

Lab+Life SCIENTIST



Fairytales and
bad karma

OCTOBER 2015
VOL. 26 NO. 5
PP 100008671

ANALYTICAL | BIOTECH | ENVIRONMENTAL | INDUSTRIAL | LIFE SCIENCES | MEDICAL



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Funding a cure for type 1 diabetes

Doctors and scientists based at the Westmead Millennium Institute for Medical Research and Westmead Hospital have been awarded \$3.3 million to extend their research into a clinical cure for type 1 diabetes — a chronic autoimmune disease affecting 120,000 Australians.

Type 1 diabetes destroys the body's insulin-producing cells, which normally prevent blood-sugar levels from becoming dangerously high. As noted by Professor Philip O'Connell, the leader of the Westmead research, "Until now, treatment has focused on managing the consequences and complications of type 1 diabetes."

Professor O'Connell and his team have sought to change this, taking insulin-producing islet cells from a donor pancreas and infusing them into the liver of a patient with type 1 diabetes via the portal vein. There, the islet cells populate and start producing insulin, providing a practical cure for an otherwise debilitating disease.

Professor O'Connell said clinical trials underway at Westmead Hospital and elsewhere since 2006 have proven the technique to be highly

successful. But so far its use has been limited to a small number of patients with so-called 'brittle' diabetes.

"The current need for transplant recipients to take powerful drugs for the rest of their lives to prevent islet rejection means the technique has been reserved for people with life-threatening undetected hypoglycaemia and is not suitable for children or younger patients," he said.

Now, the Type 1 Diabetes Clinical Research Network (T1DCRN) has awarded Professor O'Connell's team a grant to advance this research. The network's funding is designed to plug the gap between lab-based research and expensive clinical trials that prevents new type 1 diabetes treatments entering widespread use.

"Winning a grant of this size allows us to assemble the necessary expertise to develop a completely new therapeutic paradigm, which not only has the potential to improve islet transplantation but will also have the potential to

treat the disease before diabetes has manifested," Professor O'Connell said.

"It will allow us to concentrate on prevention and cure — so that one day, patients won't need insulin injections or pumps, and medical complications will be a thing of the past."

The four-year research program will aim to develop alternative strategies that promote immune tolerance towards transplanted pancreatic islets, thereby making islet transplantation a viable option for a wider range of Australians living with type 1 diabetes.

"The average age of patients when they suffer the onset of type 1 diabetes is just 11 years, so if we could successfully use pancreatic islet transplantation in the young, it would solve a significant problem," Professor O'Connell said. He added that the research could bring his team closer to "achieving the goal of drug-free immunosuppression, which may benefit the recipients of other types of transplants".



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A Canadian company has begun marketing two non-browning apple varieties that employ CSIRO's patented gene-silencing technology. But in GM-averse Australia, there are no takers — why?

In March this year, Canadian biotechnology company Okanagan Specialty Fruits (OSF) received the green light from the Canadian Food Inspection Agency and Health Canada to grow and market two new apples genetically modified to resist browning when bruised or cut. The US Department of Agriculture had approved the production and sale of OSF's Arctic Apples in the US a month earlier.

The news probably caused mixed emotions for the CSIRO Plant Industry researchers who invented the patented gene-silencing technology that Okanagan used to develop its new, snowy-white-fleshed Golden Delicious and Granny Smith apples.

The technology has been available to the Australian stone and pome fruit industries, and the potato industry, for around a decade, but there have been no takers. The anti-GM movement has been so virulently effective in fomenting community fears of GM crops and foods that their commercialisation in Australia has been all but stifled.

Canada launched the world's first broadacre GM crop, herbicide-tolerant canola, in 1995. Anti-GM activists have struggled for traction in Canada because GM canola's early commercial success and snow-white safety record effectively forestalled any attempt to convince Canadians that GM crops were an unacceptable threat to human health and the environment.

Despite GM canola's runaway success in Canada, anti-GM activists' relentless scare-mongering in Australia spooked state governments into imposing a four-year, Australia-wide moratorium on the crop, which delayed the first plantings for 13 years after the crop debuted in Canada.

In 2008, the Victorian and NSW governments finally broke with the other southern states by lifting their moratoria. WA followed suit in 2011, but in South Australia and Tasmania it is still illegal to grow or transport GM canola.



No snow-white apple fairytale for Australia



Australian farmers are exceptional in the world for rapidly adopting new agronomy and management techniques and making them a success, but the genetics is left out.

Okanagan's Arctic Apples are just the first products from Okanagan's pipeline of non-browning fruits which employ CSIRO's patented RNA-interference gene-silencing technology to switch off the polyphenol oxidase (PPO) gene. The PPO gene specifies an enzyme that causes exposed flesh to turn brown by oxidising phenolic molecules in the flesh of apples and other stone and pome fruits, including quinces, cherries, peaches and nectarines, and some vegetables like potatoes.

Australia was the first country in the world to release a genetically modified organism (GMO) into the environment in 1988 — a neutered strain of the crown gall bacterium *Agrobacterium tumefaciens* that prevents crown gall disease in newly grafted stone and pome fruit trees. It is now sold worldwide.

Today, GM crops like canola, maize, soybean, rice and cotton account for 10% of the total planted area of crops around the world. But Australia's pioneering foray into GM agriculture was short-lived — it rapidly stalled in the 1990s in the face of a tide of scare-mongering propaganda generated by anti-GM organisations like the Australian Gene Ethics Network, Greenpeace and Greenpeace's rural spinoff, the Network of Concerned Farmers.

Australia's national regulatory agency, the Office of the Gene Technology Regulator (OGTR), now lists dozens of crops that have been officially approved for commercial release in Australia. Most are 'me too' crop varieties containing the same tried-and-tested genes used for more than two decades to confer tolerance to herbicide or insect pests. But the OGTR requires them all to be submitted to the same rigorous, time-consuming and costly regulatory regime, including contained field trials, before they can be grown commercially.

In the 27 years since No-Gall was launched in Australia, just three GM crops have been commercialised in Australia: herbicide-tolerant canola; pest-resistant cotton, which rescued

and transformed the cotton industry; and Florigene's mauve and purple-hued carnation varieties, a spin-off from attempts to develop a truly blue rose.

Dr Jim Peacock, a pioneering GM crop researcher and former chief scientist of Australia, said Okanagan's non-browning apples highlight the area in which Australian agriculture is failing: new product development. When the Australian Academy of Technological Sciences and Engineering recently sought his views on the future directions of Australian agriculture, he pointed to a missing 'G' in the equation: genetics.

"They had produced a position paper highlighting some of the advances that had really helped our agriculture, and there have been many examples in the past," he said. "But most advances have involved agronomy and crop-management technologies.

"Australian farmers are exceptional in the world for rapidly adopting new agronomy and management techniques and making them a success, but the genetics is left out.

"I told the academy, yes, we've been pretty good, and we can expect to make further incremental gains in productivity. But there are two components to success in agriculture: production methods and products. For the most part, we pay no attention to new products — we just produce commodities.

"A successful example of a new product is one we helped develop — BarleyMax, the low glycaemic index barley we helped develop to improve the crop's health-giving properties.

"It has been developed for the Australian market by a small local cereal company, and it has been successful. But it could and should be marketed worldwide.

"That hasn't happened because our business entrepreneurs have failed to appreciate the potential of new products developed by genetics. Some of these entrepreneurs are business advisers to our research institutions.



Professor Rick Roush, former Dean of Agriculture at the University of Melbourne and a pioneering member of the Genetic Manipulation Committee (the predecessor of the Office of the Gene Technology Regulator), believes Australia’s scientific community and governments made strategic errors in their defence of GM crops and were constantly outflanked by the anti-GM movement.

Now Dean of Agricultural Sciences at Pennsylvania State University in the US, Professor Roush said he is an admirer of a group of “pretty elite” scientists in the UK who established a rapid-response team to counter alarmist anti-GM claims in the media. None has any direct connection to research, development or commercialisation of GM crops.

“They organise themselves so there was always someone on call when an anti-GM story came out in the news media, so they could offer comment in the interests of balance,” Professor Roush said.

“I’m sure that journalists didn’t often seek to find balance, or even seek a comment, but even when they did, they didn’t know whom to contact. As a result, the usual suspects in the UK — as in Australia — could always be counted on for negative comment, and the journalist would not seek a balancing response.”

Professor Roush said the UK group alerted Australian scientists in 2012 to the imminent publication in the journal *Food and Chemical Toxicology* of a study by French molecular biologist Gilles-Éric Seralini — a noted opponent of GM crops — claiming to show that rats fed on a Roundup-Ready maize strain developed multiple tumours.

(Elsevier retracted the paper in November 2013 after scientists roundly criticised it for inept methodology and conclusions. Among other flaws, Seralini’s feeding study used Sprague-Dawley rats, which are prone to spontaneously develop tumours.)

The UK group’s strategy of being constantly available to the media for balancing comment required it to be “clean as the driven snow”, Professor Roush said.

“The fundamental problem has been that when a scientist says anything positive about GM, there’s a kneejerk reaction from most anti-GM groups, because these kinds of ideas are so far from their world view that they assume you have to be on the take if your views differ from theirs.

“The mistake we made early on was to believe people would listen to the scientific evidence, when we really needed to become involved much more in hand-to-hand combat, so that nothing they said went unchallenged. But nobody was prepared to do that.

“I don’t believe it was really about the need for crops with consumer-benefiting traits, because anti-GM groups have continued to attack GM crops that had nothing to do with multinational control of the food supply.

“Literally in the same week, activists attacked vitamin A-enriched GM rice trial plots in the Philippines, while other activists mowed down publicly produced GM papaya on the Big Island of Hawaii.”

(The GM papayas are resistant to the devastating papaya ringspot virus, which had virtually wiped out the Hawaiian papaya industry by the early 2000s.)

Professor Roush said a small research team, headed by Dr Dennis Gonsalves at the University of Hawai’i, developed the GM papayas “totally in the public sector”, without corporate sponsorship or proprietary technology. The papayas been grown successfully in Hawaii for several years before activists vandalised them.

Asked if Australia’s complex and rigorous regulatory apparatus for GM crops might have had the paradoxical effect of helping to convince the community that concerns about GM crops were well founded, Professor Roush said, “I do think [the activists] were able to exploit that.

“We should consider the history of the Asilomar agreement to suspend gene-splicing experiments in the mid-1970s until the technology could be shown to be safe. Today, high school students are doing the same experiments — so it really is time we backed off on such rigorous safety regimes.

“One of the results of such intense regulation is that only large companies like Monsanto or Aventis can afford to put a new GM crop through that process — smaller companies are locked out.

“The history of GM crops is one of a very high level of safety. There’s no question that we need to investigate new GM crops, but over-regulation has shut down the ability of public-sector research to flourish in countries like Australia and the US. If we can’t do it, the Chinese will.”

“Our ability to commercialise new products is pathetic. As far as I know, no Australian government — federal or state — has made a serious attempt to look at the increasingly wealthy Asian countries and ask them what they want in their food.

“What traits would they find attractive? How do they like to buy their food — raw or processed — and what sort of processing suits their tastes? We never ask these questions, but I believe it is one of the most important things we can do if we’re going to capitalise on the rapid growth in our Asian markets.

“If we’re exporting food to India or China, what our governments do is put a brand logo on it — they don’t think to change the product at all.

“With regard to the gene-silencing technology used in Canada’s Arctic Apples, it was a very important discovery by our scientists, and it’s being used to great advantage in research around the world and to develop innovative new products.

“We use it in research in Australia, but commercially, it has gone nowhere.

“These days, if you come to us and ask if we can make a certain trait in an agricultural crop — say, develop a maize variety that produces pink



OSF President Neal Carter with a new Arctic Apple variety



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Slices of non-browning Arctic Apple Golden vs conventional Golden apple. OSF's non-browning Granny Smith and Golden apples.

cornflakes — we can provide you with a very accurate assessment of whether it can be done, how it can be done and how long it would take.

“We are very confident of the capabilities of our technology, our knowledge of how genes work and how we can modify their function. But we’re just not doing it — our entrepreneurs and investors don’t seem to be interested.

“With regard to BarleyMax, there are three ways to produce a low-GI starch in barley. We can do it with molecular genetics, which is what we did to achieve proof of concept at the start of the project.

“We can go to the breeders and tell them to run their mutation processes, and tell them the particular mutation to look for in the gene — which is what the breeders did.

“Or we can sift through germplasm collections of wild barley from southern Asia, and find naturally occurring examples of the mutation we need.

“All these approaches target the same mutations in the same gene, yet there is no way we could have sold the GM version in supermarkets.

“The BarleyMax mutants that are now grown commercially were chance products of the most horrendous mutation-inducing chemicals, and as long as they’re not GM, nobody even thinks to ask how they were produced.”

Peacock is disappointed with the “undue attention” that the media and politicians have paid to the anti-GM movement in Australia. “They don’t argue from a factual base, but in emotive, frightening terms,” he said.

“But equally sad, I believe, has been the lack of considered viewpoints from our politicians — for the most part, they make no attempt to understand the full potential and facts about GM plants. But they do react to all the anti-GM noise because they are concerned about votes.

“It’s really disappointing, for example, that we still don’t have blanket acceptance of GM canola across Australia. For years, our canola farmers suffered in the competition with Canadian farmers who had GM herbicide-tolerant canola.

“Canada’s GM varieties were more reliable and offered higher yields, and they were able to sell

every seed they produced into Japan. Meanwhile, in Australia, idiotic anti-GM activists were trumpeting that countries like Japan would not accept GM canola — the opposite was actually true.

“It’s symptomatic of the whole problem in Australia. We’d occasionally have a politician taking an interest in the issue — the last-but-one WA Minister for Agriculture inspected the GM canola trials at Cootamundra, went home and lifted the moratorium in WA.

“One of the outstanding possibilities for GM canola is varieties that CSIRO is now developing here in Canberra that will produce the healthy omega-3 oils that the food industry currently extracts from marine fish.

“We’re using an established crop to synthesise a product of great importance to our personal health, and to our market opportunities.”

Dr Peacock said the omega-3-rich GM canola promises to reduce harvesting pressure on endangered marine fish species — a prospect that anti-GM activists genuinely concerned for the environment should welcome.

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CSIRO leads global effort to save honey bees



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An international collaboration of researchers, beekeepers, farmers, industry and technology companies, led by Australia's own CSIRO, is aiming to better understand what is harming the health and pollination ability of honey bees.

Around 70% of what goes into our mouths relies on pollination — not only products like stone fruits and berries, but also beef. It is therefore particularly worrisome that Australia's horticulture and agricultural industries are vulnerable to declines in honey bee populations, as they rely on unmanaged feral honey bees for much of their crop pollination.

“Our managed bee pollination services would be hard pressed to meet the extra demand required to replace the key role unmanaged honey bees play, so the outcome would likely be a drop in crop production and a rise in prices of popular food staples like fruit and veggies,” said CSIRO Pollination Researcher Dr Saul Cunningham.

With bee populations around the world in decline, researchers have launched the Global Initiative for Honey bee Health (GIHH). The GIHH partners with industry members Intel, Hitachi Chemical, Nissin Corporation and Vale, and brings together scientists from Australia, New Zealand, Brazil, Mexico and the United Kingdom.



The Varroa mite, seen here latched onto a bee pupae, is the most significant pest to honey bees around the world.

“The sensors, working in partnership with Intel technology, operate in a similar way to an aeroplane's black box flight recorder in that they provide us with vital information about what stress factors impact bee health.”

As bees are normally predictable creatures, changes in their behaviour indicate stress factors or a change in their environment. By modelling bee movement, researchers can help identify the causes of stress, as well as any disease or other biosecurity risks.

One stress factor that is yet to reach Australia is the devastating Varroa mite, which has wiped out bee colonies overseas at an alarming rate. Dr Cunningham noted, “This puts Australia in a good position to act as a control group for research on this major issue that could one day become our problem, too.”

Professor de Souza concluded, “The time is now for a tightly focused, well-coordinated national and international effort, using the same shared technology and research protocols, to help solve the problems facing honey bees worldwide before it is too late.”

Integral to this international research effort is the incorporation of micro-sensors, around a quarter of a centimetre in length, which are manually fitted to the backs of bees. These sensors work like a vehicle e-tag system, with strategically placed receivers identifying individual bees and recording their movements in and around bee hives.

“The tiny technology allows researchers to analyse the effects of stress factors including disease, pesticides, air pollution, water contamination, diet and extreme weather on the movements of bees and their ability to pollinate,” said CSIRO Science Leader Professor Paulo de Souza.

An unexpected funnel-web encounter

Scientists from The Australian National University (ANU) have come across an unexpected species of funnel-web spider during their studies at Booderee National Park, near Jervis Bay.

ANU biologist Dr Thomas Wallenius was searching the area for funnel-webs when he found the female spider in her lair, burrowed into a rotting log.

“They build a silk-lined burrow inside the hollow log which can be up to two metres long,” he said. “She had probably been living in there for 25 to 30 years,” he said.



Dr Wallenius and his colleagues believe the 50 mm spider is a species of the tree-dwelling genus *Hadronyche*, rather than the ground-dwelling genus *Atrax* — the only species reported in the park's records.

“[The discovery] shows we still have a lot to learn about what's out there in the bush,” he said.

“It may even turn out to be a new species of funnel-web.”

The discovery of the spider is part of a larger biodiversity study of the area, with Dr Wallenius noting, “The Jervis Bay region has a wide variety of both plant and animal species, as northerly and southerly ocean currents meet, which makes it a rich area to study.”

He added that other spiders are often mistaken for funnel-webs, so members of the public should not panic if they think they have found one.

“The males are more likely to be encountered in the summer months, and may be more aggressive, but contrary to common belief, funnel-webs can't jump.”



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Puffed rice reveals patterns in compressed porous materials

An international research team has presented a creative approach to explaining the patterns of movement in porous materials when compressed. Their study, which made use of puffed rice cereal, has been published in the journal *Nature Physics*.

Lead author Professor Itai Einav, from the University of Sydney's Particles and Grains Laboratory, has the long-term research objective of understanding how grains behave under varying conditions. Professor Einav said he and his team "knew that brittle porous materials such as rocks, foams or even snow exhibit irreversible compaction patterns... [but] what we didn't know is in what ways it moves and deforms, and specifically what types of internal patterns develop".

Professor Einav and his team, from the University of Sydney and San Diego State University, decided to use puffed rice in order to demonstrate this movement. He explained, "We picked puffed rice because they are highly porous and compliant and typify generic brittle porous materials when being compressed.

"We wanted to understand how packs of brittle grains coordinate motion when crushed. Many of us have tried this at home as kids — crushing puffed rice cereal with a spoon.

"For us, this simple experiment revealed surprisingly rich compaction patterns that were due to the competing processes of internal collapse and recovery."

Co-lead author Dr François Guillard, also from the University of Sydney, said the research model replicating the experiments offers a new perspective on jerky flows in metallic alloys.

"We used a robust spring-lattice model to capture the process of internal collapse and recovery and are now able explain the dynamics of previously and newly observed patterns," he said.

The results of the research will have an impact on our understanding of everything from snowballs colliding during avalanches to crater patterns formed during meteorite impacts. Dr Guillard said, "The lattice model we have created can address other brittle porous media such as natural rocks, bones and snow, and man-made ceramics, foams and pharmaceutical powders."



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Australia's record-breaking heat levels

A study published in the journal *Geophysical Research Letters* has found that in the past 15 years, new heat records in Australia have outnumbered cold temperature records by 12 to 1 — with global warming said to be the prime cause.

According to lead author Dr Sophie Lewis, from the ARC Centre of Excellence for Climate System Science, "In a climate without global warming the ratio of new heat records to cold records would be 1:1, and that was the case in Australia from 1910–1960.

"But after 1960 the number of heat records increased, while new cold records declined. This trend accelerated again between 2000 and 2014, so that today for every record cold temperature set, 12 heat records are broken in Australia."

In particular, Dr Lewis and study co-author Dr Andrew King noticed two striking trends in this record-breaking activity:

- Night-time temperatures or minimum heat records were being broken more frequently than daytime temperatures;
- The decrease in cold records being set was most pronounced in the cooler months from April to September than through Australia's warmer months from October to March.

The findings complement research from around the world showing increasing numbers of global and regional heat records being set.

In examining the changes in record-breaking temperatures, the researchers looked at the influence of El Niño, La Niña and the roughly 24-year cycle of the Interdecadal Pacific Oscillation to see if these natural variations could be responsible.

While these events had some minor impact, the authors claim they did not influence the overall trend of increasing heat records or the global warming signal resulting from human-produced greenhouse gas emissions.

"The only year in the past 15 years to produce more cold records than warm records was 2011, which was impacted by two La Niña events at the beginning and end of the year that brought extensive rainfall," said Dr King.

"However, the dominance of cold records in 2011 was not caused by an increased number of cold records, which were around average, but by the lack of heat records for that one year.

"By 2012 normal service had resumed, and the trend in record-breaking heat events dominating cold records was back."

In terms of global average temperatures, the coldest year on record was 1909. Since then, the record for the hottest year has been broken 18 times — and is likely to be broken again in 2015.

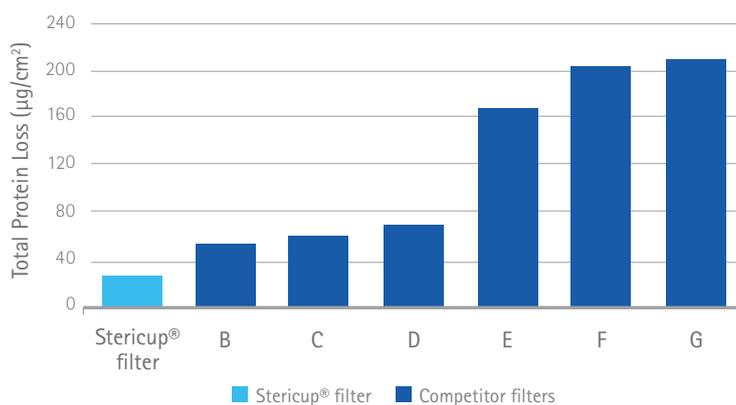
"If this trend continues with the continuing rise in greenhouse gases, there may come a time when the chances of a new record cold year being set in Australia will be close to zero," Dr Lewis said.

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Bad karma is causing million-dollar oil palm crop failures

Oil palm fruit and seeds are the source of nearly half of the worldwide supply of edible vegetable oil, and provide one of the most promising sources of biofuel. However, over the last three decades tens upon tens of thousands of fledgling oil palm plants at elite corporate plantations in Malaysia and elsewhere in Southeast Asia have failed. These failures have cost untold millions in spoilage and have had adverse implications for the tropical environment. According to an international team of genetic sleuths, the cause is bad karma.

In the 1980s, a much ballyhooed new method of generating plantations brimming with clones of the highest-yielding specimens of the oil palm plant met with unanticipated disaster. Corporate investors were astonished to observe that the finest hybrids, cloned in culture dishes, often grew into barren adults bearing desiccated, worthless fruits. These plants displayed a mutant form that scientists called ‘mantled’.

It takes oil palms about six years to grow to maturity. Thus, the fate of promising nurslings is not clear until long after an investment of land and time has been made. When they’re growing well, the trees are valuable.

Given the immense and still growing world demand for palm oil, it has been in industry’s interest to increase yield. Helping in this effort have been plant geneticists. Cold Spring Harbor Laboratory (CSHL) Professor Robert A



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Martienssen, FRS, is one plant geneticist who has taken a keen interest in the challenge of boosting yield.

“Our work in this area has been driven in part by environmental concerns,” Martienssen said. “As we devise ways to reliably boost yields, we thereby lessen the economic motivation to spread oil palm holdings into sensitive rainforest areas that are important to preserve.” In past work, Martienssen has been instrumental in identifying a gene called SHELL that controls fruit yield.

The solution to the mystery of the ‘mantled’ oil palm and a demonstration of a way of preventing it has been published online in *Nature*. It comes down to a question of karma, according to Martienssen, along with Meilina Ong Abdullah, lead author of the paper, and her colleagues at the Malaysian Palm Oil Board (MPOB), the entity empowered to oversee that nation’s world-leading oil palm

industry, and researchers at Orion Genomics, a private US firm that spun out of CSHL (co-founded by Martienssen).

Mantled plants have their origins in tissue grafted from prize oil palm hybrids, grown in culture dishes. Tissue samples are derived from what gourmets would call the “heart of palm” — the growing tip of the palm plant, bearing its stem cells. In this way, the best yielders can be cloned — something that can’t be done when growing the next generation from seeds.

Martienssen suspected that the field in which he specialised would provide a path to understanding what went wrong in some of those culture dishes, leading to mantled oil palms. His expertise is epigenetics — an array of molecular mechanisms whose actions modify the expression of genes without altering the sequence of the DNA ‘letters’ that ‘spell out’ the genes.

One very common epigenetic mechanism is called methylation. The addition or removal of methyl groups (CH_3) from the DNA double helix within a given gene and areas near it can result in that gene’s expression being enhanced, reduced or even prevented altogether. Using a microarray revealing methylation across the genome of several commercially important cloned varieties of oil palm, Martienssen and colleagues were able to spot a single genomic location where the absence of a methyl ‘tag’ corresponded with a version of a gene previously linked to mantled plants.

The gene in question is the oil palm equivalent of a gene called DEFICIENS in the snapdragon plant, where it was first described. The team renamed the gene MANTLED in oil palm. The gene helps determine the fate of sexual organs, and when mutated can cause male organs to develop instead as female organs. Within MANTLED in oil palm is lodged a retrotransposon. It is one of myriad genomic invaders that lay (mostly) dormant within genes in all forms of life. This particular invader, or one very similar to it, was first spotted in rice plants, and had been named karma.

Martienssen and colleagues discovered that in mantled plants, a methyl mark present in healthy plants was missing at a location in the karma retrotransposon called a splice site. Karma sits within an intron in MANTLED. When the splice site is unmethylated, the gene does not use the normal exon to splice the intron, but instead uses karma. The RNA message copied from the

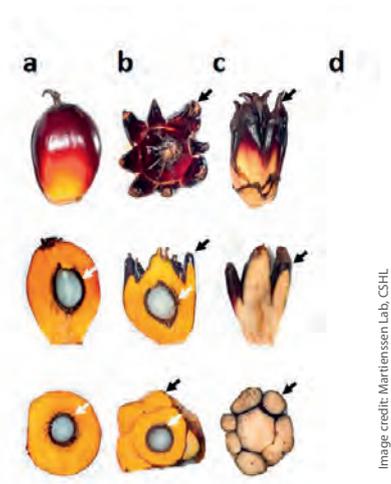


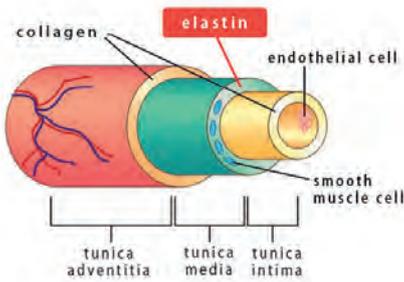
Image credit: Martienssen Lab, CSHL

Imagine planting prized hybrid nurslings in year one, only to discover when the plants mature 6 years later that their fruits are worthless. That’s the ‘mantled’ dilemma facing oil palm growers. Scientists have discovered the genetic secret behind the transformation of oil palm plants bearing normal fruit (far left column) to plants bearing desiccated, worthless ‘mantled’ fruit (far right column). A simple genetic test will enable growers to cull mutated plants at the beginning of the process, while they are still in culture dishes. Credit: Martienssen Lab, CSHL

gene encodes a mutant protein that gives rise to plants with worthless fruit. The team playfully dubbed this faulty gene message ‘bad karma’. In trees that develop normally and yield healthy fruits, the methyl mark is always present at the karma splice site, giving rise to a version of the correct gene message, which the team naturally calls ‘good karma’.

The team is not sure why ‘bad karma’ happens when oil palm tissue is cloned in culture. Martienssen suspects it has something to do with the temporary separation of plant tissue from its place of origin, the stem-cell containing meristem. Meristems also contain small RNAs that help guide methyl marks and other epigenetic signals to appropriate positions along the double helix.

A simple epigenetic test, analogous to inexpensive tests currently in use during pregnancy to detect a panel of human diseases in foetuses, will readily identify bad karma and thus enable growers to cull damaged clones at the plantlet stage. This will save vast sums of money, and importantly, says Martienssen, will be a boon to yield since it will promote the propagation of healthy high-value hybrid clones and thus reduce the economic pressure on growers large and small to devote additional land to generate more fruit.



Elastin glycation assay kit

Elastin is one of the extracellular matrix (ECM) proteins containing collagen that exists in hydrophobic amino acids such as alanine, glycine, valine and proline. It is an elastic fibrous protein which is located in the aorta, ligaments, lungs, skin and connective tissue.

Elasticity and flexibility acting on blood vessels are maintained by elastin. Elastin in the vessel wall and skin tissue is also glycosylated by diseases such as ageing and diabetes. It has been reported to cause sclerotic change and ageing of blood vessels and skin.

The Elastin Glycation Assay Kit, from Cosmo Bio, is a complete assay system designed to measure the fluorescent advanced glycation end products (AGEs) formed in elastin, when the elastin is glycosylated with glyceraldehyde. The fluorescent AGEs can be detected with the fluorescence microplate reader equipped with a 370 nm excitation filter and 440 nm emission filter. The kit provides sufficient reagents to perform up to 192 assays.

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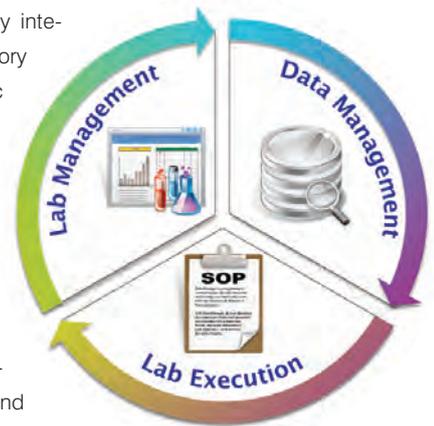
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The Thermo Scientific SampleManager is a fully integrated laboratory platform encompassing a laboratory information management system (LIMS), scientific data management system (SDMS) and lab execution system (LES).

The product can be connected to users' existing informatics infrastructure, regardless of which or how many instrument vendors they use. This enables labs to execute and manage all their laboratory processes easily, with the data rigour and intelligence that laboratory management requires to drive efficiency and profitability lab- and business-wide.

Thermo Fisher's tightly integrated informatics platform now features more intuitive dashboards and an enhanced statistical quality control (SQC) capability designed to detect non-conformance trending before it reaches predefined thresholds. For pharmaceutical QA/QC labs, enhanced SampleManager stability is said to improve study management, substudy execution and planning and maintenance of study inventory. The system also automatically calculates the expiration date throughout a study to verify label claims.

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3PP gas generator

Peak Scientific's Precision Series has been made available by Agilent Technologies as a 3PP gas generator. The move will make it easier for users to enjoy the benefits of Peak's on-demand GC gas solution for those requiring nitrogen, hydrogen or zero air for carrier, detector or make-up gas.

Precision's gas generator technology is designed to meet the specific requirements of GC applications. Models featuring custom blue LED lighting have been introduced exclusively for Agilent, as well as a dedicated water bottle included with all hydrogen generators. The product has minimal annual maintenance requirements.

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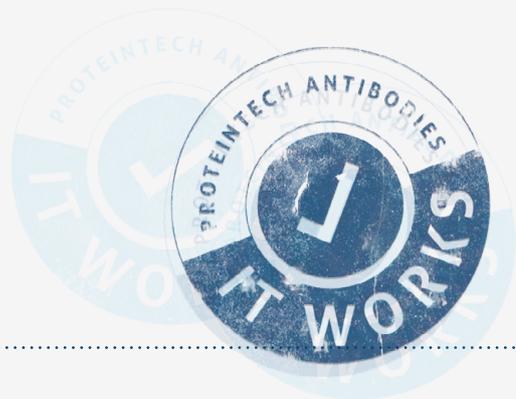
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How Testo supports UTS's critical facilities

Storing pharmaceutical and biological materials isn't as simple as putting them in a facility closet with little-to-no air control functions.

According to the WHO, there are a number of facility climate requirements companies need to abide by. These standards define what sort of temperature loggers organisations should use. The University of Technology Sydney (UTS) is one institution that must pay attention to climate control guidelines.

The university's role in pharmaceutical, biotechnological and scientific assessments has made indoor climate administration a key priority. University Technical Service Support Manager Philip Lawrence detailed how the Testo Saveris data logger assists him in maintaining optimal storage environments.



What's your role at the university?

As Technical Support Manager in the Faculty of Science, I am responsible for cross-facility operations and projects such as the alarm systems, our field vehicle fleet, centralised glasswash, the cryostorage facility and I also manage our superlab teaching facility. Planning and implementing new systems and facilities, as well as reviewing, recommending and applying improvements to existing systems, is routine.

Why does UTS need a temperature monitoring system?

One of the conditions on our insurance for perishable goods is that it is only covered if we have alarms set for our temperature monitoring system. Moreover, the insurance

excess often prohibits any reasonable recovery of losses and is often too little too late when years of work have been lost. We therefore rely on early detection of critical storage problems that allow us to respond to and correct equipment failures and save our precious samples.

Why does the school have multiple temperature parameters for its samples?

Medium-term storage of live cells requires that they are stored below -50°C to prevent the cells from deteriorating. For this we use a -80°C freezer so there is room for temperature drift without losing cells. For very long-term storage of biological samples, we put cells and nucleic acid samples in liquid or vapour phase nitrogen as they need to be kept below the glass transition temperature of water (below -135°C).

We also have incubators running different temperature set points, as our research is diverse — covering biomedical cell culture and cryostorage, aquatic algae and corals. We store numerous other biological samples at -200, -80, -20 and 4°C.

What is it about the Saveris temperature logger that makes it so helpful?

The Testo wireless system allows us to set up new equipment on an alarm in a matter of minutes and gives us direct control of the alarm set points, who receives notifications and in what order. It also gives us instant feedback of all aspects of the system and this allows us to quickly test, troubleshoot and correct problems without depending on other departments in the university. By contrast, wired systems take a long time to install in new locations, are expensive and usually involve several different divisions of the university.

For highly critical temperature storage, the Saveris provides rapid alarms and also allows us to review temperature history for each incubator. For some less-critical systems, we use the device to monitor refrigerator power supplies.

I like the Testo system because it has made the monitoring and troubleshooting of our critical storage practical and easy even across multiple facilities that require different types of monitoring.

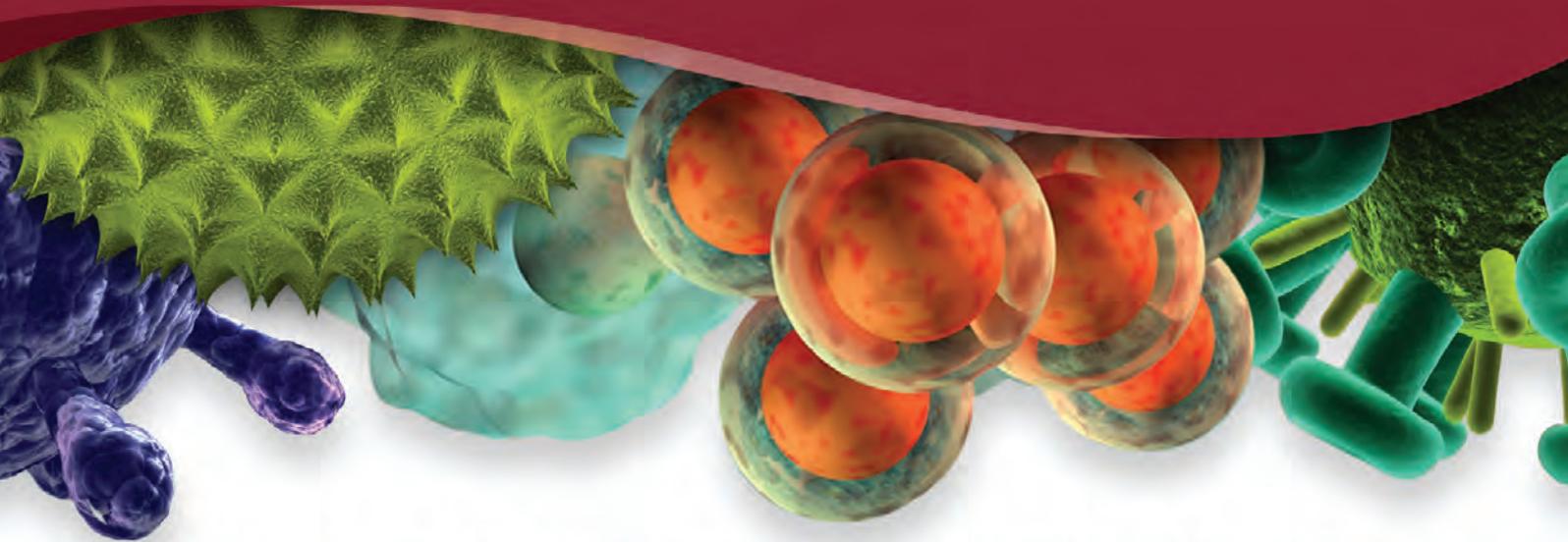
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There's an app for that

Context and location aware mobile apps, integrated with allied technologies, are transforming business processes for biotech companies as they offer the promise of greater accuracy of reporting and improved safety and compliance.

By applying mobile technologies to traditional paper-based business processes, both companies and industry sectors are gaining massive leaps in efficiency and employee productivity. 'Consumerisation of IT' and the omnipresence of powerful portable computing devices makes these business transformations more accessible than ever before.

Even though most are very tech savvy, biotechnology organisations are facing the same pressures as many other industries in responding to reduced budgets and tighter operating requirements. Now, new proximity technology coupled with enterprise mobility apps is allowing these everyday devices to make the previously complex and expensive process of scanning, tagging and tracking far more efficient, accurate and cost-effective.

Highly bespoke activity-centric apps (a concept Ovum has coined 'soldier apps') can now be developed far more quickly and incorporate greater

security than ever before. Typically produced as hybrid apps (HTML5 web apps wrapped in a native app shell), these offer the best of all worlds. They can be very quick to produce with readily available web skills, they offer the same 'evergreen' functionality of websites meaning no need to constantly download app updates, yet they can access all the device functionality to provide a native user experience and incorporate advanced API integration for dynamic data sharing between an organisation's existing backend systems.

Using such apps on a smartphone, smartwatch, tablet or Bluetooth-linked device allows the user to interact with proximity beacons, RFID devices, QR codes and NFC tags. Such devices send a signal, alarm or prompt and the app reads that signal in the context of the user's location, activity or authentication. This can trigger a variety of responses from the app depending on what that tag/beacon is associated with. Beacons, still a relatively new technology, can, for example, send text, audio, images or video to the user's device within a predefined distance so the user is aware that they need to take action at a particular location.

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In the lab

In a laboratory setting, this means that safety systems can be set up around predefined zones. Take, for example, a hazardous area. The user can be notified when they move in or out of a predefined area, with the action they need to take (donning PPE equipment for instance) displayed on the smartphone or linked device (such as a smartwatch). Because such apps are designed to harness all manner of ancillary technologies, you could even interact with other alarm systems to display a warning message on a separate screen alerting other staff in the area. Further, such apps can connect to existing monitoring, testing and measuring equipment to allow an automatic and accurate transcription of results.

Considering other use cases, the transferring of items between locations can progress from a simple 'courier style' tracking at different waypoints to real-time GPS locations. Waypoint scanning of a cloud beacon by a phone/app can instead record data such as temperature (tissue or bone samples need to be kept below -196°C for example), even convey to the user the action required when picked

up or reaching the delivery point. This could be a check list, risk assessment or safety sheet. In the case of a check list in an app, it could also display images of the item for visual identification as items are checked off or scanned. Such procedures can be made mandatory under an app so if they're not followed then a notification can be sent to other staff within the organisation or even outside entities like government regulators or health authorities.

Designing an app with secure login and integrating that app with the organisation's identity and access systems means the options presented to each user under different scenarios can vary with their level of authority, controlled by the backend system. When the user moves into an area, for example, they can be authorised to open cabinets, operate equipment or move items from one area to another.

As smartwatches, Bluetooth wristbands and even biometric clothing are becoming more commonplace and affordable; these can also interact with a user's app to enforce security and/or monitor the wearer's wellbeing. In many biotechnology and medical organisations, both government and commercial,

the monitoring of staff movements is important. Traditionally managing secure access to specific areas is carried out by ID card or tag based security systems but proximity devices and mobile apps linked to wearables that monitor a user's unique heart rate (ECG) or fingerprint scan can now provide a higher level of biometric authentication. Such technologies can even replace a user's ID to access an app and before too long we'll be at a point where we're able to monitor basic functions of pulse, temperature, respiration and stress levels during their work activities.

Already these activity-based apps are being used in other industries to streamline and transform business processes. Organisations as diverse as airports, banks, local councils, construction firms, health and community care providers are uncovering both time and cost savings along with a better and deeper level of data capture. From a safety and compliance perspective, these organisations are also using mobile apps to manage job risk analysis as well as confirming the level of competency of staff to perform high-risk or skilled functions. Checking a user has the credentials to sign off on an activity and then activating alternate workflows for the transformed business process is another vital role activity-based apps can play.

From government laboratories to commercial medical and biotech organisations, the possibilities are endless in improving safety and efficiencies using these new integrated technologies.

**Bob Mudge is a Director of Scan Smart Australia and has been involved in both the medical and the mobile app fields for many years working with a diverse range of medical and bio-medical clients. The company is currently engaged with a number of biotech companies to advise and build out the mobile strategies, policies and technologies behind such innovative work practices.*

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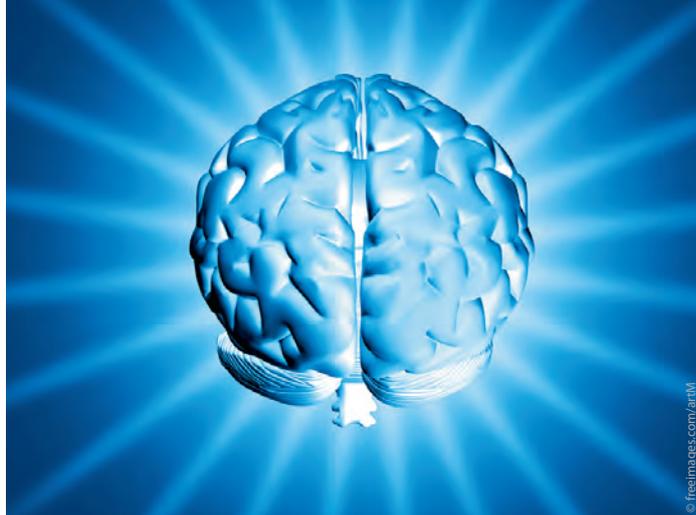
Linkage grant to improve diagnostic imaging

Radiopharmaceutical company Clarity Pharmaceuticals and the University of Melbourne have been awarded an Australian Research Council (ARC) Linkage grant to fund the development of new agents for diagnostic imaging using positron emission tomography (PET). The ultimate aim of the project is to try to improve molecular imaging of the brain for various disorders.

Valued at \$365,000 over three years, the grant will fund research into the use of PET isotopes of copper, gallium and fluorine with a view to replacing existing technologies that rely on single-photon emission from technetium and the technique of single photon emission computed tomography. It has been co-awarded to the University of Melbourne's Associate Professor Paul Donnelly, the inventor of several patents for radiopharmaceutical technologies.

"This grant is a result of continuous collaboration between Clarity and the University of Melbourne, and we are proud that our translational approach to science brings strong positive outcomes," said Clarity CEO Dr Matthew Harris. "Our team is looking forward to progressing the opportunity to support development and commercialisation of new treatments to ensure better patient outcomes."

Clarity recently in-licensed from the University of Melbourne two patents from Associate Professor Donnelly's portfolio, covering analogues of sarcophagine chelators, which stem from a previous Linkage grant between the two organisations. These patents are being used for applications in the imaging of cancer, with a clinical trial currently underway.



ROI slipping in biomedical research



The increasing amount of money spent on biomedical research in the US over the past 50 years has resulted in diminished return on investment in terms of life-expectancy gains and new drug approvals, according to researchers from the Johns Hopkins Bloomberg School of Public Health.

Writing in the journal *Proceedings of the National Academy of Sciences*, the researchers found that while the number of scientists has increased more than ninefold since 1965 and the National Institutes of Health's (NIH) budget has increased fourfold, the number of new drugs approved by the FDA has only increased a little more than twofold. Meanwhile, life-expectancy gains have remained constant at roughly two months per year.

"We are spending more money now just to get the same results we always have, and this is going to keep happening if we don't fix things," said study co-author Professor Arturo Casadevall.

The NIH budget grew substantially from 1965 to 2003, before a steady decrease from 2003 to 2014. Meanwhile, the cost per new drug, in millions of dollars of NIH budget, has grown rapidly since the 1980s. According to Professor Casadevall's co-author, Anthony Bowen, "There

is something wrong in the process, but there are no simple answers.

"It may be a confluence of factors that are causing us not to be getting more bang for our buck," Bowen said. The authors suggest that these factors may include the following:

- Increased regulations, adding to the non-scientific burdens of scientists who could otherwise spend more time at the bench.
- The fact that all the 'easy cures' have been found, and that to tackle Alzheimer's disease, cancers and autoimmune diseases is inherently more complex.
- 'Perverse' incentives for researchers to cut corners or oversimplify their studies to gain acceptance into top-tier medical journals, resulting in findings that cannot be reproduced and are therefore worthless.

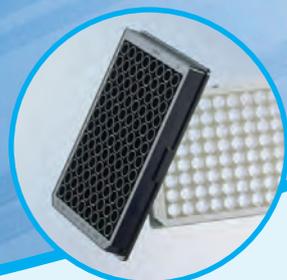
"The culture of science appears to be changing," Professor Casadevall said. "Less important work is being hyped, when the quality of work may not be clear until decades later when someone builds on your success to find a cure." One recent study estimated that more than \$28 billion is spent each year in the US on preclinical research that can't be reproduced and that the prevalence of these studies in the literature is 50%.

While new drug approvals and life-expectancy rates are not the only measures by which to judge the efficiency of biomedical research, the authors argue that a sick person will ultimately need either medicine or surgery to save their life. Many times these medicines haven't been developed, they state, with Professor Casadevall noting that many of the best drugs being used to treat conditions today were developed many decades ago.

"Scientists, regulators and citizens need to take a hard look at the scientific enterprise and see which are problems that can be resolved," concluded Professor Casadevall.

"We need a system with rigour, reproducibility and integrity, and we need to find a way to get there as soon as we can."

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Explore new horizons at ASI2015

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The Australasian Society for Immunology invites you to be a part of its 45th annual scientific meeting (ASI2015), the theme of which is 'New Horizons'.

The event will be held at the National Convention Centre from Sunday 29 November to Thursday 3 December 2015. It will be preceded on the Sunday by four preconference workshops — the Postgraduate workshop, the Tumour Immunology workshop, the Infection and Immunity workshop and the Mucosal Immunology workshop — before the meeting officially opens at 4.30 pm.

The conference will feature an impressive line-up of national and international speakers who will help build an extensive program across the four days. The confirmed speakers will cover a broad range of topics, from cancer immunology through to autoimmunity, ensuring that the conference is of interest to both researchers and clinicians.

The event will include an exhibition of the latest products and services for the immunology industry. The daily conference program will be structured to give participants maximum opportunity to visit the exhibition, network with the exhibitors and pick up information on new products and research currently underway.

For the first time, ASI will partner with the German Society for Immunology (DGfI) for

a satellite meeting jointly organised by both societies. Attendance at the satellite meeting on 3–4 December will be open to all ASI members as well as a delegation of 15–18 senior German immunologists, some of whom will also present at the main ASI meeting.

The meeting will include an exhibition of the latest products and services for the immunology industry. The daily conference program will be structured to give participants maximum opportunity to visit the exhibition, network with the exhibitors and pick up information on new products and research currently underway.

To bring everyone together, the meeting will also host several social functions, enabling delegates and guests to mingle, enjoy good food and wine and experience some entertainment. The functions include a welcome reception, a student gathering and a conference dinner.

The ASI has a strong history of attracting a large group of specialist delegates to its annual scientific meeting, and the combination of the conference and the ASI-DGfI satellite meeting is sure to continue this tradition. Further information on the event can be found on the ASI2015 website: <http://asi2015.org/>.

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what's new

Pathology FISH probes

Oxford Gene Technology (OGT) offers a wide range of fluorescence in situ hybridisation (FISH) probes. The company is extending its portfolio of Cytocell Aquarius Pathology FISH probes, with the addition of eight more probes for 1q25, 1p36, 19p13, 19q13, ROS1-GOPC and RET. The FISH probes provide bright signals for accurate scoring leading to consistent results, backed up by full evaluation support from OGT.

In addition to pathology probes, a large number of other probes are available, including haematology and haematopathology probes, as well as whole chromosome and murine chromosome painting probes.

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The Airwolf AXIOM 3D printer combines the versatility of printing in over 40 thermoplastic materials and a build volume of over 16,000 cm³ to offer a high-performance desktop 3D printer for manufacturing high-precision prototypes and custom functional parts.

AXIOM's fully enclosed chamber and heated bed ensure a consistent heat environment and minimal warpage when printing large parts and enable a high-resolution output with layer heights as low as 40 µm. The product's 315°C hot end supports a range of over 40 thermoplastics — from low-temperature materials like TPU and PLA, through to high-temperature materials like nylon and polycarbonate.

Ease of use has been paramount in the design. Prior to every 3D print, the product's four-point print bed auto-levelling system automatically calibrates the print bed, ensuring the proper initial layer height and orientation, and then actively maintains that levelling throughout the entire print process. The Easy Feed filament system automatically draws filament into its print head, reducing jamming and blockages. The CoreXY motion control system is said to allow faster movement than gantry systems, providing a print speed of 250 mm/s and precise control of the print head.

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Biomolecule measurement

The Malvern Viscosizer TD is an automated characterisation tool that uses Taylor dispersion analysis (TDA) to enable ultralow-volume, solution-based molecular size and stability measurement capabilities, combined with relative viscosity assessment.

Measurements of hydrodynamic size in different solution conditions give insight into the conformational stability and self-association behaviour of a candidate drug. However, these measurements can be challenging due to the limited availability of target proteins, as well as interference from complex buffer and excipient backgrounds.

The Malvern Viscosizer TD addresses these issues by enabling label-free analysis of biomolecules in complex formulations, particularly at low concentrations and low volumes. The stability of small molecules, peptides, proteins and samples with mixtures can be monitored even in the presence of excipients and surfactants, without measurement interference.

UV detection allows measurements at low concentration down to microgram quantities. Measurements are not adversely affected by the presence of low levels of aggregates, so samples can be run without dilution or filtration. Using microcapillary flow methodology, the product also allows complementary relative viscosity measurement on the same sample.

Features include: temperature-controlled sample storage and measurement; nanolitre-scale sample volume for sizing; and microlitre-scale sample volume for relative viscosity. The capability to work in biologically relevant solutions makes the instrument complementary to established tools for protein characterisation such as dynamic light scattering (DLS) and size-exclusion chromatography (SEC).

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Digital multimeter

The Fluke 28II Ex is a completely sealed, IP67-rated, intrinsically safe digital multimeter. Available to rent from TechRentals, it is suitable for hazardous environments found in the petroleum, chemical and pharmaceutical industries.

The product features true RMS readings of AC voltage and current for measurement of nonlinear signals. Measuring up to 1000 V, 10 A AC and

DC, it also handles frequency measurements to 200 kHz, as well as testing involving resistance, conductance, diodes, capacitance and temperature.

Other features include: a 10,000 μ F capacitance range; Ex certifications from leading certification bodies; a backlit keypad; and a large, bright display.

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Nanoparticles for lateral flow assays

The in-vitro diagnostic market requires antibodies to be linked to nanoparticles. Gold nanoparticles are attractive for the development of reagents for lateral flow assays because of their intense ruby red colour. The production of gold nanoparticle antibody conjugates is challenging because of instability, and numerous parameters need to be optimised. Multiple batches are usually made on each project, which adds cost and slows the development of assays.

InnovaCoat GOLD products are 'conjugation friendly' nanoparticles with a surface coat that enhances gold stability and permits easy covalent attachment of a variety of molecules, including antibodies, analytes and other biomolecules. The conjugation reaction is initiated simply by adding a solution of antibody to the freeze-dried powder; the hands-on time is 2 min and the conjugate is ready to use within 15 min.

As well as avoiding the optimisation steps, InnovaCoat GOLD conjugates are said to demonstrate enhanced sensitivity when compared to traditional passive conjugation methods. In the case of immuno-gold conjugates, the antibody can be attached irreversibly without the need for extensive trials at different values of pH and/or salt concentration.

The conjugation kits are available with 10, 20, 40, 60 and 80 nm gold nanoparticles (all with 20 OD). The conjugates can be used in a variety of assays, including lateral flow tests.

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Test method for acid number in crude oil

A test method for the determination of the acid number in crude oil and petroleum refinery intermediates and products is under active investigation by ASTM (ASTM WK48004).

The method is claimed to be more accurate, more precise, more robust and more repeatable than the ASTM D664 potentiometric method. It is also said to be faster and to use less solvent, meaning reagent and waste disposal costs are much lower.

The thermometric endpoint titration (TET) method utilises the same titrant (0.1 mol/L KOH in 2-propanol) as ASTM D664. Instead of using a potentiometric probe (which is liable to fouling of the membrane and clogging of the reference junction after only a couple of determinations), the endpoint is detected using a sensitive, fast-responding electronic thermometer.

The probe requires essentially no maintenance, aside from a solvent rinse, and requires no hydration or calibration. Always ready for use, it can be used by operators as a 'walk-up' method or fully automated with a sample changer in the laboratory. Because the method is fast, it is said to increase corrective response time to varying process conditions, with consequent savings to equipment and process running costs.

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How well are you ageing?

An international group of researchers has found a set of genes associated with 'healthy ageing' in 65-year-olds.

The scientists say their study, published in the journal *Genome Biology*, provides the first practical and accurate test for the rate at which individual bodies are ageing. It could thus lead to numerous insights in research, with 'age' being a critical factor in almost every area of medicine.

"Our discovery provides the first robust molecular 'signature' of biological age in humans and should be able to transform the way that age is used to make medical decisions," said lead author Professor James Timmons, from the Division of Genetics and Molecular Medicine at King's College London. "This includes identifying those more likely to be at risk of Alzheimer's, as catching those at early risk is key to evaluating potential treatments."

The seven-year study, taking place at King's College London, Karolinska Institutet in Sweden and Duke University in the USA, used RNA profiling to measure and compare gene expression in thousands of

human tissue samples. Rather than looking for genes associated with disease or longevity, the researchers discovered that the 'activation' of 150 genes in the blood, brain and muscle tissue were a hallmark of good health at 65 years of age. From this, they were able to create a reproducible formula for 'healthy ageing' and use this to tell how well a person is ageing when compared to others born in the same year.

The researchers used their 'healthy age gene score' to compare the RNA profiles of several 70-year-old subjects. Despite all subjects being born within a year of each other, their RNA demonstrated a very wide distribution in healthy age gene score, varying over a four-fold range. This variation was shown to link to long-term health, cognitive health and renal function. In particular, patients diagnosed with Alzheimer's disease had an altered healthy ageing RNA signature in their blood and, therefore, a lower healthy age gene score, suggesting significant association with the disease.

The correlation between a low score and cognitive decline implies that the molecular test could translate into a simple blood test to predict those most at risk of Alzheimer's disease or other forms of dementia and age-related diseases. Given that early intervention is important in Alzheimer's, the score could even be integrated to help decide which middle-aged subjects could be offered entry into a preventative clinical trial many years before the clinical expression of Alzheimer's.

"This is the first blood test of its kind that has shown that the same set of molecules are regulated in both the blood and the brain regions associated with dementia, and it can help contribute to a dementia diagnosis," Professor Timmons said. "This also provides strong evidence that dementia in humans could be called a type of 'accelerated ageing' or 'failure to activate the healthy ageing program'."

Additionally, the molecular test could enable more suitable donor matching for older organ transplants. It could also provide a more efficient way of determining if an animal model of ageing is suitable to evaluate the effectiveness of anti-ageing treatments.

Interestingly, a person's healthy age gene score was not found to correlate with lifestyle-associated conditions, such as heart disease and diabetes. It is therefore likely to represent a unique rate of ageing largely independent of a person's lifestyle choices. Furthermore, the study does not provide insight into how to improve a person's score and thus alter their biological age.

"We now need to find out more about why these vast differences in ageing occur, with the hope that the test could be used to reduce the risk of developing diseases associated with age," Professor Timmons said.



Trays

Labware manufacturer Kartell has released a series of trays.

The company's deep PVC trays, with deep, ribbed bases, are suitable for photographic purposes. The trays are made stackable for easy storage and come in a variety of sizes, from small (200 x 150 x 45 mm) to large (540 x 420 x 180 mm).

Kartell also has a range of high-impact PS trays, which are suitable for use with foodstuffs or for general laboratory use. They are also stackable and are available in sizes from small (201



x 151 x 21 mm) to large (408 x 299 x 81 mm).

The company's low-form, deep trays are available in three sizes ranging from small (310 x 415 x 97 mm) to large (410 x 458 x 143 mm). The HDPE trays are stackable and come with handles for the user's convenience.

The manufacturer has also released rectangular tanks with draining holes on all sides. They are stackable and made from HDPE, with a recessed rim to allow for ventilation. They are available in one size: 350 x 540 x 115 mm.

Sieper & Co Pty Ltd
www.sieper.com.au



Vortexer with universal attachment

The LLG uniTEXER Vortexer, with a single carrier head, accommodates common consumables such as vials, test tubes, cylinders and conical tubes within the lab. It is compatible with the following: one assay plate,

two 50 mL conical tubes, two 15 mL conical tubes, four x 1.5/2 mL microcentrifuge tubes, six 0.5 mL microcentrifuge tubes or twenty-four 0.2 mL microcentrifuge tubes. The mixer can replace a vortexer that requires multiple heads in order to be as flexible and versatile as the unit, according to the company.

The product's quiet, rattle-free mixing is suitable for gentle sample mixing, hands-free shaking, cell pellet resuspension and high-frequency mixing. Due to its open design, the carrier head is easy to clean, preventing cross-contamination between tasks. The vortexer features an easy-to-use rotary dial that is used for fine speed control and allows variable speed. The dial clearly displays the speed.

The modern design is both aesthetically pleasing and functional. The orange housing makes the mixer easy to see in the lab and features housing made of acrylonitrile butadiene styrene - a strong and rigid case to protect the device against any drops or bumps. The mixer features elastomeric feet, which ensure good stability on the bench and quiet operation. It weighs 3.8 kg.

The vortexer is suitable for laboratory mixing in chemical, biotech, environmental and pharmaceutical laboratories. Eppendorf 5 mL tubes fit into the universal attachment.

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Single-cell genomics to combat inflammation

Husband-and-wife team Marcel and Claudia Nold are using single-cell technologies to control inflammation — an important response to infection or injury which, nevertheless, can cause conditions such as diabetes, heart disease and Alzheimer's disease if not carefully controlled.

“Inflammation is a double-edged sword: in many diseases, such as stroke, heart attacks and autoimmune diseases like Crohn's disease and lupus, the immune system's responses are too strong and can wreak great havoc if not sufficiently contained,” said Associate Professor Marcel Nold.

“Rampant, uncontrolled inflammation leads to tissue damage, which, in the unfortunately not-uncommon severe cases, can result in organ failure and death.”

Based at the Hudson Institute of Medical Research, the Nolds and their colleagues recently discovered the mechanisms by which interleukin 37 (IL-37), a cytokine of the IL-1 family, acts to regulate immune responses and to control inflammation in the body. Their study was published in the journal *Nature Immunology*.

The team found that, to achieve its powerful protective effects, IL-37 uses a pair of very specific receptors on target cells. Binding of these two receptors triggers IL-37 to instruct target cells to execute a cascade of events, which subdue some of

the molecular pathways by which the body mounts inflammatory responses.

“IL-37 has been shown to override the body's destructive responses to injury and disease, and our experiments will further probe how we can block or mimic its function,” Associate Professor Nold said.

“We hope this discovery could be harnessed to suppress inflammation in all different kinds of scenarios, from autoimmune diseases to the common cold, and to unleash the immune system's own desired and targeted attacks on various cancers.”

The Nolds' research recently received a boost from the inaugural \$50,000 Fielding Innovation Award, which supports a Hudson Institute scientist who is producing major advancements in the commercialisation of their research. According to Dr Claudia Nold, the award will “greatly help us to get the extensive amount of work done that our laboratory needs to accomplish over the next 12 months and beyond in order to take our findings through to a commercial stage”.

The team's next step will use single-cell technology, located at the Hudson Institute's Single Cell Genomics Centre, to analyse the activity of genes controlling the receptor's function. As noted by Hudson Institute Associate Director Professor Paul

Hertzog, single-cell genomics allows enables scientists to “isolate each individual cell from a diseased organ or tumour to establish which cells are actually causing the disease, or responding to a treatment”.

“By allowing scientists to analyse the transcription of thousands of genes at the single-cell level, the technology enables researchers to identify different cell types that have, until now, remained out of reach,” he said.

The Single Cell Genomics Centre was officially opened last month by Parliamentary Secretary for Medical Research Frank McGuire, who toured the state-of-the-art facility to learn about the groundbreaking research being enabled by single-cell technology. The centre has also been named a Single Cell Centre of Excellence by biotechnology company Fluidigm, making it the first facility in the Southern Hemisphere to receive such an honour.

The centre will this month relocate to the Monash Health Translational Research Facility (TRF) — the result of a partnership between the Hudson Institute, Monash Health and Monash University. The \$87.5 million building will enable single-cell genomics research to be more actively translated into patient treatments, with an entire floor dedicated to clinical trials.



Medical keyboard with integrated touchpad

Interworld Electronics has released the SK-97-TP sealed medical keyboard. The full-size, 97-key keyboard includes a numeric keypad and 12 function keys. For added convenience and functionality, it also features an integrated touchpad with left- and right-click buttons.

The device is housed in a lightweight, ultrathin ABS polycarbonate case with an industrial silicone rubber keypad. It is fully sealed and meets IP65 specifications, making it resistant to splashing, hose-directed water; bleach, alcohol and hospital-grade disinfectants; corrosive, abrasive, acidic and alkaline substances; and dirt, dust, sand and other airborne debris.

With an operating temperature range of -0 to +60°C, the product is equally at home in office, laboratory and industrial environments. The USB interface is compatible with all modern computer systems.

Typical applications include scientific and medical research laboratories; operating rooms; medical carts; food and beverage processing plants; and other environments where a lightweight, compact, fully sealed keyboard is a necessity.

Interworld Electronics and Computer Industries
www.ieci.com.au

Stable-labelled internal standards of antifungal agents

Cerilliant has introduced five stable-labelled internal standards of the antifungal agents fluconazole, itraconazole, ketoconazole, posaconazole and voriconazole at 1 mg/mL concentrations. The certified reference materials offer clinical and diagnostic testing labs, hospitals and bioanalytical/PKDM labs a full selection of internal standards for quantitation of the most common antifungal drugs in serum or plasma by mass spectrometry-based analytical methods.

The certified reference solutions are manufactured and certified to industry standards, including ISO Guide 34, ISO/IEC 17025 and ISO 13485, and are compliant with ISO 15194. The deuterium or ¹³C substitutions of each internal standard were carefully chosen to conserve a minimum [M+3] separation from the unlabelled drug in the major ion fragments used in LC-MS/MS antifungal TDM applications and metabolism studies.

The internal standards complement Cerilliant's catalogue of triazole, imidazole and other azole antifungal certified spiking solutions. The company will also introduce stable-labelled internal standards for the antifungal metronidazole and active metabolite hydroxyitraconazole.

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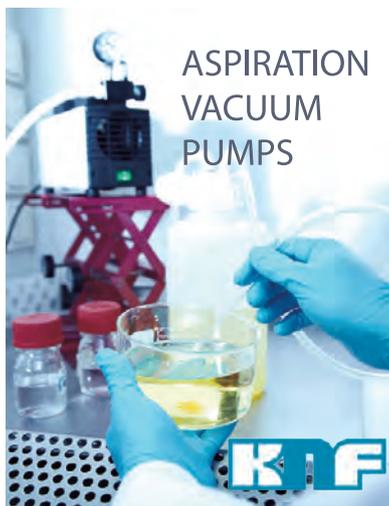
Brushless DC motor for use in a vacuum

maxon motor has released a brushless DC motor suitable for use in an ultrahigh vacuum.

The 22 mm, 24 V brushless DC motor is an off-the-shelf solution for an application that traditionally requires high levels of customisation. The stainless steel, SmCo magnet-based brushless motor features low outgassing and can be baked out at 240°C. It is also vibration tested to MIL-STD810F.

Scientific and vacuum applications for DC motors are varied, an example being the Watt balance — a machine developed to compare masses with electrical values in a vacuum. The balance seeks to use Planck's constant to redefine the kilogram in terms of voltage and current. The vacuum-capable motor has allowed scientists to build a 3-axis robot, providing the necessary mass movements for the experiment.

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Tyvek IsoClean delivers a balance of protection, durability and comfort. Made using DuPont's patented flash-spinning process, it provides an inherent barrier to particles, microorganisms and non-hazardous light liquid splash.

The IC105 Coverall is clean processed and then sterilised for use in Level A, ISO Class 5 cleanrooms. The product meets the requirements of users who have limited space in their operations and see the benefits of reducing the number of SKUs they need to stock.

Gamma sterilised to a SAL of 10^{-6} , the garments are claimed to offer lowest level of particle shedding within the DuPont product portfolio. Serged seams have multiple interlocking threads that are sewn around the raw edges of garment material to create a strong, stress-resistant seam.

The coverall has elastic openings for a tight fit at the wrist and ankle. It features an attached hood with elastic around the face opening and attached thumb loops to minimise bunching of the sleeves.

There is front-zipper closure for easy donning and doffing, while the attached boots with PVC soles provide enhanced skid resistance and durability.

DuPont (Aust) Limited
www.dupont.com.au

Petri dish filler

For laboratories involved in culture media preparation, sterile dispensing is essential for successful downstream applications and to meet quality requirements. The Integra MediaJet plate pourer system is suitable for automatic petri-dish filling with culture media.

The product offers the flexibility to fill petri dishes of various sizes, petri dishes with two compartments and test tubes of various diameters and lengths. At the same time, the unit requires only minimal bench space in the laboratory.

The intuitive, full-size graphical user interface makes it easy to control all functions of the system. The feed-in-stack out technology ensures completely user-independent operation. The typical production variations in the diameter and shape of the petri dishes are easily handled by the unit as they are actively guided throughout the entire filling process.

Sources of contamination are eliminated with the single-piece construction of the filling chamber, allowing for convenient cleaning; and the UV lamp extension over the full length of rotor where the dishes are opened. The lamp emits a powerful 2.1 W UV-C radiation for optimal bactericidal efficiency. User safety is ensured as the lamp is shielded from the user with a UV-blocking lid.

The product is compatible with a wide range of 35, 60 and 90 mm petri dishes. It is complemented by the Integra MediaJet, which enables the sterilisation of up to 30 L of media.

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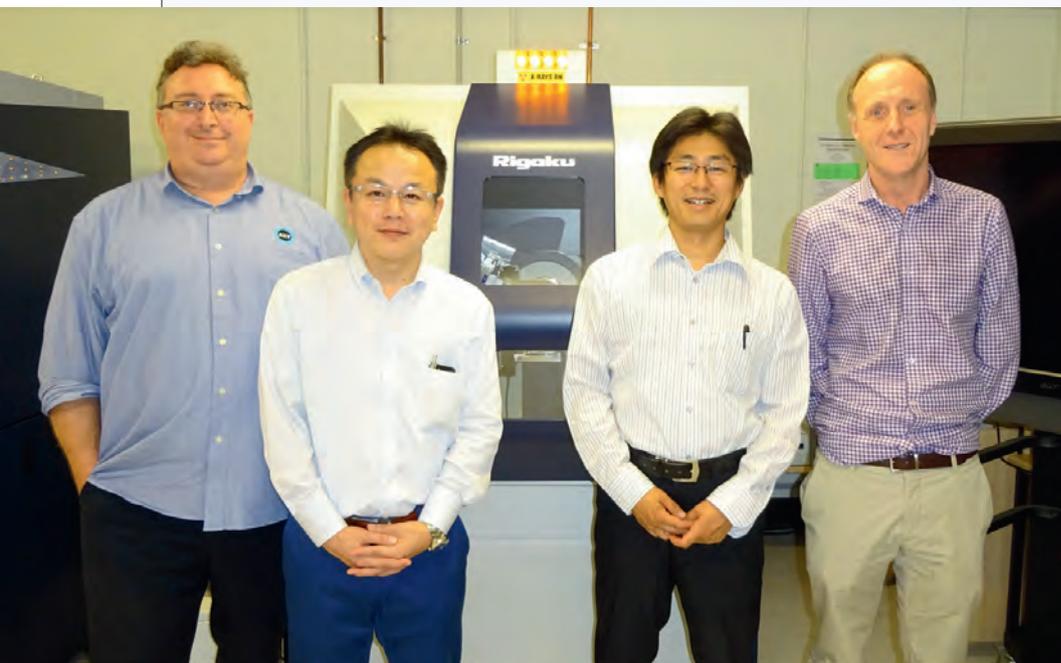


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UQ is now home to a high-powered X-ray diffractometer



Richard Trett (AXT), Akira Kitamura, Shintaro Kobayashi (Rigaku) and Kevin Jack (The University of Queensland) with the 9 kW Rigaku SmartLab diffractometer.

Scientific equipment supplier AXT has completed the installation and commissioning of the Rigaku SmartLab — claimed to be Australia's highest powered X-ray diffractometer (XRD) — at the Centre for Microscopy and Microanalysis (CMM), The University of Queensland (UQ). The system features a 9 kW rotating anode X-ray source and has been configured for thin film analysis with Rigaku's in-plane hardware.

"We are very excited about this new acquisition," said CMM Acting Director Dr Kevin Jack. "It makes an excellent addition to the analytical capabilities of the centre and will be extremely beneficial to our researchers, who are developing materials for a range of applications such

as solar cells, electronic devices, membranes, fuel cells, semiconductors and biomaterials. We have a number of users queuing up to use it already."

The X-ray flux is said to be second only to a synchrotron, enabling high-sensitivity measurements to be achieved. It is claimed that the product will make detection of trace phases and ultrathin films possible, as well as increase throughput and speed up research.

The in-plane arm allows detailed studies to be carried out using data collected perpendicular to the sample surface. This ability is relevant to thin film analysis, as thin films and coatings are often highly oriented due to the manner in which they are deposited or grown. This opens the door to perfect pole figure determination, which would not otherwise be possible, as well as orientation studies that would be very time-consuming using a more conventional goniometer. Coupled with SmartLab hardware which maintains the sample in the horizontal plane and high X-ray flux, the product is tailored for thin film analysis.

Once installed, the instrument requires little maintenance and can be readily reconfigured to perform a range of differing measurements. Its user-friendly guidance software walks the operator through any hardware changes. Smart components that the software can identify ensure configuration changes are made correctly. Smart cabling and Rigaku's auto-align functionality make the system suitable for use by non-experts, maximising measurement time and minimising the time required for training.

The guidance software also helps optimise experimental parameters. It will help the UQ researchers perform a range of thin film measurements, such as out-of-plane diffraction; high-resolution XRD; in-plane XRD; X-ray reflection (XRR); small-angle X-ray scattering (SAXS); pole figures; and rocking curves.

While the diffractometer has been designed for thin film diffraction measurements, it can also be configured to analyse bulk materials — such as powders and solids — and has the ability to carry out spatially resolved (micro)diffraction and in situ temperature studies. Additional flexibility is possible with the addition of the battery cell attachment, as well as a host of other attachments that provide further levels of versatility.

The system commissioning coincided with thin film XRD seminars presented by Rigaku's thin film expert Shintaro Kobayashi. Seminars were held at Swinburne University of Technology and the University of New South Wales in the lead-up to the main event at UQ, which included live demonstrations of the SmartLab's functionality and capabilities.

AXT Pty Ltd
www.axt.com.au



Data collection and visualisation software

Mettler-Toledo has introduced its Collect+ data collection and visualisation software. The software shows users a visual overview of their operations, taking complicated process data and making it easy to understand at a glance. It is designed for use by quality managers, production managers, maintenance managers and procurement managers.

Production scales and other equipment can be connected to a central data collection system that stores the data in real time for archiving and analysis. The integrated dashboard tool can show process trends over time, highlight deviations and gauge performance in views that can be customised for specific production areas or employees. The software can also export data to Microsoft Excel for integration into other reporting systems and distribute the information to anyone who needs it, no matter where they are in your facility.

The product can be installed in a matter of minutes and can be accessed from multiple PCs and on mobile devices. As it supports Windows operating systems, there is no special server required. Nearly any device with data output can be connected, and millions of measurements can be stored thanks to an optimised data collection engine.

Mettler-Toledo Ltd
www.mt.com

96-well protein precipitation plates

Restek's line of Resprep sample preparation products has expanded to include 96-well protein precipitation (PPT) plates. The Resprep PPT3 96-well plates offer efficient protein removal with built-in, drip-free membrane and three-way versatility for filtration, so the user can easily prepare serum, plasma and other biological samples.

The plates offer greater than 99% protein removal and drip-free, in-well protein precipitation for a minimum of 24 h — with no fear of backflushing or contamination. A dual-layer membrane with different porosities in each layer prohibits clogging, speeds up filtration and, using the company's recommended solvent-first method, streamlines sample preparation even further.

The 2 mL deep wells are suitable for mixing by vortex or pipette, and the 96-well plates can be used to increase throughput in general filtration applications. The versatile plates are compatible with all common filtration devices: vacuum manifold, positive pressure manifold and centrifugation.

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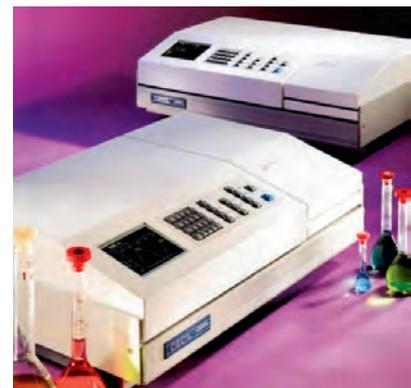
Cecil Instruments has added extra software and accessory options to its UV/Visible spectrophotometers, making them even easier to use. The spectrophotometers provide for fast, easy and precise measurements, with wavelength ranges extending to 1100 nm.

The units may be used within many fields, such as food and beverage, molecular biology, environmental testing, clinical chemistry, genomics, metabolomics, proteomics, sports testing, production facilities, pharmaceutical and nutraceutical research, and optical and surface coatings testing. They can be operated in a choice of six languages with instantly expandable ESEF software options and password protection.

The spectrophotometers may be supplied with a wide range of additional features, such as PC use, USB ports, integrating spheres, nano cells, food and beverage programs, molecular biology methods, temperature control, automatic cell changers, variable path-length cell holders, water testing methods, high-performance wavelength scanning, multiple wavelength analyses, multicomponent analyses, automatic calibration curves, spectral derivatives and dissolution testing accessories.

BEST Lab Instrumentation Pty Ltd

www.bestlab.com.au



DC linear actuator for positioning

maxon motor has released a 6 mm micro linear positioning drive with internal gearing. Micro DC motor linear positioning systems are suitable for applications that require accurate positioning and high forces while maintaining minimal weight and a small footprint; eg, syringe pump actuation and lens or sensor adjustment in a production or laboratory environment.

The linear speed, length and forces can be controlled and adjusted by combining a suitable brushed or brushless DC motor, encoder and motor drive electronics. Up to 11 N continuous and 15 N intermittently can be achieved with linear speeds of 25 mm/s. With a linear actuator, thrust bearing system and planetary gearhead in one assembly, the product weighs only 2.9 g. This makes it suitable for specialist robotic applications.

The device is available in two versions: a ceramic version for high efficiency and longer lifespan; and a metal version which is more cost effective for less demanding applications.

maxon motor Australia Pty Ltd

www.maxonmotor.com.au



Surface area and porosity instrument

The Micromeritics ASAP 2060 surface area and porosity instrument is equipped with 10 and 0.1 mmHg high-resolution transducers to permit krypton (low surface area) and micropore measurements, respectively. The single-port system provides pressure measurement from 0 to 950 mmHg and features resolution up to 1×10^{-7} torr (0.1 mmHg transducer).

Increased throughput is available with up to three additional units on a shared turbo pumping system, without adding the additional multiple dedicated vacuum systems. The instrument provides research-grade results and MicroActive software to the user.

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Rotational rheometer

In the development of new foods, scientists incorporate analytical instruments such as rotational rheometers to scientifically quantify texture and identify foodstuffs that are suitable for further development. Rheology — the study of a material's tendency to deform and flow — can be linked with mouthfeel and the release of flavours, making it an important analytical technique for food development.

The Malvern Kinexus rotational rheometer is used extensively throughout the food industry to customise formulations and achieve products with the right look, feel or stability. The Kinexus enables detailed exploration of the internal structural features which underpin the performance of foods.

The Kinexus Ultra+ Rheometer is claimed to have the highest sensitivity air bearing and widest torque range, coupled with the impressive vertical (axial) control capabilities of the Kinexus platform, for rheological testing. The user-friendly, sequence-driven rSpace software enables fully customisable test design to allow researchers to set up and investigate tailored rheological test protocols.

A wide variety of measurement geometries are available and are optimised for rheological characterisation of complex fluids and soft solids, including dispersions, emulsions, polymer and surfactant solutions, pastes and gels. Intelligent geometry recognition comes standard, with full auto-configuration and user feedback on system status to ensure robust data for all measurements.

Other features include: dual-action capabilities for shear and vertical (axial) test control; total flexibility of control; complete sample history captured every time; and SOP-driven tests for consistent testing with user feedback and guidance.

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Who wins — the fungus or the frog?

An epic battle is being fought between frog-killing chytrid fungus and the frogs of the world. And the outcome is not clear-cut. Australian scientists have found that while some native frogs are winning their war, others are not.

Research has suggested that the chytrid fungus has been spread by the African clawed frog, which carries it but is immune. For decades African frogs were exported worldwide following a 1934 discovery that they could be used for pregnancy tests in humans.

Studies by the ARC Centre of Excellence for Environmental Decisions (CEED) show the whistling tree frog is successfully beating the lethal fungus, as is the alpine tree frog. However, the iconic yellow-and-black striped corroboree frog — a critically endangered Australian species — is fast losing the struggle.

The research is also revealing what causes frogs to live or die, providing scientists crucial clues in the fight to save the nation's remaining frogs, said Ben Scheele, who recently completed

his PhD with CEED at The Australian National University (ANU).

"Frogs catch the fungal infection through contact with infected water or direct contact with other infected frogs," said Scheele. "It attacks the skin, making it difficult for the frogs to breathe, and this stops their heart eventually.

"Chytrid has since been found in over 500 amphibian species and is now on all continents except Antarctica," Scheele said. It has driven the decline of over 200 species, of which 113 are thought to be extinct. As Australian frogs face the same fate, we decided to investigate this killer, focusing on its long-term effects."

Good news is that the whistling tree frog is recovering, since its population crashed in the 1980s, Scheele said. Surveys show that year by year, the species is returning to habitats it used to occupy decades ago, and it has even been found at 39 new sites.

"High-quality habitat plays an important role. Many of the sites we looked at contained coarse woody debris which provided refuge for new colonisers. These ponds also had more plants and stable water levels which are needed to protect developing frog eggs and provide habitat for tadpoles," he explained.

Monitoring by the NSW Office of Environment and Heritage shows that numbers of endangered alpine tree frogs, despite going through a similar decline in recent decades, now appear stable. "Our studies reveal this is because chytrid is rare in their tadpoles and juvenile frogs, which enables the next generation to spread out in its woodland habitat free of the disease," said Scheele.

"Although adult frogs later return to the wetlands to mate and contract the fungus, they are usually able to breed before they die."

On the other hand, the iconic northern corroboree frog, once abundant in Kosciuszko and Namadgi National Parks, is being pushed closer to extinction every day. While some frogs survived the fungus's attack in the 1980s, they are still infected through common eastern froglets that carry chytrid and share the corroboree frog's habitats.

"For frogs that are losing the battle, we'll have to breed them in captivity or transfer them to environments that can help get rid of the fungus," said Scheele. "These include ponds with shallow edge areas that heat up rapidly, as chytrid dies in warm temperatures. We can also deepen ponds and fill them with water, preventing them from drying during droughts and killing tadpoles."

It's crucial to maintain high-quality habitats for frogs that are surviving or re-expanding their population, he added. "Australians can also help by monitoring their local frogs — through programs such as FrogWatch — and help raise awareness on how to protect our amphibians.

"Our results show that given enough time, some amphibian species can recover from diseases, provided that high-quality habitat is protected. So the simplest thing we can do for these species is to prevent further habitat loss."

The study 'Low impact of chytridiomycosis on frog recruitment enables persistence in refuges despite high adult mortality' by Scheele, BC, DA Hunter, LF Skerratt, LA Brannelly and DA Driscoll was published in *Biological Conservation*.

The study 'Decline and re-expansion of an amphibian with high prevalence of chytrid fungus' by Scheele, BC, F Guarino, W Osborne, DA Hunter, LF Skerratt and DA Driscoll was published in *Biological Conservation*.

Diabetic biomarker test

EKF Diagnostics has introduced a diabetic biomarker test that provides a 2-3 week indicator of average blood glucose. The Stanbio Chemistry Glycated Serum Protein (GSP) LiquiColor test closes the information gap between daily blood glucose testing and the 2- to 3-month HbA1c reading. This means it serves as an accurate intermediate marker of glycaemia in instances where HbA1c may be of limited value, such as pregnancy, reduced RBC lifespan and hemodialysis.

The assay, based on a double enzymatic degradation method, is said to provide better specificity and accuracy compared to the older non-enzymatic fructosamine NBT method. This is because the test utilises the specificity of fructosyl-amino oxidase to eliminate inaccuracies caused by non-glycated protein reducing substances which significantly interfere with the NBT fructosamine method.

Available as a liquid-stable kit and calibrator, the open-channel enzymatic test is suitable for use on a variety of clinical chemistry analysers, with onboard stability of up to four weeks. It is also both FDA approved and CE marked.

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Leak test devices

The Leak-Master series of leak test devices locate small holes in rigid or flexible packaging quickly and precisely, enabling inert gas and vacuum packaging to be tested for leaks via a method that doesn't involve trace gas. The Leak-Master Easy is the entry-level model in the series.

The test product is placed in a chamber filled with water. When the lid is closed, the air space above the water level is evacuated, the package inflating underwater. If air bubbles emerge, there is a leak. The test method is straightforward and has the additional advantage that the weak point of the packaging is visible.

The Leak-Master Easy Plus records, saves and communicates (via ethernet and SD card) its test program and results. This means QC/QA managers can check all leak test results at any time.

Operation is via a coloured touch screen, enabling products, users and test programs to be configured rapidly and easily. After logging on to the device and selecting the product to be tested, the user places the packaging in the test chamber, closes the cover and starts the program.

The preset vacuum is automatically generated and maintained over the defined time period. The user performs a visual inspection and enters whether the packaging was leak-proof or not after the test process. The end result is a standardised test sequence that can be reproduced at any time.

Special test programs are also possible, eg, height simulation. At the touch of a finger, the system can simulate a flight profile. Variants with CO₂ as the test gas are also available. The test is performed without contact in a vacuum chamber using a sensor, which logs any escaping CO₂.

The inline variant Leak-Master MapMax can be integrated seamlessly into a packaging line. Testing for carbon dioxide is also carried out here, but fully automatically and with a speed of 15 cycles/min so the entire production is logged. All detectors are available in multiple chamber sizes.



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The risky business of cell culture

The process of cell culture is one which can be beneficial for modelling health and disease but is not without its risks — risks which many scientists are often willing to take.

Cultured cells — ie, those removed from an animal or plant for growth in an artificial environment — retain many of the properties of the parental tissue or cell type, including disease-specific changes. This similarity means that cell-based screening platforms can be used effectively to test new therapeutic approaches.

However, cell culture also carries risks. Without proper handling, cultured cells may change in behaviour as they are transferred to new medium formulations, become contaminated with microorganisms or become cross-contaminated by cells from another culture. This could place the safety of the scientist at risk and/or negatively impact any subsequent research. However, many laboratories are not aware of common cell culture problems and do not manage these risks effectively.

In order to assess cell culture risks and their management, not-for-profit cell line repository CellBank Australia conducted what is claimed to be the first survey to look at cell culture practice in Australia and New Zealand. The 250 eligible survey respondents were typically Australian biomedical scientists with at least 12 months' experience who handle multiple cell lines on a weekly basis. The results of the survey were published in the *International Journal of Cancer* by University of

Sydney researchers, led by CellBank Australia General Manager Mark Shannon.

When asked about the sources of cell lines that entered their laboratories during the previous year, 76% of respondents indicated that they had obtained cell lines from either research laboratories or originators — sources where mycoplasma and authentication testing are often not performed — as opposed to official cell line repositories. In addition, more than half (54%) had gifted their cell lines to other research laboratories.

The researchers acknowledged that the sharing of reagents is often seen in the scientific community as a form of collaboration. “However,” they wrote, “sharing of cell lines contravenes Material Transfer Agreements, which usually state that material should not be distributed to third parties. Sharing of cell lines without testing also means that contamination is not detected and is an important reason why it continues to be a widespread problem.

“To address this risk, scientists should obtain their cell lines from a source that performs mycoplasma and authentication testing. We encourage scientists to deposit published cell lines in a repository, where the necessary testing is performed to detect contamination before cell lines are widely distributed.”

Respondents were further quizzed on their own laboratories' testing and quality assurance practices. When asked about mycoplasma, 75% of respondents indicated that testing was typically

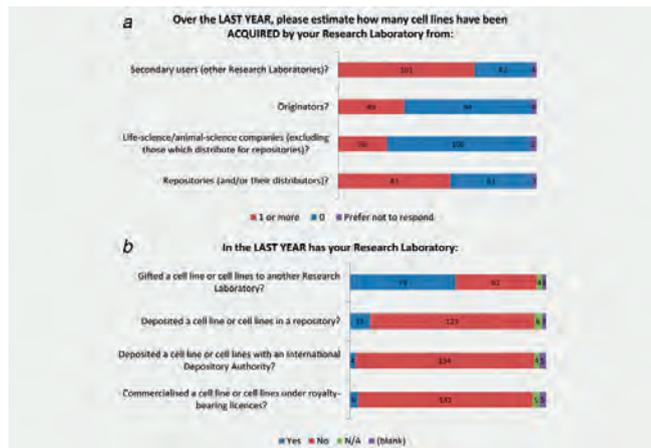


Figure 1: Incoming and outgoing cell lines in the last year.

performed — others said their laboratory did not test for mycoplasma (16%) or had not decided (9%). Laboratories most commonly performed their own testing (32%), though some used in-house services or went to external providers.

Meanwhile, 46% of respondents said that authentication testing was typically performed in their laboratory — others stated that authentication testing was typically not performed (18%), that they were unsure (18%) or that a decision had not been made regarding testing (16%). Laboratories that tested for authenticity most commonly used an external provider (40%), with others performing their own testing or using in-house services.

“When testing is performed, 18–20% of scientists detect contamination in at least one sample,” the authors noted. And yet, “A large minority of the scientists surveyed still do not test for mycoplasma or authenticity.” This is particularly worrying in the case of those respondents who do not conduct testing when gifting to, or obtaining from, other laboratories.

Finally, respondents were asked about practices regarding banking, storage and shipping of cell culture. Around 6% indicated that frozen stocks were lost in the last year due to failure of an on-site liquid nitrogen storage container, while a further 10% had lost cell line stocks while in transit from an overseas source. When asked whether their laboratory typically uses a master bank approach for its cell lines — an approach which minimises the risks associated with prolonged passaging and enables testing of stocks for authenticity and contamination — approximately half (47%) responded in the affirmative and 20% in the negative. The rest were either unsure or undecided.

The researchers concluded that there are many measures which could help combat cell culture risks, including more standardised and accessible methods for testing contamination, guidelines to improve the reporting of preclinical research and improved training.

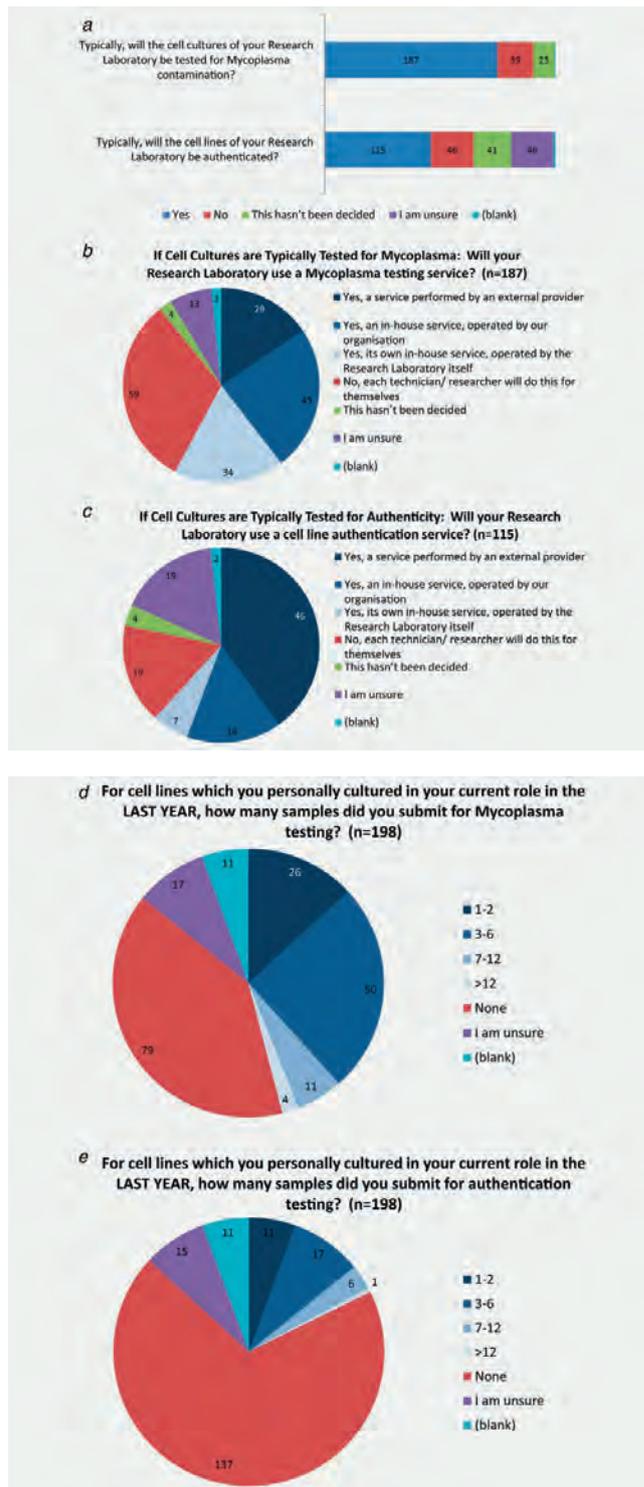


Figure 2: Mycoplasma and authentication testing uptake.

“[But] while training is part of the solution, it does not address the risk that scientists may decide not to test their cell lines for contamination,” the authors stressed. “To address this risk, it is essential for publications to report on a cell line’s source and its mycoplasma and authentication testing status.”

According to Shannon, the study has been very worthwhile.

“Now the research community has a better sense of both its strengths and its weaknesses when it comes to managing common risks in everyday cell culture practice,” he said. “To me, this is a great step forward as we now have a benchmark to work from — one that I expect will be very helpful to individual laboratories and institutions as they strive to achieve more credible, reproducible and translatable research from cultured cells.”



Process analyser

The Metrohm ICON 4117 process analyser performs photometric absorption measurements in the visible light range. With differential absorbance colorimetry (DAC), the analyser compensates for the colour and turbidity of the sample by measuring both before and after the addition of a colour reagent.

The DAC technique can be used to measure aluminium, ammonia, chlorine, chromium, copper, cyanide, hydrazine, iron, manganese, nickel, nitrate, nitrite, phenol, phosphate, silica and zinc. The photometer module comprises a heated cuvette with 2.4 cm light path and a long-life LED source.

Various parameters can be managed by the software, besides analysis results — low-reagent level alarms, calibration errors and loss of sample are a few examples of alarms that can be logged in the database or sent to a control room for further review by the operator.

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March 2015
 Total CAB
 Audited Circulation 7937

Printed and bound by
 SOS Print+Media

Print Post Approved PP100008671

ISSN No. 2203-773X

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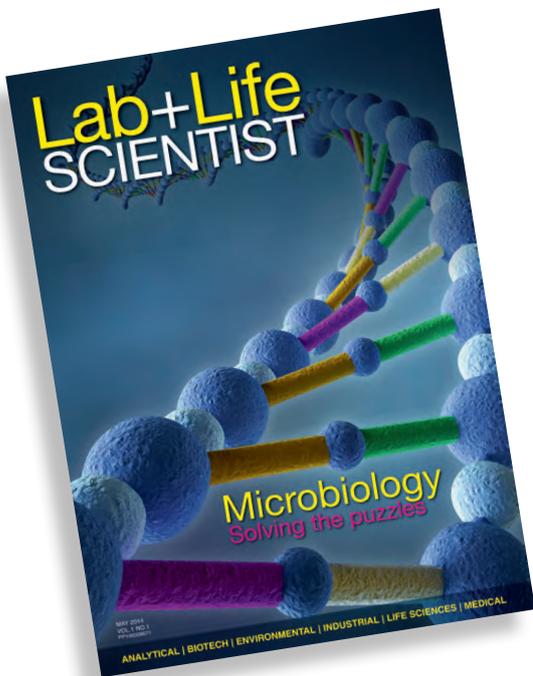
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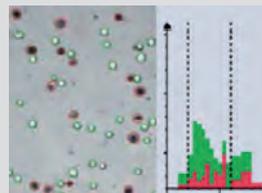


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