

Lab+Life SCIENTIST

Microscopic imaging
under the sea

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Regeneration



Image: Alex Gabbott

Welcome all to *Lab+Life Scientist*, which this issue examines everything from exploding bacteria to underwater imaging. But first, let's address the elephant in the room.

Long-running editor of *LLS* and chief editor at WF Media Janette Woodhouse has now settled into semi-retirement and as such has handed over some of her duties. Janette has been devoted to *LLS* throughout many years and seemingly even more name changes, all the while following her guiding principle of "make it interesting". I would like to thank her for her service, and I hope I make her proud as I take over the reins.

So who am I, exactly? My name is Lauren Davis, and I've been Janette's assistant on *LLS* for the past 4.5 years or so. Although I didn't do particularly well in science at school, I did win the inaugural Science Writer of the Year Award when I was 14. (I believe my teacher was particularly impressed by my short story written from the point of view of a pool of lava.) A year later, I began my gradual transformation into a science-fiction geek, which

today sees me as President of the Doctor Who Club of Australia and a devotee of Avon from *Blake's 7*.

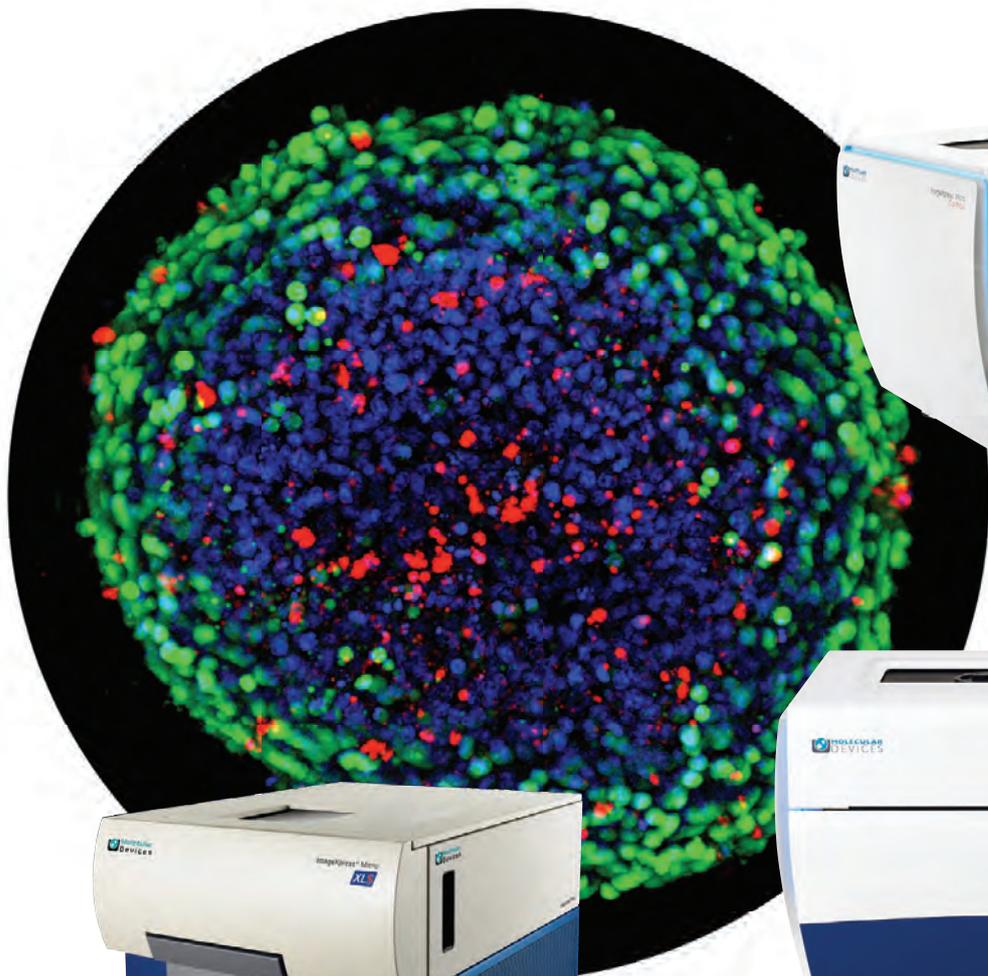
But my interest in science is by no means restricted to the realm of fiction, thanks largely to my time on *LLS*. Before joining this magazine, I never knew how much of a problem antibiotic resistance was — or the lengths scientists were going to in order to solve it. I never knew the full impact of incurable diseases — or the breakthroughs scientists were making in treating these diseases. What it boils down to is, I never knew how interesting science could be, and it's through magazines like this one — and people like Janette — that I came to change my mind.

So if you have anything interesting to tell me, please do get in touch. Whether you're a scientist with an interesting story, or a distributor with an interesting product, or a reader with an interesting anecdote, I'd love to hear from you. Members of the science industry know how important collaboration is to innovation, so let's start collaborating.

Regards,
Lauren Davis
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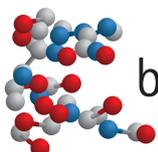
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Earlier this year, it was discovered that the superbug *Pseudomonas aeruginosa* causes infection by blowing itself up, releasing virulence factors into the environment in the process. Now, US scientists have created their own self-destructing bacteria — one which they hope to deploy in the fight against cancer.

“

In synthetic biology, one goal of therapeutics is to target disease sites and minimise damage,” said Jeff Hasty, a professor at University of California San Diego, who wondered if a genetic ‘kill’ circuit could be engineered to control a population of bacteria in vivo. “We also wanted to deliver a significant therapeutic payload to the disease site.”

With this in mind, Professor Hasty and his team at UC San Diego decided to synchronise a strain of *Salmonella* to release bursts of cancer drugs when a colony self-destructs within the tumour environment. The concept of using bacteria to deliver cancer drugs in vivo was promising because conventional chemotherapy doesn’t always reach the inner regions of a tumour, but bacteria can colonise there.

“One of the difficulties in treating cancer is the fact that tumours often have poor blood supply, meaning that it is difficult for chemotherapy drugs to reach them,” commented Dr Tom Williams from Macquarie University’s synthetic biology consortium. “On the other hand, poor blood supply means that tumours don’t receive much oxygen. This can provide a means of distinguishing tumour cells from normal healthy tissue so that cancer treatments can be targeted and have fewer side effects.”

Writing in the journal *Nature*, the study authors noted, “The widespread view of bacteria as strictly pathogenic has given way to an appreciation of the prevalence of some beneficial microbes within the human body. It is perhaps inevitable that some bacteria would evolve to preferentially grow in environments that harbour disease and thus provide a natural platform for the development of engineered therapies.”



Self-destructing bacteria to fight cancer



“We found that the combination of both circuit-engineered bacteria and chemotherapy leads to a notable reduction of tumour activity”

The researchers hypothesised that such therapies could “benefit from bacteria that are programmed to limit bacterial growth while continually producing and releasing cytotoxic agents” in situ. They thus began by observing cycling of the bacterial population that limits overall growth while simultaneously enabling production and release of encoded cargo — a gene that drives production of a therapeutic.

“In this paper, we describe a circuit that contains a gene that codes for a small molecule that can diffuse between cells and can turn on genes,” said lead author and UC San Diego PhD student Omar Din. “Once the population grows to a critical size — a few thousand cells — there’s a high enough concentration of that molecule present in the cells to cause mass transcription of the genes behind the promoter.”

The molecule, AHL, coordinates gene expression across a colony of bacterial cells. Once on, the genes driven by the promoter are also activated, including the AHL-producing gene itself. The more AHL accumulates, the more it is produced. And because AHL is small enough to diffuse between cells and turn on the promoter in neighbouring cells, the genes activated by it would also be produced in high amounts. This leads to a phenomenon known as quorum sensing, used by bacteria to communicate with each other about the size of their population and regulate gene expression accordingly. Din used quorum sensing to synchronise the cells and then added a kill gene that causes cells to break open (lyse) when a bacterial colony grows to a threshold. Only a few cells remain to repopulate the colony.

In order to find the right drug for delivery by the bacteria, the researchers tested three different therapeutic proteins that had been shown to shrink tumours. The tests showed that the proteins were most effective when combined.

The scientists placed the genes responsible for these proteins in the circuit, along with the lysis gene, then conducted experiments that showed enough protein was produced to kill cancer cells.

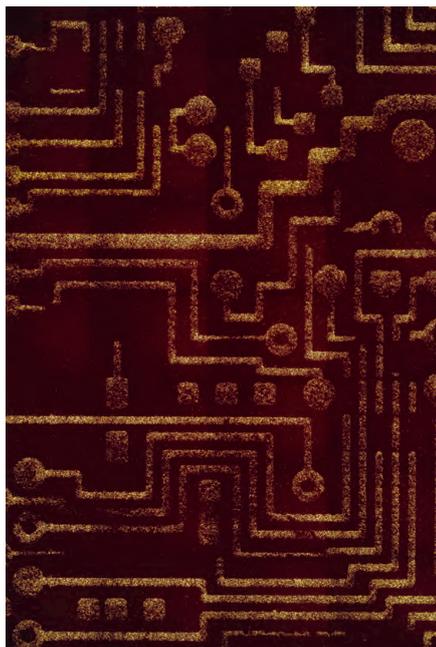
The bacterial therapy was transferred to UC San Diego alumnus and postdoctoral researcher Tal Danino, based at the Massachusetts Institute of Technology (MIT), for testing in an animal model. The bacteria were first injected into mice with a grafted subcutaneous tumour, resulting in a decrease in tumour size. Danino then used a more advanced mouse model with liver metastases, where bacteria were fed to the mice.

“We found that the combination of both circuit-engineered bacteria and chemotherapy leads to a notable reduction of tumour activity along with a marked survival benefit over either therapy alone,” the researchers said. And while this new approach has not yet cured any mice, the therapy has led to around a 50% increase in life expectancy — though it is difficult to anticipate how this would translate to humans.

The experiments thus establish a proof-of-principle for using the tools of synthetic biology to engineer tumour-targeting bacteria to deliver therapeutic proteins in vivo. The next possible steps include investigating the natural presence of bacteria in tumours and then engineering these bacteria for use in vivo and using multiple strains of bacteria to form a therapeutic community.

“Additionally, we are currently investigating methods for maintaining the circuit inside bacteria,” said Din. “Since the proteins produced by the circuit put a burden on the bacteria, the bacteria are prone to mutate these genes.

“Additionally, there is a selection pressure to get rid of the plasmids which harbour the genes comprising the circuit. Thus, one of our future research aims is to identify strategies for stabilising the circuit components in bacteria and decreasing their susceptibility to mutations.”



This image shows a motherboard image micropatterned using programmable probiotic bacteria. The bright lines are composed of dots made of bacteria. Researchers delivered artificial genetic circuits into the bacteria which allow the microbes to kill cancer cells in three different ways. Image courtesy of Vik Muniz and Tal Danino under CC BY-NC-ND 3.0

While further work will be required to make this therapy ready for application in humans, fellow scientists have been quick to voice their support. Dr Williams, for instance, said the treatment “represents a creative and promising weapon in the ongoing fight against cancer”. Cancer genomics pioneer Bert Vogelstein, director of the Ludwig Center at Johns Hopkins, added that the paper describes “a highly innovative strategy” which is “just the kind of new, forward-thinking approach that we desperately need if we are to more effectively combat cancer”.

But perhaps the highest praise has come from Jim Collins, a professor at MIT and co-founder of the field of synthetic biology, who said the work by Professor Hasty and his team is “a brilliant demonstration of how theory in synthetic biology can lead to clinically meaningful advances”.

“Over a decade ago, during the early days of the field, Jeff developed a theoretical framework for synchronising cellular processes across a community of cells,” said Collins. “Now his team has shown experimentally how one can harness such effects to create a novel, clinically viable therapeutic approach.”

Drought-proof crops under development

The Australian National University (ANU) has led an international research effort into how plants, such as rice and wheat, sense and respond to extreme drought stress. Published in the journal *Proceedings of the National Academy of Sciences*, their study could lead to the development of next-generation, drought-proof crops.

Lead researcher Dr Kai Xun Chan said the team discovered an enzyme that senses adverse drought and sunlight conditions. He explained, “The sensor in plant leaves is constantly sensing the state of its environment in terms of water and light levels.

“The sensor is able to sense when conditions become unfavourable, such as during extreme drought stress, by changing itself into a form with altered shape and activity.

“This sets off a ‘fire alarm’ in the plant, telling it to respond to drought by making beneficial chemical compounds, for instance. But in the field, this can occur too late and the plant would have suffered damage already.”

However, Dr Chan said, “If we can get the alarm to go off at the first signs of water deficit, we can help the plant survive severe droughts.”

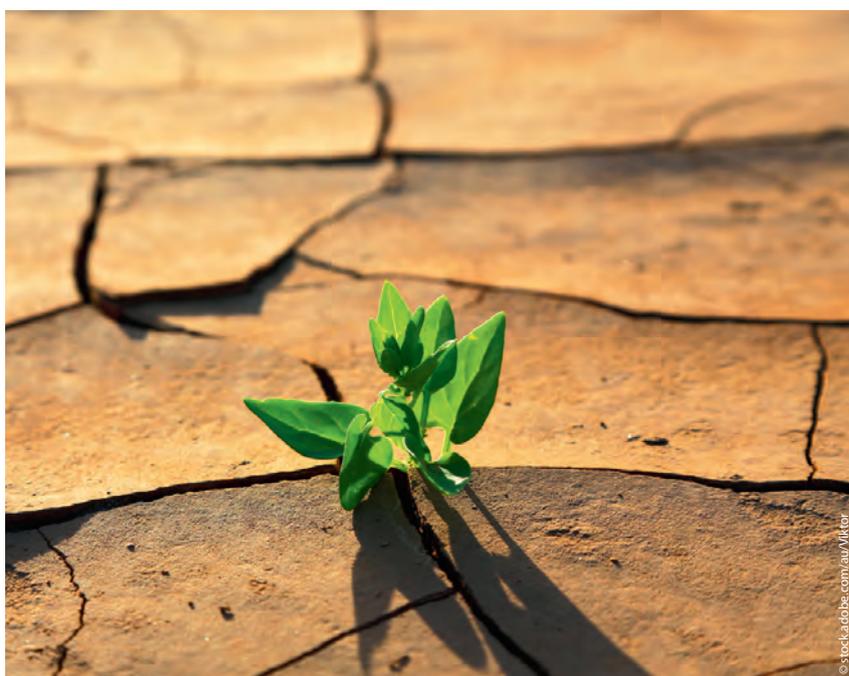
By activating the sensor alarm faster during a dry season, the plant can activate countermeasures in its leaves to prevent unnecessary water loss and ensure that the plant survives until the next rainfall. More drought-tolerant crops would be crucial to helping ensure global food security, reducing the impact of drought on the national economy.

ANU researchers Dr Peter Mabbitt and Associate Professor Colin Jackson, using X-ray facilities at the Australian Synchrotron, enabled the team to create a 3D model of the sensor enzyme. Dr Chan said they will use this model and a computer program to identify candidate chemical compounds that match well with the enzyme’s structure.

“We’re really excited about the potential applications of this research, which range from genetic modifications and plant breeding to the development of a chemical spray that directly targets this sensor to set off the alarm in plants,” Dr Chan said.

“Within two years, we hope to identify potential compounds for a chemical spray which will rescue crop yields. We would then need to perfect a compound in consultation with farmers and other industry players.

“We have already received funding from ANU Connect Ventures Discovery Translational Fund for this follow-up project.”





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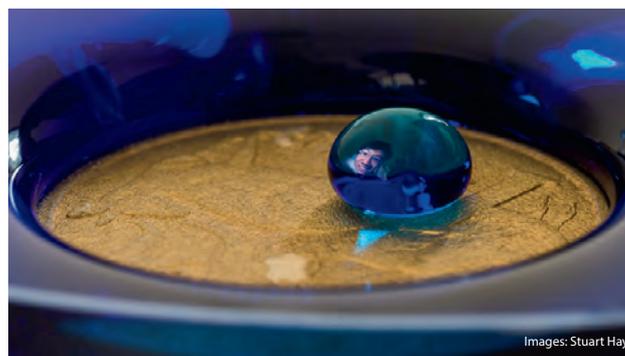
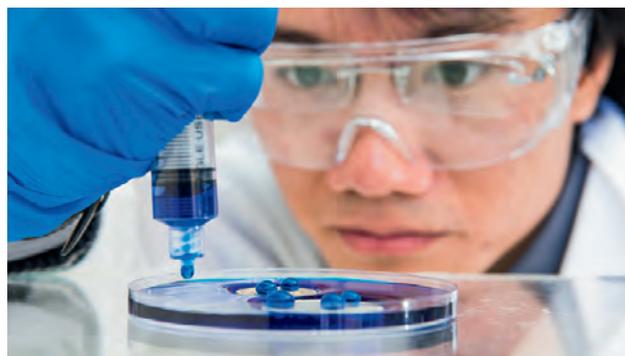
AXT has partnered with the life sciences company Unchained Labs and will now be exclusively distributing its innovative and novel range of instruments for the analysis and formulation of biologics in Australia and New Zealand. The products will be of particular interest to researchers developing protein-based therapeutics that have the potential to treat a range of illnesses and diseases, including cancer.

Unchained Labs has developed a range of problem-solving products for biologics research and drug development. By taking existing technologies and adding improvements, their solutions have been designed to replace current methods and tools that may not be as efficient or productive. Their products are said to be characterised by increased capabilities, multifunctionality, automation and sensitivity, allowing users to spend less time developing and refining protein formulations.

Unchained Labs claims to make light work of analysing biologics — from protein sizing and prediction of aggregation and stability through to ramping up the preparation of biologic formulations. With the addition of the freeslate and freeslate jr. products, robust and sensitive automation of biologics formulations, small molecular preformulation and process chemistry becomes a simplified walkaway process.

“With the current global share of biologics-based drugs increasing, it is an exciting time for us to partner with a company producing such breakthrough and groundbreaking products,” said Desley Pitcher, national sales manager for life science at AXT.

“We look forward to putting these cutting-edge solutions in the hands of local researchers as they will help keep us at the forefront of medical research.”



Images: Stuart Hay.

Nanoparticle coating can repel water

Scientists at The Australian National University (ANU) have developed a water-repelling coating that could one day be used to waterproof mobile phones, prevent ice from forming on aeroplanes and protect boat hulls from corroding. Their work has been published in the journal *ACS Applied Materials & Interfaces*.

Developed in the university's Nanotechnology Research Laboratory, the superhydrophobic coating has been created by combining two plastics: one tough and one flexible. This makes it more robust than other superhydrophobic coatings, which are susceptible to wear damages following breakage of their nano/microstructures.

“It's like two interwoven fishing nets, made of different materials,” said ANU PhD student William Wong. This gives the new material its extreme robustness and strength, he said, as well as transparency and resistance to ultraviolet radiation.

“The surface is a layer of nanoparticles, which water slides off as if it's on a hot barbecue,” said Wong.

The team developed two ways of creating the material, both of which are cheaper and easier than current manufacturing processes. One method uses a flame to generate the nanoparticle constituents of the material. For lower temperature applications, the team dissolved the two components in a sprayable form.

Associate Professor Antonio Tricoli, head of the Nanotechnology Research Laboratory, said the coating is “able to stabilise very fragile nanomaterials, resulting in ultradurable nanotextures with numerous real-world applications”. For example, he said, “It will keep skyscraper windows clean and prevent the mirror in the bathroom from fogging up.”

In addition to waterproofing, the ability to control the properties of materials could also be applied to a wide range of other coatings, according to Wong. “A lot of the functional coatings today are very weak,” he said, “but we will be able to apply the same principles to make robust coatings that are, for example, anti-corrosive, self-cleaning or oil-repellent.”



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Criminals beware — scientists can now trace gunshot residue to ammunition brand

If you're a criminal with a propensity towards guns, now might be the time to go straight, as Flinders University forensic scientists have reported matching gunshot residue with specific brands of ammunition for the first time.

The scientists, led by Professor Paul Kirkbride, have been conducting ongoing research to detect gunshot residue and then match the glass fragment trace elements and isotopes present with those in bullet cartridges. As Professor Kirkbride told *Lab+Life Scientist* back in 2015, "The isotope fingerprint carries clues as to the particular geographical origin of the minerals that make up the glass."

The team's research has seen them work with some of the most advanced analytical instrumentation in Australia — including a Time-of-Flight Secondary Ion Mass Spectrometer (ToF-SIMS) and a Sensitive High Resolution Ion Microprobe (SHRIMP) — in addition to collaborating with SA Police, Forensic Science SA, ChemCentre WA, the Future Industries Institute, Australian Scientific Instruments and Geoscience Australia. They have now reached a previously unachievable level of detail about gun crimes — with more progress expected soon.

"We've shown matching characteristics in the trace elements and isotopes found in glass fragments in the residue left on the shooter, in the wound and in the specific batch or brand of ammunition," said Professor Kirkbride. This is expected to have massive implications for Australia, as the research is focused on .22 ammunition — the most commonly used ammunition in Australian gun crimes.

"Eventually we hope to provide law enforcement agencies with the ability to identify not only the brand of ammunition, but also the location of manufacture and points of distribution, which all contribute significantly towards identifying the purchaser," Professor Kirkbride concluded.



The UNSW-Ec0.

Australian satellites join global research project

Three Australian research satellites will be deployed to the International Space Station (ISS) later this year, marking the first time an Australian-made satellite has gone into space since 2002.

The launch will take place as part of the global QB50 project, coordinated by Belgium's von Karman Institute for Fluid Dynamics. Involving 28 countries, the project will see 50 lunchbox-sized satellites called 'CubeSats' carry out the most extensive measurements ever undertaken of the region known as the thermosphere, located between 200 and 380 km above Earth.

"This region is poorly understood and hard to measure," said Andrew Dempster, director of Australian Centre for Space Engineering Research (ACSER) at UNSW. "And yet, it's the interface between our planet and space. It's where much of the ultraviolet and X-ray radiation from the sun collides with the Earth, and generates auroras and potential hazards that can affect power grids, communications and GPS receivers."

Australia is the latest partner to join the project, with the Turnbull government authorising the launch of three CubeSats built by Australian universities. The three satellites are ACSER's UNSW-Ec0, which will study the atomic composition of the thermosphere; INSPIRE-2, a joint project between the University of Sydney, UNSW and ANU, which will measure the electron temperature and density of plasma in the region; and SUSat, a joint project between the University of Adelaide and the University of South Australia.

The satellites, which weigh about 2 kg each, are currently being shipped to the Netherlands ahead of a late December launch from the United States to the ISS. They will be deployed from the ISS a month or so after arrival and drift down from the station's orbit of 380 km towards the target region. Each CubeSat will also carry other instruments with which to carry out its own experiments.

"This is the most extensive exploration of the lower thermosphere ever, collecting measurements in the kind of detail never before tried," said Elias Aboutanios, project leader of UNSW-Ec0. "The satellites will operate for 3–9 months — and may last up to a year — orbiting this little-studied region of space, before their orbits decay and they re-enter the atmosphere and burn up."

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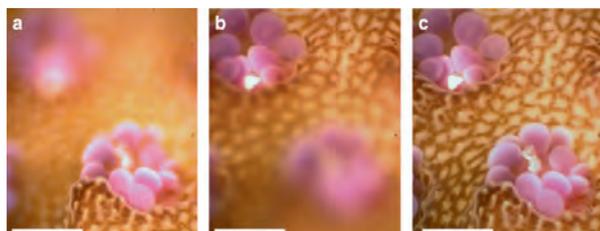


Microscopic imaging under the sea

Attention all marine microorganisms — are you ready for your close-up?

Many important biological processes in the ocean take place at microscopic scales, but when scientists remove organisms from their native habitats to study them in the lab, much of the information and its context are lost. In a quest to overcome this challenge, researchers from Scripps Institution of Oceanography have built a diver-operated underwater microscope to study millimetre-scale processes as they naturally occur on the sea floor.

The Benthic Underwater Microscope (BUM) is a two-part system — an underwater computer with a diver interface tethered to a microscopic imaging unit — to study marine subjects at nearly micron resolution. The instrument has a high magnification lens, a ring of focused LED lights for fast exposures, fluorescence imaging capabilities and a flexible tuneable lens, similar to the human eye, to change focus for viewing structures in 3D.



Images of a live coral acquired in situ with the BUM using an ETL focal scan. Scale bars: 500 μm . Images appear courtesy of the authors under CC BY 4.0

“This underwater microscope is the first instrument to image the sea floor at such small scales,” said PhD student Andrew Mullen, co-lead author of the study. “The system is capable of seeing features as small as single cells underwater.”

The motivation for building the imaging system was to better understand the many ecological processes taking place underwater on a microscopic scale, according to senior author Jules Jaffe. He explained, “To understand the evolution of the dynamic processes taking place in the ocean, we need to observe them at the appropriate scale.”

To test the new technology’s ability to capture small-scale processes taking place underwater, the researchers used the imaging system to view millimetre-sized coral polyps off the coast of Israel in the Red Sea and off Maui, Hawaii. The results were published in the journal *Nature Communications*.

During experiments in the Red Sea, the researchers set up the BUM to capture the interactions of two corals of different species placed close to each other. The images revealed microscale processes in which corals emit string-like filaments that secrete enzymes from their stomach cavity to wage a chemical turf battle to destroy the tissue of other species in a competition for sea-floor space. Yet when the researchers placed corals of the same species next to each other, they did not eject these gastric fluids.

“They can recognise friend versus foe,” explained Mullen.

The researchers also captured video of neighbouring individual polyps on a single coral colony taking turns embracing one another, an unknown phenomenon the researchers call coral polyp ‘kissing’.

Next, the researchers deployed the instrument off Maui following one of the largest coral-bleaching events on record, which occurs when single-celled algae that live inside the coral polyp eject themselves during high ocean temperature events. Recently bleached corals are still alive, but in their weakened state can be rapidly invaded and overgrown by filamentous turf algae.

Using the microscope, the research team observed a previously unreported honeycomb pattern of initial algal colonisation and growth in areas between the individual coral polyps during coral bleaching. These findings provide insight into a process that marine ecologist Jennifer Smith, a co-author of the study, called the “succession of algae”, where small filamentous algae initially settle on the ridges between coral polyps and eventually smother the living tissue. The images showed that algae are able to actively overgrow living corals during a bleaching event.

Jaffe and Mullen are now preparing the instrument to take pictures of microscopic particles in the water near the coral’s surface to study how the flow of water over corals allows them to exchange the necessary gases to breathe.

Moisture analysers



Adam Equipment has expanded its line of PMB moisture analysers, with the PMB 163 offering a capacity of 160 g and readability of 0.01%/0.001 g. The product joins the PMB 53, which has a capacity of 50 g and provides results at 0.01%/0.001 g, and the PMB 202, which offers a capacity of 200 g and provides results at 0.05%/0.01 g.

Moisture analysers allow scientists, researchers and technicians to rapidly dry samples, saving testing time in the laboratory and the field. With simple operation and quick response time, PMB moisture analysers are suitable for use in food processing and quality control, providing an easy way to verify the moisture content in foods and helping production workers assess contents of mixtures and batches.

The PMB's automatic test-setting function enables easy recall for frequent testing of the same items without additional user programming. USB and RS232 interfaces provide speedy connectivity, while a second USB port allows storage of test programs and data on a flash drive. The moisture analysers are self-contained, needing neither additional software nor a network connection for readings. Users can collect data on a production floor or anywhere power is available.

A 400 W halogen bulb heats samples in 1°C selectable increments. Three heating options allow test methods and temperatures to be customised for different materials. The product offers rugged metal housing, automatic external calibration, capacity tracker and a levelling bubble. A pan lifter is included to easily remove samples.

Adam Equipment (SE ASIA) Pty Ltd
www.adamequipment.com.au



DC motor

The 2668 ... CR DC motor from FAULHABER is claimed to offer more power than comparable drives and to be the most powerful copper-graphite commutated DC micromotor in its size class on the market.

Due to a bigger NdFeB magnet and a high copper content in the winding, it supplies a rated torque of 70 mNm. As a result, it weighs just 189 g with a diameter of 26 mm. Furthermore, it reaches full power quickly with its high pulse torque. The product is thus well suited to professional high-performance tools such as pruning shears or motorised screwdrivers.

The copper-graphite brushes of the motor are characterised by their high stability and low wear. The housing is made of coated steel. The motor can be combined with high-resolution optical or magnetic encoders. As well as handheld devices, it is also suitable for many other applications, such as aerospace, robotics, medical technology, special machinery construction, metering systems and automation solutions.

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Disposable tips for liquid handling

Tecan's updated range of 10 µL LiHa disposable tips will improve labware access on Fluent and Freedom EVO workstations. The redesigned tips are 3.6 mm longer and have been developed to improve access to PCR plates and common 384-well microplate formats, helping to minimise dead volumes and waste of precious samples and reagents.

Suitable for genomics applications — such as next-generation sequencing and human identification (HID) — the tips are available in both Tecan Pure and Tecan Sterile purity levels, with a choice of both filtered and non-filtered options. They are available in both standard trays and SLAS formats, offering users more choice in terms of deck set-up, storage options and nested options and thus maximising on-deck capacities and walkaway times.

The redesigned tip is optimised for applications requiring high-throughput and low-volume pipetting. Offering sterile tip purity and a range of storage options gives users more choice in how they automate their protocols, helping to streamline laboratory workflows and maximise return on investment.

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Open source: the future of malaria medicines

Malaria is one of the leading causes of mortality in developing countries. There were an estimated 214 million cases of malaria in 2015, including around 438,000 deaths of which many were young children.

To help tackle this major health problem, a unique 'open source' study led by researchers at the University of Sydney has established a collaborative patent-free environment that is expected to accelerate the development of new malaria treatments.

The study, based on over 13,500 potential drug molecules released into the public domain by GSK, involved more than 50 researchers from eight countries. An 'open source' model — often used in the development of computer software — brought together this group of dedicated scientists who all agreed to refrain from seeking patents to protect their contribution.

Professor Matthew Todd*, from the University of Sydney, believes that reversing the tide on malaria requires the pooling of resources combined with bringing together the experience and expertise of scientists from different backgrounds and specialties. In recent years Professor Todd has worked closely with the Tres Cantos Open Lab Foundation, which gives independent researchers access to GSK resources, expertise and facilities to help research into diseases of the developing world.

"Open source is a radically different

approach to medical research that is likely to accelerate the discovery and development of new treatments. Tres Cantos gave us existing data on malaria, which really helped as a starting point and gave us a head start. Our new data is now available to other researchers, which encourages debate among the scientific community and lays the groundwork for future studies," said Professor Todd.

In 2012, GSK deposited thousands of drug structures into the public domain, along with the associated pharmacological data. The move marked the first large-scale public release of such structures by a pharmaceutical company.

"Medical researchers want to work with the best people, the latest equipment and the largest collection of good compounds. Using an open source model, we have been able to access expertise, knowledge and equipment that we wouldn't normally have access to, which is very valuable to our research," said Professor Todd.

Dr Andrew Weekes, medical director at GSK Australia, believes open source innovation will increase in popularity as more pharmaceutical companies adopt the model.

"The use of open source models in medicine is now a reality that the scientific community is embracing. There is a growing consensus that an open source approach, with greater collaboration and transparency between the pharmaceutical industry and independent researchers, is the key to tackling diseases of the developing world," said Dr Weekes.

While it's still too early to evaluate the success of the Tres Cantos Open Lab Foundation in terms of drug approvals, this new approach has encouraged research into diseases of the developing world. There is profound anticipation that the open source ways of working could herald a new age of research and development.

**Professor Matthew Todd's research into malaria is being funded by the Australian Research Council and Medicines for Malaria, based in Geneva. He received an Open Lab Foundation grant for his research towards new medicines for tuberculosis.*



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Rotational rheometers

The Malvern Kinexus is a rotational rheometer that helps define material characteristics from viscosity to viscoelasticity. It offers high-specification air bearing and wide torque range measurement with good vertical (axial) control capabilities for rheological testing.

Sequence-driven rSpace software enables fully customisable test design and SOP operation for total flexibility. The rheometer is said to provide greater understanding of flow and deformation behaviour compared to viscometers by enabling several key benefits.

The rheometer uses a low-friction air bearing that enables measurement of even low-viscosity samples and solids. A complete range of rheological tests can be performed with full control of sample strain history.

The rheometers make it possible to gather more relevant yield stress data than can be measured using a viscometer, thereby supporting faster, more effective formulation. Unlike viscometers, the rheometers allow oscillatory testing to probe the viscoelasticity of a sample, providing a microstructural fingerprint that can be used to quantify stability and to refine critical aspects of product performance.

The rheometers make it possible to apply test sequences that directly simulate in-use behaviour to provide valuable data for product optimisation. Precise normal force and gap control makes it possible to measure tack or stickiness and the rheology of samples with high solids fractions.

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Norovirus

cultured in the lab



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Forty-eight years after noroviruses were first identified, US scientists have found a way to grow them in the lab. Their study, published in the journal *Science*, will allow researchers to explore and develop procedures to prevent and treat infection and to better understand norovirus biology.

Norovirus, also known as winter vomiting bug or the cruise ship virus, is the leading cause of illness and outbreaks from contaminated food. Unfortunately, the virus does not grow in laboratory cultures that traditionally support the growth of other viruses, such as transformed cells that are derived from cancerous tissues. In addition, noroviruses are species specific — human noroviruses only infect and cause disease in humans, and mouse noroviruses only do so in mice. Human noroviruses do not grow in mice or other small animal models typically used for research.

“People have been trying to grow norovirus in the lab for a very long time. We tried for the last 20 years,” said senior author Dr Mary Estes from the Baylor College of Medicine. “Despite all the attempts and the success of growing other viruses, it remained a mystery why noroviruses were so hard to work with.”

Dr Estes theorised that scientists had not succeeded at growing noroviruses because they didn’t have the right cell type. She showed that

in patients with chronic norovirus infections, the virus could be detected in intestinal cells called enterocytes, but normal human enterocyte cells rapidly died when put into culture.

“A breakthrough came when we learned that Dr Hans Clevers’ team in the Netherlands had developed a method to make a new type of human intestinal epithelial cell culture system including enterocytes,” Dr Estes said. “These novel, multicellular human cultures, called enteroids, are made from adult intestinal stem cells from patient tissues. We anticipated that putting the virus in these non-transformed human cell cultures would let the virus grow.”

It took Dr Estes and colleagues about one year to get the human intestinal epithelial cultures growing well in the lab. After successfully testing the cultures with another human gastrointestinal virus — rotavirus — they tried with the human norovirus.

“[We] found that some strains would grow, but others wouldn’t,” said Dr Estes. “We suspected that still something was missing.”

The researchers tried to improve the growth of the viruses by adding to the cultures substances that

are naturally present in the upper small intestine, the natural environment where the virus grows. Other intestinal viruses use these substances to grow inside the body.

“The human body responds to food by secreting enzymes from the pancreas and bile from the liver into the small intestine,” explained co-author Dr David Y Graham. “Pancreatic enzymes digest the large molecules and bile solubilises fats.

“Viruses that cause gastroenteritis, such as rotavirus, utilise pancreatic enzymes to trigger their replication, but these enzymes had no effect on norovirus. We asked, if pancreatic enzymes were not important, was bile a key component allowing the virus to recognise where it was and replicate?”

The answer was a big fat yes, with Dr Estes saying, “When we added bile to the cultures, norovirus strains that didn’t grow before now grew in large numbers.

“We finally solved the 48-year-old mystery. We were able to grow norovirus in cultures that mimic the intestinal environment, where the virus naturally grows, by adding bile to the cultures. Bile is critical for several important bacterial pathogens,

“When we added bile to the cultures, norovirus strains that didn’t grow before now grew in large numbers.”

but this is the first time it’s been shown that bile is important for the replication of human intestinal viruses.”

The researchers anticipate that these cultures will allow them to answer important questions, such as why one strain of norovirus infects one person but not another. As Dr Estes explained, “Each culture is unique and reflects the genetics of the individual from whom the culture was established.

“This allowed us to show that some cultures, like some people, are susceptible to only one or to several human norovirus strains. These cultures will allow us to determine the mechanisms that

restrict replication in some people but not others.”

This is the first example where human intestinal epithelial cultures have been used to cultivate a non-cultivable agent — and Dr Estes believes that it won’t be the last.

“I predict this new culture system, changing certain conditions, will allow for the cultivation of other viruses or bacteria that we cannot grow at the moment,” she said. “If we succeed, it will help us develop effective methods to prevent and treat infection, test vaccines, interrupt transmission and better understand how these microbes infect people, respond to bodily defences and evolve.”

Mass spectrometers



The 6500+ Series LC-MS/MS systems, from SCIEX, feature IonDrive technology with an enhanced high energy detector and SelexION+ technology. The platform is the culmination of years of research and development in improving sensitivity, accelerating throughput and enhancing data quality.

IonDrive technology simultaneously targets enhancements in the series, ruggedly driving performance improvements and sensitivity in three key components of the system: the production of more ions with the optimally designed IonDrive Turbo V source; the capture and transmission of more ions with the IonDrive QJet guide; and the detection of more ions with the enhanced IonDrive High Energy Detector+.

The enhanced robustness, and up to six orders of dynamic range, increases the breadth of applications possible with the device. From small molecules to large molecules, and across polarities, the series delivers sensitive quantitative results without compromise. Furthermore, the enhanced SelexION+ is said to deliver the added selectivity needed without compromising LLOQs.

Driven by Linear Accelerator Trap technology, the QTRAP 6500+ system enables enhanced MS/MS workflows even with UHPLC approaches. For complex samples, the selectivity of the MRM³ workflow enhances data quality while reducing the need for added sample preparation.

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AbraMag Magnetic Beads from Abraxis are super-paramagnetic, non-aggregating iron oxide particles (or ‘microspheres’) for sample prep or for capturing/purifying targets such as proteins, antibodies, DNA/RNA and *E. coli*. AbraMag’s design enables fast-binding kinetics, with high sensitivity and selectivity, in both manual and automated biomedical and research applications.

The beads are said to have multiple advantages over conventional methods (eg, columns, centrifugation), including better performance, yield and purity, with a high binding capacity for rapid and efficient target purification. The stable, preblocked particles provide clean purification even from complex samples.

The company can modify or create the particles to suit the user’s needs.

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Automating the blood stock supply chain



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InterSystems has announced an agreement to interface TrakCare, its unified healthcare information system, to the Australian National Blood Authority's (NBA) BloodNet ordering and inventory management system, thus automating the ordering and distribution of blood products to TrakCare Lab users.

The NBA manages and coordinates the supply of blood products and services on behalf of the Australian federal, state and territory governments. Through the web-based system BloodNet, approved healthcare providers can order blood and blood products from suppliers such as the Australian Red Cross Blood Service via a laboratory information system (LIS) interfaced to BloodNet. LIS interfaces enable real-time exchange of critical blood stock information, promoting efficiencies in Australia's \$1.1 billion blood products supply chain and improving emergency response capabilities.

InterSystems will implement the BloodNet interface with TrakCare Lab customers, including the Northern Territory Department of Health, St John of God Health Care, St Vincent's Hospital in Sydney and Melbourne, Launceston General Hospital and others over time. Together, these health services consume around 8% of Australia's blood products.

Interfaced healthcare services also receive information such as phenotype strings, allowing blood products to be electronically matched to patients without manually searching bag labels, according to NBA Chief Information Officer Peter O'Halloran. They can also access executive dashboards and business intelligence services to optimise their inventory levels.

InterSystems will include the BloodNet interface in its TrakCare Lab LIS product as well as its TrakCare Lab Enterprise laboratory business management system, released in April this year. Under the NBA contract, InterSystems will continue to update the interface to support ongoing BloodNet enhancements.

TrakCare and other LIS BloodNet interfaces over the next two years are expected to realise annual savings of \$18.1 million through reduced wastage and expenditure on blood and immunoglobulin products. They also benefit hospital or pathology services — significantly reducing time spent double-keying information and virtually eliminating data transcription errors — with annual savings of \$1.85 million in staff time expected.

"With input from the TrakCare interface, we will be rolling out digital dashboards that will provide real-time information about orders and stock levels," said O'Halloran. "They will also highlight short expiry units — for example, a bag with only five hours of shelf life — so they can be used in time. When a blood donor shares that gift of life, we want to ensure it gets used by a patient rather than getting lost in administrative oversights or inefficiencies."

"InterSystems is proud to be working alongside an innovative organisation like the National Blood Authority," said Simon Gatward, InterSystems Country Manager for Australia and New Zealand. "The BloodNet interface will promote efficiencies within the healthcare system and improved patient outcomes."

InterSystems Corporation (Australia)
www.intersystems.com.au

Rapid and thorough DNA, RNA and protein extraction

The FastPrep-24 5G high-speed benchtop homogeniser is an ultrahigh-performance sample preparation system that allows for the extraction of fully intact, biologically functional macromolecules from routine as well as highly resistant samples.

Promo code: LabLS

The high-speed benchtop homogeniser can be used for grinding, lysing or homogenising - facilitating the easy and reproducible isolation of stable RNA, active proteins and full-length genomic DNA. Applications include but are not limited to all types of human, animal and plant tissues including cultured cells; bacterial, yeast and fungal cells, including spores and oocytes; environmental and metagenomic samples including soil and faecal samples; and other inorganic solid matrices.

The intuitive software, microprocessor control and high-definition touch screen programming features in the FastPrep-24 5G ensure that optimisation time is minimised so users have more time to analyse data.

The FastPrep-24 5G uses a unique, optimised motion to disrupt cells through the multidirectional, simultaneous beating of specialised Lysing Matrix beads on the sample material. Samples and buffers are added to Lysing Matrix Tubes containing the beads, supplied ready to use, certified nuclease-free and in a variety of sample type specific compositions.

The instrument lyses thoroughly and quickly any tissues and cells and thus allows easy and reproducible isolation of stable RNA, active proteins and full-length genomic DNA.

The sample tubes remain securely sealed during the processing and the single-use design eliminates cross-contamination. Program parameters are easily set using the touch screen user interface, or users can choose from the 70-plus recommended programs, user-defined saved programs or user-defined custom programs stored on the 5G's onboard computer.

The recommended programs are the heart of the 5G's functionality. These validated programs include all variable assay parameters. This is a valuable optimisation tool for new users and is of special interest to those who are working with pathogenic or dangerous samples, as well as low abundance samples.

FastPrep will homogenise up to 24 samples in 2 mL tubes or, with optional adapters, lyse 48 samples in 2 mL tubes, 24 samples in 4.5 mL tubes, 12 samples in 15 mL tubes or 2 samples in 50 mL tubes making FastPrep a particularly versatile homogeniser. Developed for difficult and resistant samples, FastPrep-24 thoroughly and quickly lyses all tissues and cells providing easy and reproducible isolation of stable RNA, active proteins and full-length genomic DNA.

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The NextGen Sample Prep delivers the most DNA, RNA and proteins from the most resistant samples in 40 seconds or less.



Laboratory cooler



The HTS-PS1 from Huber Kältemaschinenbau is a compact cooler for the laboratory. Typical applications include the removal of process heat or temperature control for pipetting elements and bioreactors.

The air-water cooler does not include an active refrigeration unit. Instead, it uses a circulating cycle of cooling water in the form of a heat exchanger. Since there is no compressor, the device requires no maintenance, is quiet and is easy to install.

The device offers a cooling power of up to 0.8 kW, depending on the temperature difference between the environment and return temperature. The circulating pump reaches a pumped capacity of up to 8 L/min and a pressure output of 0.2 bar. The product can be operated over a temperature range of 5 to 80°C.

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Pipetting robot

Normalising DNA or protein sample concentrations can be a time-consuming, laborious and potentially error-prone task. With the Andrew Alliance pipetting robot and Andrew Lab software, users need never normalise by hand again.

With just a few clicks in Andrew Lab software, complex normalisations can be completed with ease. Just press play, walk away and allow Andrew the pipetting robot to complete all normalisations.

The product can improve both process and quality of results in concentration-critical applications. Automating normalisations becomes easy and accessible to scientists who may not be accustomed to using automation.

The Andrew pipetting system weighs less than 10 kg, has a small footprint and is compatible with over 100 different consumables. With up to 13 deck positions, it can be used in hoods and cold rooms.

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Corrosive cabinets

Award Plastics & Displays is a manufacturer of many product lines, including a health and safety range. The range can be used in many sites, such as schools, offices, industrial sites and labs.

The company's corrosive cabinets are made from chemical-resistant, industrial-grade PVC, unlike other cabinets which are made from steel and therefore corrode when corrosive chemicals spill. The corrosive cabinets are also said to be lighter for easier installation.

The range consists of small cabinets such as the 40 L, which can be wall-hung in confined spaces, and two larger sizes, which can fit under a standard-height bench. A test tube drying rack made from the same material is also available.

Award Plastics Ltd

www.awardplastics.co.nz

Environmental monitoring system

The Vaisala viewLinc Environmental Monitoring System has been redesigned to offer long-range wireless communication, ease of use and fast deployment. The system is suitable for monitoring high-value assets that are affected by environmental conditions, such as air temperature or humidity. It is used in pharmaceuticals, museums, galleries and IT server rooms.

The product provides trends, alarming and customisable reporting that ensure environmental information via a wide selection of Vaisala devices that monitor temperature, humidity, CO₂ and other variables. For GxP compliance, validation documents are available. The updated system leverages cutting-edge wireless communications capabilities in order to utilise logging devices that communicate even in obstructed environments.

Vaisala licensed a long-range wireless specification to create VaiNet, a wireless technology for viewLinc. The signal strength between network access points and data loggers can travel over 100 m indoors. It is not affected by walls, equipment, Wi-Fi networks or other usual signal impediments.

The company has simplified and automated various functions, eliminated or improved aspects of system deployment that were time-consuming or complex, and updated the software interface with embedded help to guide users through common tasks. The result is a monitoring system that can be installed in minutes, maintains compliance for years and eliminates issues related to wireless data logging.

Vaisala Oyj

www.vaisala.com/en/

Sample management software

Ziath is launching major updates to its sample tracking software 'Samples'. The updates will allow for the improved importing of large legacy data files, the enhancement of the audit trail for individual samples and improvements to the search facility for sample retrieval.

Due to the number of laboratories that have large repositories of legacy samples already in place, the software now has an improved function for the importing of large amounts of legacy data which can then be searched for and retrieved in the database, even if the samples do not have barcodes. This means that samples that are already in storage can be incorporated into newly implemented databases.

In addition, the product now has an improved audit trail for individual tubes, which means users can more easily obtain information that relates to single sample tubes, including their location and the user that handled them last. This allows all users of the software to keep tabs on who has been using particular samples and in what time frame.

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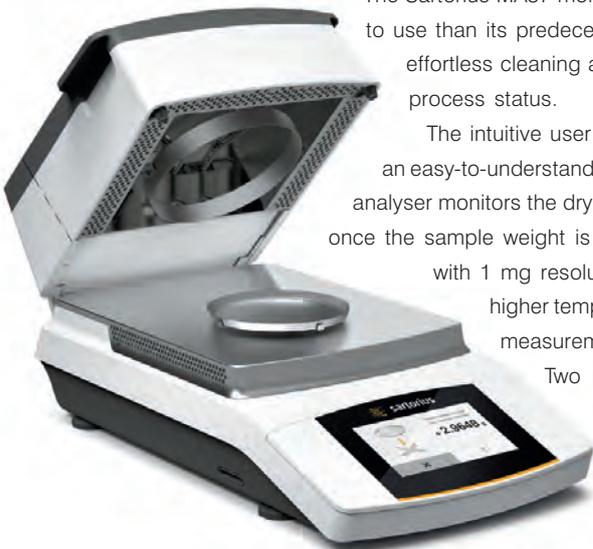
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Moisture analyser



The Sartorius MA37 moisture analyser works faster and is easier to use than its predecessor. The BetterClean design allows for effortless cleaning and the status light indicates the current process status.

The intuitive user interface, featuring a touch screen and an easy-to-understand menu, simplifies operation. The moisture analyser monitors the drying process and stops the measurement once the sample weight is constant. The built-in weighing system with 1 mg resolution is specifically optimised for use in higher temperature ranges and delivers the required measurement accuracy.

Two powerful metal tube heating elements heat the samples. These heating elements are fast, rugged and durable. Compared to glass heating lamps, eg, infrared lamps or halogen heaters, they are especially resistant to dirt and vibrations.

The product has a compact footprint and is suitable for daily recurring moisture analysis tasks, such as in production or incoming goods inspection.

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

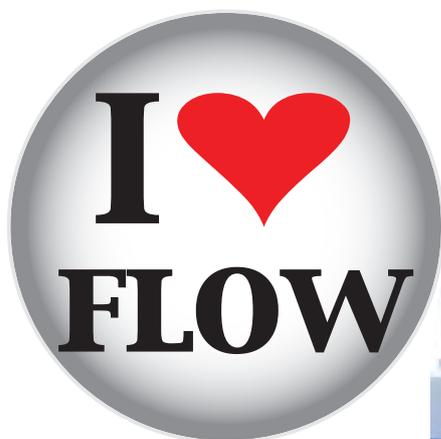
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High-content imaging system

The ImageXpress Micro Confocal High-Content Imaging System, from Molecular Devices, enables the capture of publication-grade images with a wide range of objective lenses. It allows users to work at the resolution appropriate for their biology — including whole organism, thick tissues, 3D spheroid assays, and cellular or intracellular events — at the speed expected from wide-field screening.

The system is said to capture high-quality images without sacrificing throughput or flexibility. Users can quickly and easily switch between confocal and wide-field imaging modes to satisfy the specific throughput and sensitivity needs for their assay. They can also choose from a range of available confocal disk geometries to select the best fit for their experiments.

Combined with MetaXpress High-Content Image Acquisition and Analysis Software, the system provides a complete multidimensional, high-throughput screening solution.

Bio-Strategy Pty Ltd
www.bio-strategy.com

Particle size measurement system

Size measurements of aerosols, spray particles and droplets are important for a range of applications, from the delivery of drugs to the human respiratory system through to the application of coatings, agrochemicals and fuel injection systems. Reproducible spray size analysis allows for the process of improving product performance and formulation control. However, sprays present challenges, either in terms of the environment within which measurements have to be made or the speed of the event which must be characterised.

The Malvern Spraytec has been specifically designed to deliver precise aerosol and spray particle size analysis from an easy-to-use platform. Real-time, high-speed measurements ensure the complete characterisation of both pulsed and continuous spray events. Measurements are achieved over a wide size range (0.1–2000 μm), providing high sensitivity to changes in the spray size distribution.

Multiple scattering analysis ensures measurements can be made at high spray concentrations up to 98% obscuration, far beyond the range of operation of traditional laser diffraction systems. Extensive size distribution data is generated rapidly and presented in a form that allows for an instant understanding of the evolution of the spray over time.

ATA Scientific Pty Ltd
www.atascientific.com.au



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All-in-one biologics prediction platform

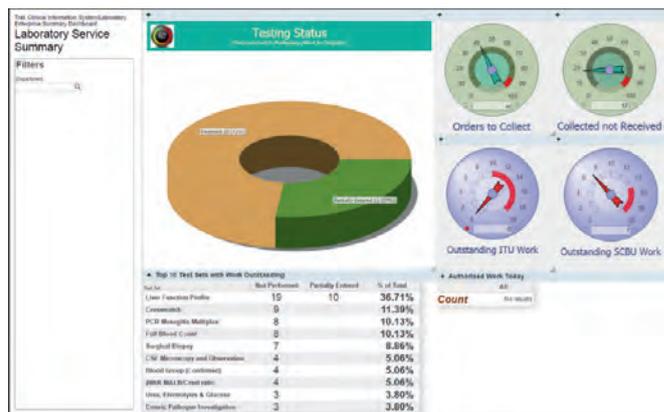
UNcle is an all-in-one biologics stability platform from UNchained Labs. The system combines the power of three detection methods: full-spectrum fluorescence, static light scattering and dynamic light scattering.

Users can choose to run all three scans or just the ones they want. Since the product is label-free, dyes do not need to be added. The system detects aggregation at two wavelengths, so users can easily identify both small and large aggregates.

The compact system uses just 9 µL of sample and can do 48 samples per run, saving time and money. The label-free detection system provides all the information required: thermal (melting, stability, recovery, aggregation), sizing, polydispersity, B22, kD and viscosity. Choosing the best formulation or protein construct thus becomes easier.

Other UNchained Labs products includes the pUNk (DLS with high sensitivity), the hUNk (aggregation predictor), the UNit (protein stability) and the GRUNT (biologics formulation prep).

AXT Pty Ltd
www.axt.com.au



Laboratory business management system

InterSystems has announced the release of its laboratory business management system, TrakCare Lab Enterprise. The product is a key module within the InterSystems TrakCare unified healthcare information system. It is also available as a standalone system.

The system is designed to help users transform from a reactive testing and results service — typically supported by a traditional data and analytical management solution — to a data-driven organisation capable of meeting the increased expectations for a modern pathology service.

While supporting a modern clinical laboratory's business practices, the product is also designed to streamline operations by reducing turnaround times for repetitive tasks, including capturing required data and delivering feedback on results and performance. It provides ERP-like visibility, control and accountability over the entire testing process.

Built on a health informatics platform, the system enables organisations to capture, share, understand and act on data for improved operational decision-making. It also simplifies administration and supports effective and responsive planning for the future.

Intersystems Corporation (Australia)
www.intersystems.com.au

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Supersonic technology enables low-emission magnesium

CSIRO has partnered with Canadian chemicals company Enirgi Group in a move to develop and commercialise an affordable and efficient technology for producing magnesium — a metal that is in rising demand from car manufacturers looking to make lightweight, low-emission vehicles.

The technology, known as MagSonic, uses carbothermal reduction and a supersonic nozzle to produce the high-quality magnesium. It is likely to produce magnesium almost twice as efficiently as today's conventional process and could reduce greenhouse gas emissions from production by 50–85%, depending on the electricity source.

The method involves heating magnesia with carbon to extreme temperatures (above 1700°C) to produce magnesium vapour and carbon monoxide. The vapour and carbon monoxide are passed through a supersonic nozzle — similar to a rocket engine — at four times the speed of sound to cool the gases in milliseconds, preventing the re-oxidation of the magnesium.

The magnesium condenses, much like the steam from a kettle forming droplets of metal. At this point the droplets, still moving faster than the speed of sound, continue to cool, travelling through a series of sonic shocks as they slow down. They soon freeze into metal powder particles that travel

into a large chamber, which gives them time to completely cool and solidify.

From this chamber the mixture of powder and cooled gas is drawn towards a cyclone. A swirling motion separates the powder, which travels downward in a spiral, while the gases are removed. The cool, solid magnesium powder is collected at the bottom of this cyclone, before being purified and cast into slabs.

CSIRO and Enirgi Group's Innovation Division will work together to further develop and validate the MagSonic technology. Once it is ready for commercialisation, Enirgi Group has the option to take up an exclusive global licence that would see the company initially build a commercial-scale magnesium production facility in Australia.

"We are pleased to be working with CSIRO on this exciting opportunity to bring reliable supply of magnesium metal to the global market in an environmentally sustainable way," said Enirgi Group's vice president of corporate development, Anthony Deal.

"We are confident that this process is capable of commercial production.

"The flow-through benefits to emerging industries like electric vehicle manufacturing are enormous, not to mention a substantial reduction in carbon emissions when compared to current magnesium production processes."

Dr Mark Cooksey, who leads CSIRO's sustainable process engineering group, added that commercialisation would help take advantage of Australia's abundant reserves of magnesite ore that remain largely untapped.

"The growth of magnesium use has been limited because it's been too expensive and labour-intensive to produce the metal from ore using traditional processes," Dr Cooksey said.

"Our MagSonic technology offers an economically viable solution to overcome these issues and make clean magnesium more available and affordable to manufacturers."

CSIRO - Manufacturing, Materials and Minerals
www.csiro.au

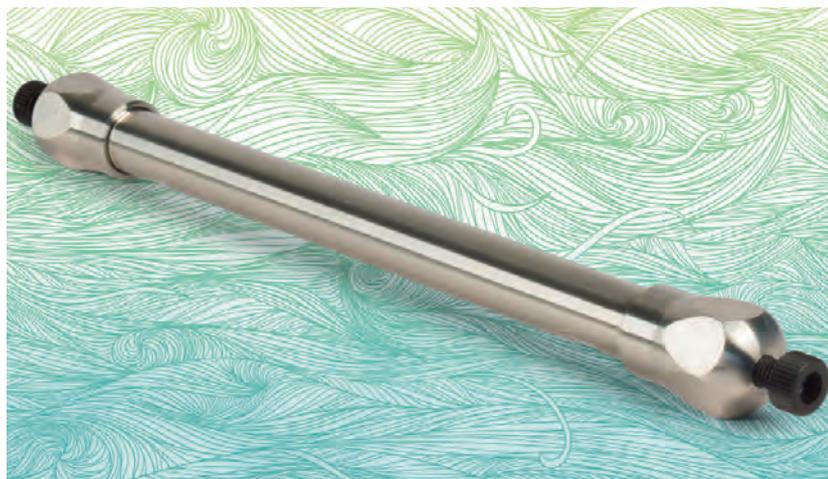
UHPLC size-exclusion column

Phenomenex introduces the Yarra SEC-X300 — a high-resolution gel filtration/aqueous size-exclusion column for the separation of high molecular weight (HMW) biomolecules on HPLC and UHPLC systems. With a wide separation range of 10 K to 700 KDa and high efficiency, the product is suitable for separating and characterising monoclonal antibody (mAb) aggregates, antibody drug conjugates (ADCs) and biosimilars in drug discovery and development research.

The HMW focus of the device complements the low molecular weight range (1 K–450 KDa) of the existing SEC-X150 column, providing two versatile separation tools for biopharmaceutical research. The Yarra surface chemistry, combined with bio-inert column hardware, is said to reduce sample adsorption compared to other GFC/SEC columns currently on the market, providing improved recovery and more accurate quantitation of biomolecules. The SEC-X150 and -X300 media are both now available in 150 and 300 mm column lengths for analytical flexibility to increase speed or further increase resolution.

Because the 1.8 µm SEC-X150 and -X300 columns typically operate at backpressures below 3500 psi on traditional HPLC and UHPLC systems, they can deliver improved performance (greater resolution, better peak shape and faster analysis time) compared to existing 3 and 5 µm GFC/SEC column methods. They are designed and manufactured for stability, reproducibility and long product life.

Phenomenex Australia
www.phenomenex.com



Non-viral primary T-cell transfection

Lonza has announced its 4D-Nucleofector LV Unit, the latest addition to the 4D-Nucleofector System, which expands non-viral primary T-cell transfection to a closed, larger-scale format. Nucleofector Technology is said to improve on traditional electroporation methods to deliver enhanced transfection efficiencies while using less substrate and with only a moderate impact on cell viability. It is suitable for scientists working with hard-to-transfect cell types, like primary blood cells or stem cells.

The system was designed with the scientist in mind, so transfection protocols established on the existing smaller-scale unit can be smoothly transferred to the large-scale unit without the need for re-optimisation. The fully closed system is also suitable for use in a regulatory environment as it can be controlled by 21 CFR Part 11-compatible software. The addition of this larger-scale transfection format allows scientists to translate the results of their research applications into potential therapeutic applications.

Lonza Australia Pty Ltd
www.lonza.com



Same-day *Alicyclobacillus* test

Alicyclobacillus (ACB) species are bacteria which are resistant to low pH and pasteurisation. They produce off-flavour and aroma compounds that spoil juice products.

Current methods for ACB testing are laborious and require over seven days to yield definitive results. These limitations make it impossible to address these spoilage organisms in real time and can result in facility contamination, product holds or recall of tainted products.

Invisible Sentinel, a molecular solutions company, has partnered with Refresco Gerber, a bottler of juice and soft drinks, to produce and validate a method for rapid detection of ACB.

The test, Veriflow ACB, uses novel PCR technology to provide a simple method which yields qualitative and quantitative results in less than 3 h. The test requires a minimal amount of equipment and hands-on time, meaning the test can be easily used on site.

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

Rotary screw compressors

Kaeser Compressors has launched two additional versions of its CSG-2 series dry compression rotary screw compressors: the CSG-2 T with integrated refrigeration dryer and the CSG-2 RD with integrated i.HOC rotation dryer. The series offers a complete compressed air system package wherever an efficient and dependable source of high-quality and clean compressed air is required.

For applications that require pressure dewpoints to +3°C, the CSG-2 T series screw compressors are available with an integrated refrigeration dryer. All refrigeration dryer components in the series are accessible via the service door on the front of the unit for ease of maintenance and service work.

Where pressure dewpoints below +3°C are required, the CSG-2 RD series screw compressors with an integrated i.HOC rotation dryer can achieve pressure dewpoints as low as -30°C. The hot compressed air from the second compression stage is used to regenerate the desiccant. This heat is essentially available for free, as no additional energy is required to power the drying process.

The rotary dryer's intelligent control ensures dewpoint stability even with fluctuating flow rates and at compressor partial load. When commissioned, the target pressure dewpoint is reached after just one rotation of the drum. As a result, the end user obtains an air dryer with maximum efficiency and lower energy costs.

Kaeser Compressors Australia
www.kaeser.com.au



Going Beyond LIMS Seminar The journey from LIMS to LBMS

The nature of the laboratory business is changing dramatically, with major shifts underway in where, when, and how testing takes place. To survive and thrive, laboratories require a new generation of informatics solutions, designed to manage the lab as an agile, knowledge-driven business in an increasingly interconnected world.

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Join us at the *Going Beyond LIMS* seminar where we will be presenting **TrakCare Lab Enterprise – the world's first Laboratory Business Management System (LBMS).**

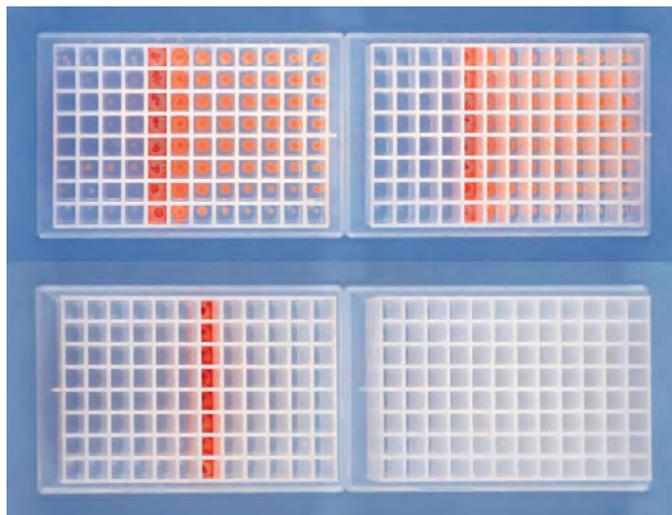
Seminar Dates

Melbourne	25 October 2016
Hobart	27 October 2016
Sydney	2 November 2016

Register now at
InterSystems.com.au/GoingBeyondLIMS
 #BeyondLIMS



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Evaporation technology

Genevac's Dri-Pure technology, available on Series 3 HT, EZ-2 and Rocket Synergy evaporators, enables scientists to rapidly dry their samples without foaming, cross-contamination or loss of sample due to solvent bumping.

The technology works by reducing pressure in the evaporation chamber in combination with an increase in rotor speed to achieve greater g-force and carefully controlling heat flow to the sample during the pressure ramping stage. Embedded in the company's evaporator software and hardware, it works automatically without need for user intervention, eliminating solvent bumping or foaming and enabling controlled 'sample safe' solvent removal in the minimum time.

The technology has been shown to eliminate cross-contamination during parallel evaporation in EZ-2 and HT evaporators. Used on the Rocket Synergy evaporator, it has been more recently demonstrated to prevent foaming often seen in batch evaporation of large volumes such as are generated by natural product extractions.

Combining Dri-Pure with the auto-stop-when-dry capability, Genevac evaporators offer unattended evaporation, enabling scientists to perform other tasks while confident that their samples will be dried without cross-contamination or thermal damage.

Scitek Australia Pty Ltd

www.scitek.com.au

Kartell
Labware division

Kartell Labware Division, established at the end of the 1950s, uses raw materials such as Polypropylene, Polystyrene and Polyethylene to advance laboratory plastics as natural alternatives to glass due to their light weight, high resistance and affordability.

Through its efficient production system together with the most modern technologies Kartell was granted ISO 9001 certification in 1996, acknowledging quality management systems that manufacture products to the highest standards.

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Inverted routine microscope

The Eclipse Ts2 from Nikon is an entry-level inverted microscope with enhanced functionality and ease of use. Its compact design saves valuable space in the laboratory and fits easily inside tissue culture hoods.

Controls are positioned intuitively on the microscope body for easy access. Accessories such as the contrast shield allow users to observe fluorescent samples even in bright laboratory environments.

LED-based diasopic and epi-fluorescence illumination enhances the efficiency and consistency of routine microscopy by eliminating the need for lamp alignment and long warm-up times. The Emboss Contrast technique enables users to easily observe samples on either plastic or glass substrates with high contrast, without requiring optical components.

Coherent Scientific Pty Ltd
www.coherent.com.au



Anaerobic workstations

Ruskin Bugbox anaerobic workstations are designed specifically to help microbiologists cope with rising workloads and provide good primary isolation rates. The product enables users to read plates easily without exposing them to oxygen.

With quick and easy access via the Ezee Sleeve gloveless port system and energy-saving lighting that provides good illumination, the workstation is easy to use. Its compact size meets the needs of even small laboratory spaces. Adjustable temperature and humidity provides a precisely controlled environment that is optimal for cell growth, with no dry spots.

LAF Technologies Pty Ltd

www.laftech.com.au



Data handling software

LabX is a ready-made, configurable system that drives workflow standard operating procedures (SOP) directly through the user's instruments. By installing the software, laboratories wishing to improve results, quality compliance and efficiency through automation can take advantage of the instruments that are often already in the lab.

The system offers an easy-to-use, transparent user experience that addresses the challenges of benchtop automation and integration. It delivers automatic, integrated instrument management and data capture functionalities to improve productivity and efficiency by centring the work on the instrument. It can also be integrated with the lab's core scientific systems, such as electronic laboratory notebooks (ELN) or laboratory information and management systems (LIMS).

The system's touch screen delivers real-time, step-by-step workflow guidance to the user according to the lab's own SOPs. The SOPs are easily configured with the flexible workflow tool that takes advantage of the instrument-specific features present in each model's firmware. The lab's benchtop instruments are easily networked to a PC or server inside or outside the lab hosting the software.

LabX captures full traceability to the instrument, method and analyst performing the work and incorporates full user rights management. A complete log and audit trail of all user and system actions is maintained.

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High-pressure reactor

The HPR-Micro Reactor is a high-pressure reactor for early exploratory research. It is suitable for research, process development and screening applications when reagents, catalysts or other essential materials are expensive or only available in a limited supply. Both green and traditional organic solvents may be used.

The product comes with an Inconel 718 SS reactor vessel, 10, 25 and 50 mL in volume, for operation up to 10,000 psi (689 bar/68.9 MPa) and -40 to 100°C with heating/cooling jackets and Ambient to 180°C with heating mantle. The vessel closure is of the hand-tight type, where no wrenches are needed to make the closure.

The reactor is compact and can fit into a fume hood, but also allows for the removal of the reactor assembly from the stand with associated valving allowing for anaerobic reagent loading in a glove box. It is equipped with a magnetically coupled stir bar for optimal mixing. All high-pressure components conform to ASME code standards and the reactor is protected from accidental overpressurisation by a rupture disc assembly.

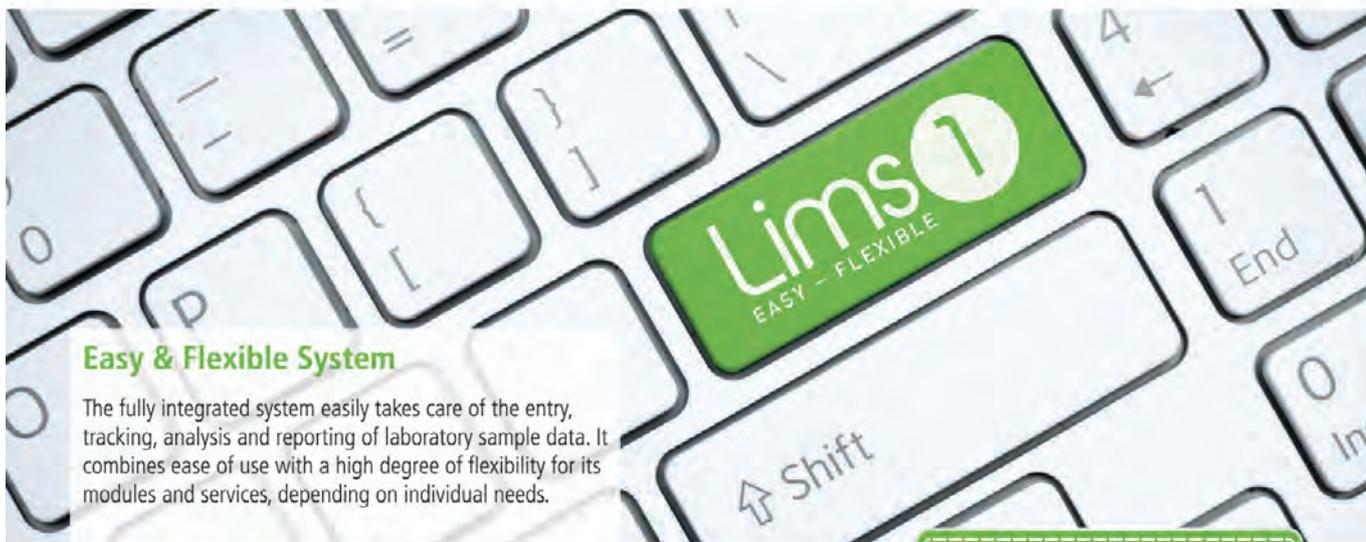
The product is suitable for applications where repetitive use makes convenience a necessity. A few examples include catalytic studies, polymerisation, hydrogenation, oxidation, isomerisation and dehydrogenation. All reactors are supplied as ready-to-use instruments, requiring only utility connections prior to operation.

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Lorne again



Image taken off the Lorne Pier, overlooking the beginning of the Great Ocean Road. Courtesy of BMiCvr (via Flickr) under CC BY-NC-ND 2.0

Get ready for life science conference season

With Lorne conference season just a few months away, Australia's life scientists will be getting ready for a massive two weeks packed with five different events.

Read on to find out how this annual conference series will transform the Victorian coastal town of Lorne into a melting pot of ideas and advances that will be of interest to the life science sector.

The 22nd Annual Lorne Proteomics Symposium: 2–5 February 2017

In 2017, the 22nd Lorne Proteomics Symposium will present the latest developments in proteomics technologies and tools for the interpretation of proteomics outputs and their application toward answering fundamental questions in biology and in clinical and translational medicine.

Featuring a stellar line-up of speakers, the program will not disappoint. Confirmed speakers to date include:

- Professor Bernhard Kuster, Technische Universitaet Muenchen
- Associate Professor Michelle Hill, The University of Queensland
- Associate Professor Vera Ignjatovic, Murdoch Childrens Research Institute
- Professor Dame Carol Robinson, University of Oxford

- Professor Albert Sickmann, Leibniz-Institut für Analytische Wissenschaften
- Professor Zoltan Takats, Imperial College London
- Professor Yu-Ju Chen, Institute of Chemistry, Academia Sinica
- Professor Jennifer Van Eyk, Cedars-Sinai

The meeting will be held at Mantra Lorne, as will all the Lorne conferences. For more information, visit www.australasianproteomics.org.au.

The 42nd Lorne Conference on Protein Structure and Function: 5–8 February 2017

The 42nd Lorne Conference on Protein Structure and Function promises to be a very special meeting with many highlights in the making, including sessions on protein folding, DNA and RNA regulation, emerging technologies and systems biology that will be of interest to many potential sponsors.

Announcements of new discoveries on biologically important and disease-related proteins are almost a daily occurrence lately and the Lorne Proteins meeting is the place to meet those behind the work. For more information, visit www.lorneproteins.org.

The 29th Lorne Cancer Conference: 9–11 February 2017

Past participants will be well aware of the history, ambience and vibrancy of this meeting, which has a strong international and national scientific content and attracts an audience of 500 delegates representing major hospitals, universities, research institutes and biotechnology companies within Australia. A highlight is the Ashley Dunn Oration, which this year will be presented by Professor Lou Staudt, co-chief of the Lymphoid Malignancies Branch in the NCI.

One of the hallmarks is the friendly interaction between the delegates and companies who supply equipment and reagents used in cancer research. This encompasses both techniques relating to diagnosis and treatment, as well as basic research. Chaired by David Vaux, the committee has now permanently expanded the popular poster sessions to both Thursday and Friday nights. For more information, visit www.lornecancer.org.



The 38th Annual Lorne Genome Conference: 12–14 February 2017

The Lorne Genome meeting has a long tradition of hosting some of the world's best researchers in genomics. 2017 will be no different; the organisers are busy preparing the international speaker platform and have some excellent speakers confirmed.

The invited speakers will once again draw national and international delegates to this popular meeting, which has continued to build over the years. The organisers anticipate attracting 350 delegates in 2017. For more information, visit www.lornegenome.org.

7th Lorne Infection and Immunity Conference: 15–7 February 2017

Lorne Infection and Immunity is an international conference dedicated to connecting microbiology and immunology, particularly in host-pathogen interactions, innate and adaptive immunity, and infectious and inflammatory diseases. Presentations focus on discovery science as well as the clinical and translational aspects of these disciplines.

The seventh annual meeting in 2017 features a broad international speaker line-up including Sonja Best, Caroline Demangel, George Gao, Nancy Haigwood, Marion Pepper, Bali Pulendran, Thierry Soldati and Dominique Soldati-Favre. Complimentary student registrations (one per registered lab head) are again on offer in 2017, as well as more opportunities for early-career researchers and students to speak at the meeting — and more prizes! For more information, visit www.lorneinfectionimmunity.org.

ASN Pty Ltd

www.asnevents.net.au



Automation-ready blowdown evaporator

The Ultravap Levante from Porvair Sciences is a nitrogen blowdown evaporator that comes with an RS232 connection and a remote command set, enabling it to connect to and be operated from most robotic liquid handling systems. The automation-ready microplate evaporator is suitable for laboratories that may wish to automate their sample dry-down bottleneck in the future.

The product includes full-colour touchscreen graphic displays, an integrated auto-ranging power supply and built-in solvent fume venting. Combined with real-time run displays showing actual gas temperature, gas flow rate and stage height, it puts user in full control of their evaporation protocols. Offering multistep ramped programming with full alphanumeric program naming, the unit offers the capability to automatically handle even complex evaporation protocols effortlessly.

Designed around a standard ANSI/SLAS plate 'nest'

to accept most microplate formats and tube racks, the evaporator can accommodate tubes up to 80 mm in height in a variety of configurations to allow the use of 2-dram vials, 1.5 mL HPLC vials, barcoded tubes in racks and many other common formats. Evaporator heads are made to match these formats in 24-, 48-, 96- and 384-well configurations. The company's 96-well spiral needle head, which creates a vortex in certain plates to speed up evaporation, can also be used.

The product can be operated from an in-house supply of nitrogen/clean dry air or from a gas cylinder. The blowdown technique employed by the device has been adopted by labs worldwide for removing chromatography solvents such as dichloromethane, acetonitrile methanol and hexane.

BMG LabTech Pty Ltd
www.bmglabtech.com

β -Lactamase plate

MERLIN's β -Lactamase plate is now available with Temocillin for the detection of OXA-48 type-D carbapenemases of Enterobacteria. The company has modified the layout of the MICRONAUT-S plate for the detection of β -Lactamases according to the latest EUCAST recommendations.

The Meropenem- and Ertapenem-Screen were designed for a more sensitive detection of low-level carbapenem resistance of Enterobacteria, whereas the configuration of Temocillin was made for the detection of OXA-48 type-D carbapenemases of Enterobacteria.

Dutec Diagnostics Pty Ltd
www.dutecdiagnostics.net.au

Spectrophotometers

Biochrom has announced the release of two additional products to the WPA visible spectrophotometer range — the WPA S800+ and S1200+ spectrophotometers.

The spectrophotometers are suitable for student use in busy teaching laboratories. Both are compact, lightweight and ergonomically designed. They also each include a large display that is easy to read and a simple user interface for rapid set-up and analysis.

The WPA S800+ is an entry-level visible spectrophotometer for labs performing basic spectroscopy measurements. It performs single-wavelength measurements of absorbance, % transmission and concentration, and has the ability to perform simple kinetics. The WPA S1200+ builds on the features of the S800+ with the addition of multiwavelength measurements and life science methods that include BCA, Bradford, Biuret and Lowry.

Both instruments accept standard 10 mm pathlength glass or disposable cuvettes. An optional test tube cell holder is available for test tubes that are between 10 and 18 mm in diameter. A heated cell holder is also available for thermostatted measurements at 37°C. The cell holders are easy to remove and install making cleaning and decontamination simple.

Additional features include: a wide wavelength range of 325–1100 nm; the option to save data to a USB memory stick for further analysis; and the ability to name samples for easy identification during the experiment.

Pacific Laboratory Products

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VAISALA



Relative humidity probe

The HygroSmart HS3 probe from Michell Instruments has been designed to withstand the kind of harsh and demanding conditions found in industrial processes. Unlike many 'disposable' probes that have a short life within harsh conditions before needing to be replaced, the HygroSmart HS3 sensor uses Michell's polymer tile to give long-term measurements. It has an accuracy of 0.8%RH, allowing for long recalibration periods.

The product consists of a solid, corrosion-resistant probe body with an interchangeable sensor. When recalibration is due, the old sensor is simply exchanged for a freshly calibrated one. This procedure takes only a few seconds to carry out with the probe itself remaining installed. Replacing just the sensor, rather than the whole probe, saves users money over the lifetime of the probe.

In most industrial applications, RH probes have to withstand vibration, exposure to water, occasional heavy shocks and high levels of electrical interference. The sensor's body is designed to cope with all these environmental factors. As well as the solid body, the probe also has a 10 bar pressure rating, RFI/EMC electrical noise approvals and IP67 ingress protection rating.

As well as its ability to withstand harsh process conditions, the probe gives control to the user, as it is 100% configurable. This gives users the ability to alter their RH and temperature measurements to keep step with changes or developments in their process.

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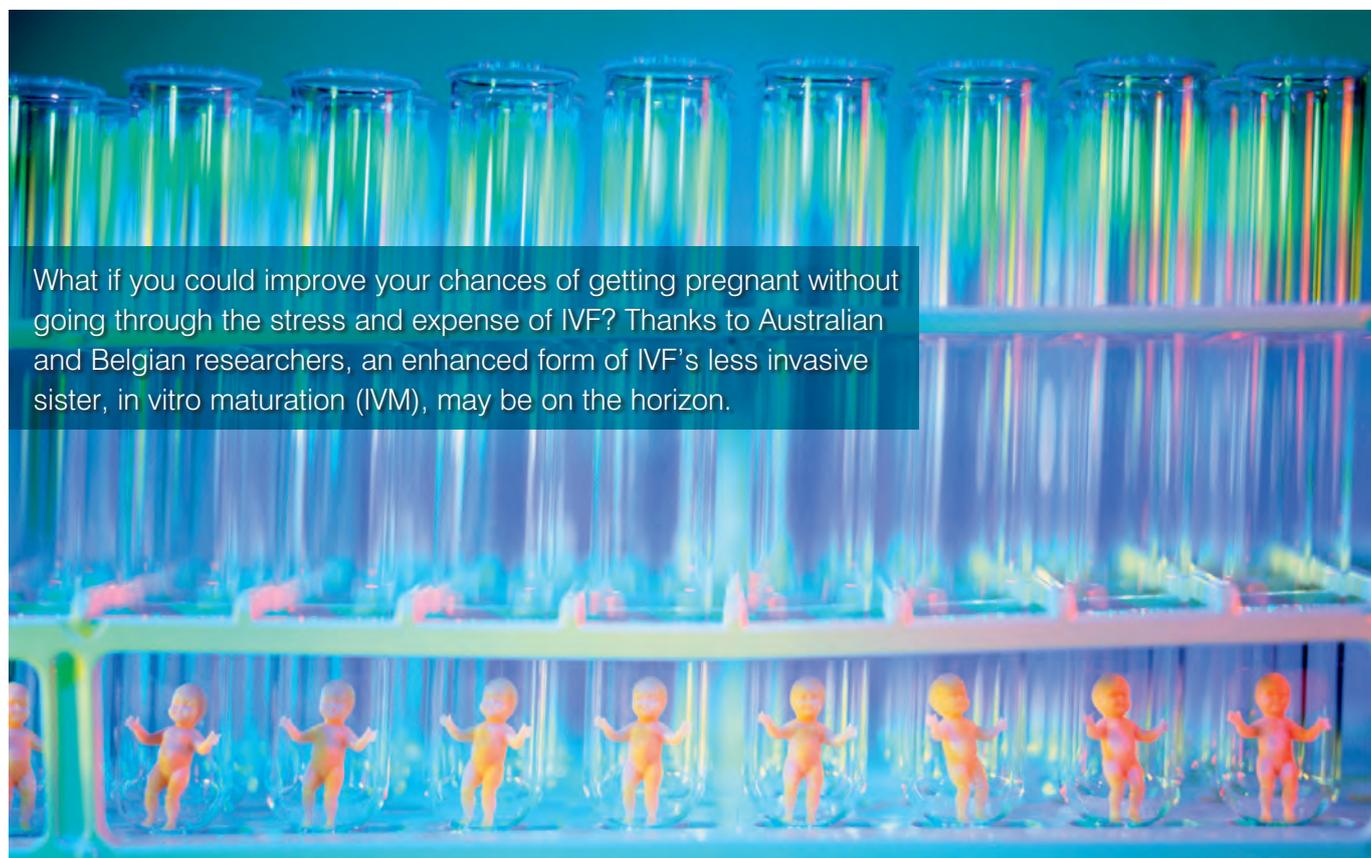
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Coherent
 S C I E N T I F I C

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What if you could improve your chances of getting pregnant without going through the stress and expense of IVF? Thanks to Australian and Belgian researchers, an enhanced form of IVF's less invasive sister, in vitro maturation (IVM), may be on the horizon.

IVF (in vitro fertilisation) requires women to inject themselves with high doses of follicle-stimulating hormones for up to 12 days in order to stimulate egg cell growth before these cells are removed from the ovary. While the use of hormone drugs is a proven treatment, its use comes with the risk of discomfort and medical complications — not to mention significant expense for both the patient and the healthcare system.

IVM, on the other hand, retrieves eggs while they are still in the immature stage and brings them to maturity in cell culture, all with minimal hormone stimulation. However, clinicians usually recommend IVF because pregnancy rates after IVM have been lower. Now, a research team led by UNSW's Associate Professor Robert Gilchrist, in collaboration with the University of Adelaide, UZ Brussel at Vrije Universiteit Brussel (VUB) and Cook Medical, is looking to even the odds.

“The aim of our research has been to restore, as far as possible, the natural processes that occur during egg maturation,” said Associate Professor Gilchrist, who is based at UNSW's School of Women's and Children's Health.

After discovering a new growth factor, called cumulin, the scientists added it to egg cells in the laboratory in combination with small signalling molecules called cyclic AMP-modulators. Initial experiments using the technique in pigs showed an improvement in egg quality and a doubling of the embryo yield compared to the existing IVM method. In a preclinical trial on human eggs, the researchers likewise found an improvement in egg quality and a 50% increase in embryo yield.

“We have demonstrated that it is possible to improve egg quality and embryo yield with next to no drugs, using potent growth factors produced by the egg,” Associate Professor Gilchrist said.

“We have a 50% increase in the efficiency of IVM, which brings it to the level of IVF — which means that in the future, this could be an alternative to IVF.”

Professor Michel De Vos, from UZ Brussel, added that the use of IVM reduces the risk of ovarian hyperstimulation syndrome (OHSS) to zero. “Young women facing cancer treatment, who wish to preserve their fertility but often don't have time to freeze their eggs, will also benefit from this breakthrough,” he said.

With the technique currently awaiting FDA approval, the researchers are conducting safety studies to ensure that altering the conditions of egg maturation does not affect the long-term health of offspring. And even if it is accepted into clinical practice, Associate Professor Gilchrist does not necessarily see it replacing IVF entirely.

“We hope that in the future we will have both IVF and IVM available for patients, depending on their individual needs,” he said.

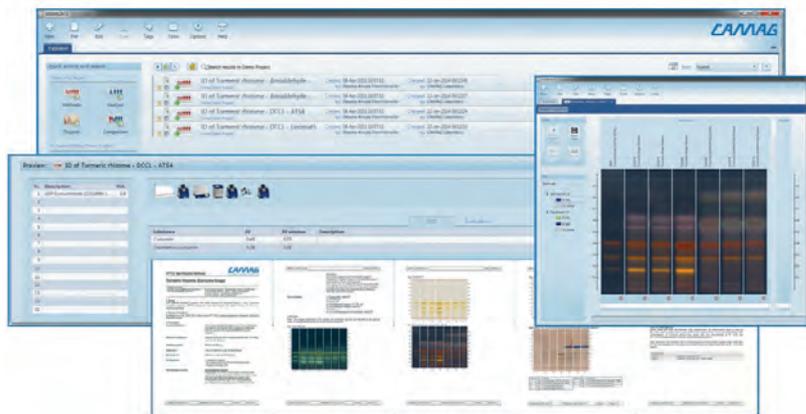
HPTLC software

CAMAG's visionCATS 2.2 software organises the workflow of high-performance thin layer chromatography, controls CAMAG's instruments and manages data. The user interface is easy to navigate and effectively guides the user throughout the chromatographic process — from definition of samples and substances to the reporting of results for effective qualitative analysis (fingerprinting), quantification and identification.

The analytical challenges of food, feed and related products are immense. One of the problematic aspects is the complexity and diversity of unknown matrices. HPTLC is in many cases able to deal with high matrix loaded samples; sample preparation is minimised because of the single use of HPTLC plates. The ability to treat multiple samples in parallel on the same HPTLC plate allows high sample throughput at low costs per sample.

visionCATS 2.2 features: image comparison; image enhancement tools; scanning densitometry and spectral evaluation; quantitative analysis with five different quantification functions (eg, linear and polynomial regression modes) with several scanning steps; an HPTLC method library for seamless import of validated methods and images of standards and reference materials; regulatory compliance with cGMP/cGLP and 21 CFR Part 11; and software architecture based on a client/server system, enabling scalability from a single workstation to a multiuser lab network.

Chromatech Scientific
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Emergency laboratory safety shower

After an exposure to a hazardous substance, any delay, even for a few seconds, can result in serious injury. OSHA and ANSI require that emergency showers be located within 10 seconds' walking distance from a hazardous site location.

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The shower is equipped with frosted front strip curtains, interior grab bars, raised deck grating and a bottom or rear drain outlet. It is compliant with ANSI and OSHA requirements.

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Motorised tip-spacing pipettes

The latest generation of INTEGRA's VOYAGER pipette range features motorised tip-spacing technology. At the push of a button, VOYAGER II pipettes allow the user to expand tip spacing anywhere between 4.5 and 33 mm (depending on the model). This enables rapid and optimised multichannel pipetting between microplates, tube racks and gel boxes of different sizes and formats.

The pipette incorporates a 135° rotatable body, enabling users to always hold the pipette in a comfortable working position. The reduced weight facilitates easy, unstrained pipetting even over prolonged sessions. The updated design features better accuracy and precision, especially at low volumes.

The product introduces an intuitive multilingual user interface operating across all menus. It allows the user to save up to 40 individual custom programs, thereby accelerating the implementation of often repeated pipetting protocols. Available in 4-, 6-, 9- and 12-channel versions, it is said to be the only commercially available pipette range where the tip spacing can be changed electronically.

Compared to using single-channel pipettes, the number of transfer steps is reduced, resulting in time savings and less error-prone sample processing. Pipetting protocols can be finished up to 12 times faster compared to using a single-channel pipette. The product allows the user to change tip spacing single-handed, thereby leaving the other hand free to handle the sample vessel.

Benefiting from a high-precision motor, the VOYAGER II tip movement can be exactly controlled and the required tip-to-tip spacing for the user's lab protocols saved for future repeat use. Up to three different tip-to-tip spacings can be saved and accessed anytime during a pipetting protocol.

BioTools Pty Ltd
www.biotoools.com.au

Elemental and isotope analysis system

The Thermo Scientific EA IsoLink IRMS system features technical advancements designed to allow scientists to expand their sample analysis processes. The system incorporates a helium management module for low-cost-per-sample analysis, as well as temperature-ramped gas chromatography for high sample throughput and analytical reproducibility.

The modular nature of the system delivers flexibility and the ability to analyse samples from very low microgram to high milligram concentrations. The helium management module utilises a valve block that decreases helium consumption up to 70%, which is especially important as global helium shortages increase.

Key applications include food authenticity and origin, forensics, geosciences and food web studies in ecology and biology.

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The Hioki high-speed electrical resistance tester RM3542A provides resistance measurement of components including ferrite bead inductors. Low-impact contacts limit inductive limitation inrush current, while low applied voltage (5 V) permits no-stress testing of small components.



The isolated four-terminal testing mode allows resistance measurement to 100 MW with minimal interference from environmental electromagnetic noise. Unreliable results are eliminated by contact checking modes including Always-On Contact checking (contact checking before and after contact bounce) and Contact Improver Function (improved penetration prevents oxidation layers from interfering with the accuracy of resistance measurement).

The Offset Voltage Compensation feature eliminates the interference of thermal EMF with the accuracy of measurements. Automatic power line frequency sensing provides for in-sync resistance measurement. Measured values are automatically subjected to statistical analysis including mean, minimum, maximum and standard deviation, as well as process indicators such as dispersion and bias factors.

Power Parameters Pty Ltd
www.parameters.com.au

Differential scanning calorimetry instruments

Differential scanning calorimetry (DSC) is a key technique for determining how materials behave in changing environments. Determining the enthalpy of a transition as the material is heated or cooled needs to be relative to the data which needs to be collected. Linseis offers a comprehensive range of thermal analysis instruments.

The model DSC 1000 and DSC 1000 HiRes offer solutions for temperatures up to 750°C and a range of options to configure these to specific applications. The thermopile sensor with 120 or 240 thermocouples produces high sensitivity and resolution. The optional 44/88 position sample robot, in combination with the optional automatic gas control and automatic evacuating system, enables long-term unattended operation.

The high-temperature DSC/DTA PT 1600 provides the scope to work on materials which are used in extreme and structural environments. Optional features include the ability to work under vacuum and various atmospheres. The DTA sensor is useful at high temperatures, where a qualitative enthalpy may be all that is required or possible to measure. In DSC mode, the specialist sensor enables to determine the heat capacity (C_p).

The modular concept of the DSC and DTA systems allow the use of different furnaces with a temperature range from -150 up to 2400°C. The systems can also be coupled to an MS or FTIR.

Scientex Pty Ltd
www.scientex.com.au



TOFMS platform

LECO Corporation has announced its latest innovation for the GC-MS marketplace — the Pegasus BT. The product gives users all of the data they need from a single sample run with an innovative TOFMS platform.

Powerful software and hardware features are said to simplify quantitation while also identifying more components with increased sensitivity. The StayClean ion source eliminates the need for source cleaning, while a convenient benchtop package saves valuable space in the laboratory. The device will give users more uptime and rich chemical data, yielding an increase in overall laboratory productivity and efficiency.

Obtaining better MS chemical information is only part of the solution. LECO's ChromaTOF brand software works seamlessly with the platform to automatically process user data and remove the guesswork involved with analyte identification and quantification. Other features include NonTarget Deconvolution, Target Analyte Find, library searches, an easy-to-configure interface and data that provides a complete mapping of each sample.

Leco Australia Pty Ltd
www.leco.com.au



Lateral flow strip

The generic Rapid Assay Device (gRAD) from BioPorto Diagnostics makes it easy and fast to develop a customised qualitative or semiquantitative lateral flow assay.

The gRAD OneDetection strip is an optimised generic lateral flow strip with a test line where a biotinylated capture antibody (or other biotinylated proteins) will bind, as well as a control line that will capture any antibody from mouse, rabbit and goat.

To generate a specific gRAD OneDetection test, just follow these simple steps: choose a target analyte to detect; find the most optimised matched antibody pair for this target; conjugate the capture antibody with biotin and the detection antibody with gold; and optimise the antibody solutions in the right concentrations.

When the sample of interest is added to the antibody solution, the antibodies react and can form a complex with the analyte in the sample. The mixture will — if a complex is formed — now contain both free capture antibody and an antigen-antibody complex with the analyte.

The strip enables users to create a custom lateral flow assay specific to their needs, as the product is not analyte dependent.

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Plate tectonics and pizza dough

The Earth's crust has more in common with pizza dough than you might think, according to an international team looking into the mechanics of plate tectonics.

Continental drift and the incremental movement of the Earth's surface has been fairly well understood for some time now, but one phenomenon that has been difficult to explain is the occasional lurch as continents uncouple.

It starts with millions of years of slow but relentless grinding and pulling, but when the supercontinent does eventually split, there is a full-margin rupture and rapid acceleration as the outer rims of the continents plunge into the gaping abyss.

Professor Dietmar Müller of the University of Sydney's School of Geosciences explained: "Plates tend to shift around quite slowly because they're sitting on an otherwise very viscous mantle. However, throughout Earth's history, there have been plenty of instances where plates have suddenly sped up during supercontinent breakup."

Professor Müller's team has joined forces with the German Research Centre for Geosciences at the University of Potsdam to analyse the seismic data and develop sophisticated computer simulations to help explain this two-phase separation process.

Thousands of kilometres of seismic profiles had to be laboriously analysed to determine the exact areas where this vigorous stretching of the

Earth's mantle had taken place during continental separation. The subsequent big data analysis required high-performance computing in an open-innovation framework.

Professor Müller compares the results with the actions of your local pizzaiola: "Imagine you're pulling apart a thick piece of dough. At first, separating it requires a lot of effort because the dough resists your pulling and stretches slowly between your hands. If you're persistent, you'll eventually reach a point where the dough becomes thin enough to separate quite easily and quickly. The same principle applies to rifting continents once the connection between them has been thinned sufficiently."

According to lead author Dr Sascha Brüne of the University of Potsdam: "This breakup process leads to margin segmentation, where rapid subsidence, high heat flow and enhanced volcanism characterise the outer margin."

This research is part of the Basin Genesis Hub, a five-year project at the University of Sydney co-funded by industry and the Australian Research Council. Interactive models of the group's work can be viewed at the Virtual Earth Laboratory.



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NFMRI Medical Research Innovation Conference
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NFMRI's second annual conference, 'Supporting Biomedical Innovations: Getting Innovations on the Right Track', will focus on exploring strategies and solutions to help build, support and grow the biomedical innovation sector in Australia. It will bring together local and international experts to explore four key themes focused around how private and social investments in medical research, together with different strategies and bold actions, can lead to the advancement of innovations. The program will also examine how to increase Australia's capability and capacity to deliver results, while growing the local economy. The four key themes that will be explored at the event include thinking differently and being bold, leading by example, building innovation in Australia and partnerships and strategies for impact.

nfmri.org.au/medical-research-innovation-summit/

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www.ausbiotechnc.org

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www.abacbs.org/conference/

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www.cosa2016.org

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www.embl-abr.org.au/game2017/

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February 2–5, Lorne
www.australasianproteomics.org.au

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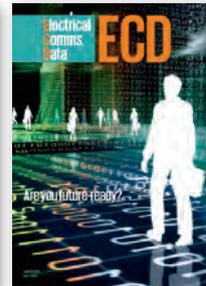
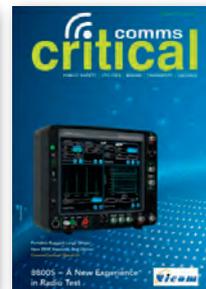
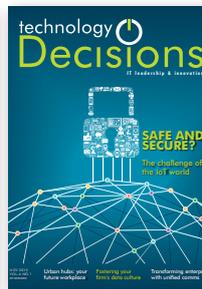
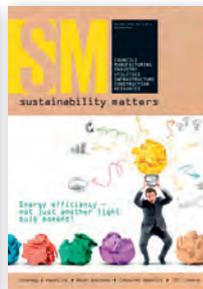
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