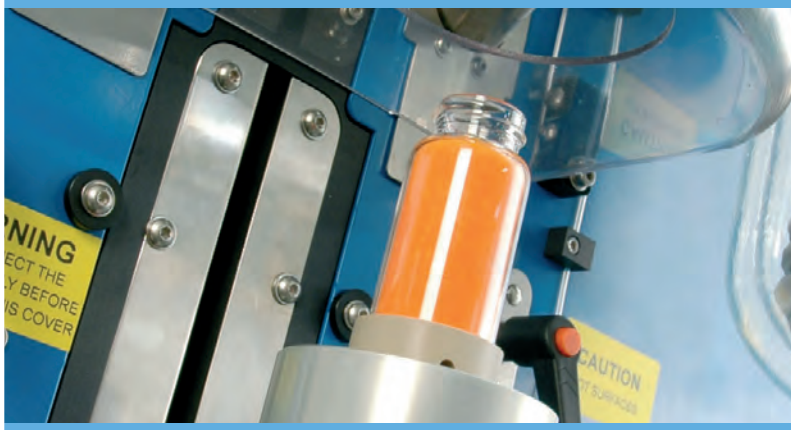

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