

Early detection blood test to help diagnose Alzheimer's

Bio21 Institute researchers have developed a non-invasive blood test that could diagnose the early onset of Alzheimer's disease (AD) with increased accuracy.

Ten years ago, group leader Professor Andrew Hill and his team began investigating the role small membrane vesicles called exosomes have in neurodegenerative diseases. From looking at the protein cargo of these vesicles, his laboratory now focusses on characterising their genetic content, particularly small non-coding RNA species such as microRNA.

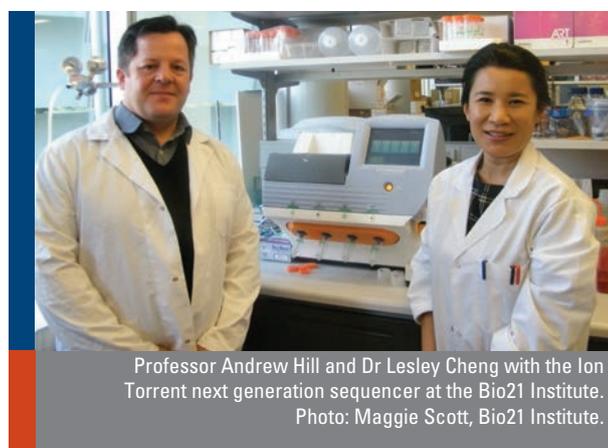
"Over the last three years, the team has been working on the technique of harvesting microRNA, contained in the protected bubbles of genetic material inside exosomes, from the bloodstream. We found that certain sets of microRNA in the bloodstream could indicate the presence or potential of AD to develop". PROFESSOR ANDREW HILL

A cost-effective and accessible early-detection blood test has been developed from this discovery which could identify changes in the brain as accurately as expensive imaging procedures. The blood test has the capacity to detect changes that occur in the brain two decades before the onset of dementia.

A blinded-trial blood test of 100 participants correctly confirmed patients currently diagnosed with clinical AD from those who are healthy. In addition, a number of patients with no concerns about their memory tested positive. These positive-testing participants then underwent brain-imaging procedures, which indicated signs of degeneration resembling AD features.

This discovery could offer better long-term health management plans for individuals with a family history of AD, or who have concerns about their memory loss. The simple test was designed to be non-invasive, low-risk and cost-effective, ensuring that patients and physicians will not have to use up time or money organising a brain scan or taking a neuropsychological test to screen for early signs of AD.

Postdoctoral researcher Dr Lesley Cheng said, "A simple blood test could be offered to concerned patients in a routine



Professor Andrew Hill and Dr Lesley Cheng with the Ion Torrent next generation sequencer at the Bio21 Institute. Photo: Maggie Scott, Bio21 Institute.

health check at a medical clinic. Testing negative could provide relief for those who are experiencing normal memory issues due to ageing, and those who do show early signs of AD can then be observed by their GP".

Over the next three to five years, the team will undertake further testing across a larger population to trial and assess the blood test for its efficacy in predicting the progressive disease. It could also provide further opportunities to develop pre-diagnostic tests and therapies, or be adapted to detect other neurodegenerative diseases such as Parkinson's Disease.

Published in *Molecular Psychiatry* journal in October, the study is a result of the combined efforts of The Florey Institute of Neuroscience and Mental Health, the CSIRO and Austin Health and Australian Imaging Biomarker and Lifestyle (AIBL) study of Aging, with funding from Alzheimer's Australia, the National Health and Medical Research Council, The ANZ Judith Jane Mason and Harold Stannett Williams Memorial Foundation and the Science Industry Endowment Fund.



Professor Tony Bacic
Photo: Helen Varnavas, Bio21 Institute.

Director's Message

Over the past three months, the Institute's achievements have continued to excel in research, industry and engagement, and in showcasing the Institute's role and impact across the University, Parkville and the wider sector.

In what has been a challenging round of competitive grant funding, we congratulate researchers who have been successful in their individual project grants, as well as with collaborators across institutions nationwide. Multiple successes in funding for infrastructure and equipment includes an Institute-led LIEF grant for an automated 3D electron microscopy capability that will increase our provision of cutting-edge technology and associated expertise. Find out more about recently funded projects as you read on.

The diversity of our research and the calibre of our researchers are outlined in a series of stories that showcase how we are working at all levels of research, training and engagement. This issue offers a taste of our exceptional interdisciplinary research community, ranging from public good programs that investigate neglected diseases to talented graduates who embrace opportunities beyond their immediate environment.

At the end of 2014, I will be completing my term as Director of the Bio21 Institute following seven years in the role. I am extraordinarily proud of our achievements as we head into our 10th year, and I am grateful to have had the privilege to be Director. The commitment and collegiality of Institute members, and the dedication of our management team has ensured our ability to achieve so much. My heartfelt thanks to the committed team that works above and beyond to ensure the Institute is recognised and positioned as a leading institute worldwide.

From the 1 January, Deputy Director Professor Malcolm McConville will be taking over the reins as Acting Director.

I wish you all the best for the holiday season and a happy 2015.

Warm regards,
Tony



Bio21 Researcher Dr Kathryn Tiedje and PhD student Ms Shazia Ruybal with the Navrongo Health Research Centre team on a recent field trip to Ghana, Africa. Left to Right: Eric Fato, Godfred Agongo, Kathryn Tiedje; James Danzumak Akaligaung and Shazia Ruybal. Photo: Lucas Menga.

Eliminating the Reservoir of Chronic Malaria Infections in Ghana: A Research Challenge

Dr Kathryn Tiedje, a malaria epidemiologist, visits Ghana several times per year to coordinate field research activities on behalf of the Day group and their collaborators from the University of Michigan (USA), Noguchi Memorial Institute for Medical Research (Ghana) and Navrongo Health Research Centre (Ghana).

Funded by the National Institutes of Health and the Fogarty International Centre in the USA, their investigation aims to eliminate *Plasmodium falciparum*, a parasite that causes over half a million deaths annually, with the majority of this burden in Sub-Saharan Africa. The grant supports a multidisciplinary team including malaria geneticists, bioinformaticians, mathematical biologists, clinical/molecular epidemiologists and entomologists. They are interested in better understanding the complexities of malaria transmission in the context of the parasite's genetic diversity in chronic carriers of infection. These chronic carriers constitute the reservoir of infection that continually fuels the spread of malaria to mosquitoes making it difficult to interrupt transmission and eliminate malaria.

"This project is being conducted to ultimately ask the question: what does it take to eliminate malaria locally when you have so many chronic carriers of infection?" DR KATHRYN TIEDJE

The project utilises a longitudinal cohort study design to determine the impacts of seasonality and malaria control programs on *P. falciparum* genetic diversity. The field research is being conducted in the Upper East Region in Ghana where a population of 100,000 residents are receiving a series of malaria control interventions, including insecticide treated bednets, indoor residual spraying (IRS) and Artemisinin combination therapy.

"We have recruited a cohort of 2000 participants and have mapped where they live, determined their socio-economic status, bed net usage and health status, thanks to the Navrongo Health Research Centre who have fostered ongoing relationships with the community. This relationship is very important for the success of the project. Not only will scientific information be gained but it will help to bring resources to the community to control malaria and strengthen health systems in the region," Dr Tiedje said.

Over the course of this five-year project, IRS will be rolled out through Global Fund support. By collecting data at seasonal time points, the research team has a unique opportunity to assess the diversity of the parasite before, during and after the IRS. By analysing the baseline data, the team found that all age groups are carrying chronic malaria infections. They are now investigating the spatial and temporal genetic structure of the malaria parasite population in these chronic carriers in response to interventions using genomics and bioinformatics. With this study design, their goal is to create a conceptual shift in malaria control practices, as current public health strategies do not take parasite diversity into consideration when they are monitored and evaluated.

"Our team's mission is to find new solutions for this chronic illness. We need to consider traditional methods of control, but we must also try to understand the effects of interventions on the parasite in order to finally eradicate it globally," said Dr Tiedje.

Exposing young scientists to new frontiers

In September, Melbourne hosted the 15th International Systems Biology Conference, a much anticipated global event that attracted top scientists from all over the world. Ten Bio21 Institute graduates were in attendance, including Mr Ashfaquul Hoque, a third year Biochemistry PhD student.

With a keen interest in the 'omics' and a personal goal to publish, Ashfaquul saw the breadth of the systems biology program and submitted an abstract in his field of proteomics. His initiative paid off and he was accepted to present a poster and oral presentation on the topic, 'Global changes in proteome and phosphoproteome following glutamate excitotoxicity in primary neurones'.

His presentations showcased his research in the field of stroke and neurodegenerative diseases, which broadly look at what happens when neurones die, specifically glutamate excitotoxicity.



Ashfaquul Hoque accessing platform technologies in the Bio21 Mass Spectrometry and Proteomics Facility. Photo: Helen Varnavas, Bio21 Institute.

"Excessive stimulation by neurotransmitters like glutamate can cause brain cell death – this is called excitotoxicity and is linked to neurodegeneration such as epileptic seizures, ischaemic stroke, and Parkinson's disease," he explained.

"The goal is to define the driving signalling pathways that direct excitotoxic neuronal death, which can ultimately lead to developing preventative drugs".

Ashfaquul was able to engage with delegates at the poster sessions and throughout the conference.

"I met postdoctorate researchers, principal investigators and other students, and had the opportunity to ask in-depth questions to better understand what they were doing in their fields of research". ASHFAQUL HOQUE

Having completed his Masters in Microbiology at University of Dhaka, Ashfaquul joined Associate Professor Heung-Chin Cheng's group in 2012 to undertake PhD studies. Once completed, he is keen to continue a post doctorate career in research.

"My experience in Australia and at the Bio21 Institute has been great and I hope to build upon opportunities to present and publish, as well as the connections I have made," he said.

Australia-India researchers explore advances in renewable energy

Leading researchers from India and Australia specialising in nanomaterial development and characterisation came together in October at the Bio21 Institute to participate in a workshop on nanomaterials for renewable energy.

Supported by the Australia-India Strategic Research Fund, the workshop was chaired by Melbourne Laureate Professor Emeritus Andrew B Holmes, and was attended by distinguished researchers, including world-renowned chemist Professor G Kulkarni leading the Indian delegation. The workshop converged around the improvement of renewable energy production, conversion and storage via new nanomaterials. Of particular interest were recent developments in perovskite nanomaterials for solar cells, with their potential to be more efficient and cost-effective than silicon solar cells.

Victorian Organic Solar Cell Consortium researchers at Bio21, Dr David Jones and Dr Wallace Wong, aim to develop long-term collaborations in solar technology between Australia and India. Complimentary research areas, skills and individual expertise between the two countries promise further developments in the industry.



Professor Reynolds AO, Mr Nakao and Professor Bacic. Photo: George Trifunovic.

Oral Health CRC welcomes GC

The Chairman of a global dental materials manufacturer, Mr Makoto Nakao of GC Corporation, recently toured Bio21 as a guest of the Oral Health CRC (Cooperative Research Centre). GC Corporation is an industry participant in the Melbourne University-based CRC, a collaboration of scientists, dental professionals and manufacturers working to advance the prevention, diagnosis and treatment of oral diseases.

Dental caries (decay) and periodontal disease (disease of the gum tissue) are among the most prevalent diseases in the Australian community, costing the Australian economy \$8.4 billion a year. The Oral Health CRC is developing novel preventives, diagnostics, treatments and models of care to reduce the cost and health impacts of oral disease, and to increase understanding of the links between oral disease and other health conditions such as diabetes, cardiovascular disease and inflammatory diseases.

GC Corporation has already commercialised three professional dental products developed from CRC research. In Melbourne to discuss future projects with Oral Health CRC CEO Melbourne Laureate Professor Eric Reynolds AO, Mr Nakao took the opportunity to visit Bio21's research facilities and meet researchers and Bio21 Director Professor Tony Bacic.

"This is the first time Mr Nakao has visited our labs in Melbourne and he brought along his senior managers from the European, Asian and Australasian divisions of the company. GC Corporation has been a highly productive industry partner and Mr Nakao and his team were keen to increase their understanding of the capabilities of the Oral Health CRC and the Bio21 Institute".

PROFESSOR ERIC REYNOLDS AO



Sean Lowe representing Team Melbourne at the iGEM Giant Jamboree in Boston.

Bio21 supports students reaching for the stars

A team of twenty enterprising undergraduate science and engineering students from The University of Melbourne joined forces to compete in the 2014 International Genetically Engineered Machine (iGEM) competition. An MIT initiative operating out of Cambridge in the USA, iGEM is a global competition designed to foster research and education in the fields of genetic engineering and synthetic biology.

The Melbourne iGEM team worked on programming *E. coli* to produce star peptides, molecules made up of several linear peptides linked together at a central core. Star peptides and, more generally, star polymers, have applications such as drug delivery vehicles and next generation antibiotics.

In November, the team presented their work at the iGEM global conference (the iGEM Giant Jamboree) and was awarded a bronze medal for their efforts. Chemical Engineering student Sean Lowe has been leading the team from the onset of the project and attended the event in Boston with team member Peter Collins.

"Working at this intersection of biotechnology and biomaterials has been really exciting. It was an excellent exercise in science and leadership, and we had a great time in the process," said Sean.

The students were mentored by leaders across multiple disciplines including Biochemistry's Associate Professors Heung-Chin Cheng and Paul Gooley, and Dental Science's Associate Professor Neil O'Brien-Simpson, and Dr Angus Johnston from the Monash Institute of Pharmaceutical Sciences (formerly of Melbourne University).

Associate Professor Heung-Chin Cheng acknowledged the fantastic collaborative efforts of students and Bio21 colleagues.

"The iGEM team has been a hard-working and committed group of talented students dedicated to pursuing their project since its inception almost 18 months ago. It has been a very rewarding experience working with this team".

Gene mutations may lead to solutions for Motor Neurone Disease

Biochemist Dr Danny Hatters leads a research team at the Bio21 Institute investigating novel methods and approaches to study the aggregation behaviour of proteins which are the hallmark of neurodegenerative diseases such as Huntington's, Alzheimer's and Motor Neurone Disease (MND).

"Proteins should have a normal biological function, but what happens in these diseases is that they become very sticky and form small clusters that can interfere with the cell function. It's a little bit like taking a clock and throwing a spanner into it. We want to understand how these abnormal clusters are damaging the cells," said Dr Hatters.

A particular area of interest is MND, a progressive degenerative disorder in which the neurones (nerve cells) in the spinal cord and brain stop working properly, causing a gradual weakening and wasting away of the muscles.

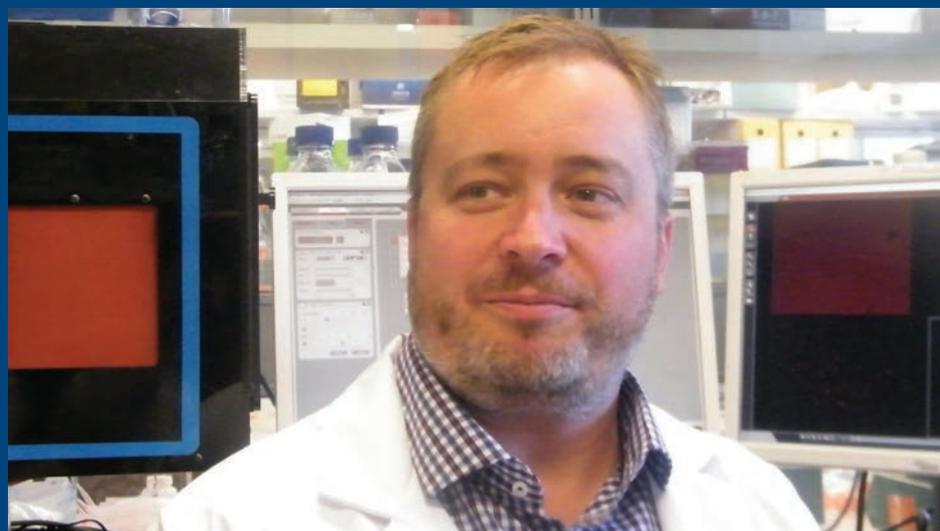
Recent studies found that familial MND, which makes up 10% of MND cases, is caused by a gene mutation. In 2011, mutations in the C9ORF72 gene were discovered to be the most common cause of familial MND, accounting for 40% of all inherited cases.

It has been suggested that the mutations cause the gene to produce junk proteins which accumulate in the brain of MND patients. These junk proteins would not otherwise be produced in healthy cell functions and are thought to be the cause of 'sticky' proteins in the cell. Dr Hatters aims to determine how junk proteins interfere with the normal cell function and the extent to which they might be toxic.

The hope is that we can identify some therapeutic targets so we can find drugs that might either improve the gene's functions or potentially develop new ways to interfere with this clustering and prevent it from happening in the first place". DR DANNY HATTERS

Dr Hatters and his team will apply a unique toolkit which was originally designed for Huntington's Disease research, and which can be applied to investigate C9ORF72 polydipeptides. "Our technique enables us to look at these clusters as they form inside individual cells, giving us the ability to really track exactly when these clusters form so we can then figure out exactly what's going wrong with these cells," he said.

Dr Hatters was recently awarded a \$100,000 Peter Stearne Familial Motor Neurone Disease Research Grant commencing in January 2015.



Dr Danny Hatters in his laboratory at the Bio21 Institute.
Photo: Helen Varnavas, Bio21 Institute.

Research community to benefit from latest funding round

In an increasingly competitive environment for science research funding and grants, researchers at the Bio21 Institute have been involved in fourteen grants worth more than \$10million in total in the latest round of funding from the Australian Government's National Health and Medical Research Council (NHMRC) and the Australian Research Council (ARC).

With an impressive tally, Institute research leaders from Chemistry, Dental Science and Biochemistry were successful as lead investigators in four ARC Research Project Grants and five NHMRC research grants worth more than \$2.5million. Their research will span the spectrum from investigating oral health issues to tackling viral diseases.

An ARC Linkage Infrastructure, Equipment and Facilities (LIEF) grant bid led by Institute researchers will provide funding for an automated 3D electron microscopy facility. This new capability will add to the existing critical mass established in microscopy technology located at Bio21.

A second ARC LIEF grant with Botany collaborators will see the installation of a new spinning disk confocal microscope which further cements Melbourne's Advanced Microscopy capability.

Institute researchers are also involved in three ARC LIEF grants led by University of Melbourne colleagues and four with collaborating institutions for a new nanoscopy facility, a high throughput phenomics facility, advanced spectroscopy and cytometry capability.

The Bio21 Institute warmly congratulates all recipients.

From Incubation to Graduation: Nurturing start-ups to success

Sienna Cancer Diagnostics has 'graduated' from the Bio21 Institute's Incubator and is relocating to larger premises that will aid the company's future growth and development.

Since establishing their offices and laboratories at Bio21 more than eight years ago, Sienna has been growing their small biotech company to develop their telomerase diagnostic tests.

Telomerase is a cancer-specific enzyme and the subject of a 2009 Nobel Prize to Melbourne University alumna Professor Elizabeth Blackburn and her colleagues. Sienna has been working to provide a non-invasive, inexpensive and reliable test for a range of different cancer indications since 2005. Their ultimate goal is to license their technology, manufacture key reagents and offer their product to the global market, while creating jobs in Victoria.

Sienna's Managing Director Dr Kerry Hegarty reflected on the benefits of being part of the Bio21 community. "Daily involvement within a collaborative environment like Bio21 adds significant value to a small biotech company; we were very fortunate to have a lift-off at the Institute," she said.

Bio21 Institute Director Professor Tony Bacic recognises the commitment and perseverance required to succeed within a challenging sector for small- and medium-sized enterprises (SMEs), and is delighted to see Sienna added to a list of success stories.

"Sienna joins a long line of SMEs who have 'graduated' from Bio21. Recognising the challenges faced by SMEs to commercialise their IP, Bio21 is delighted to have played a part in the company's development through everyday involvement at the Institute, including access to technologies and expertise, and a mutual network that fosters collaboration and sharing". PROFESSOR TONY BACIC

Sienna is relocating to new premises within the Small Technologies Cluster at Caribbean Business Park in Scoresby.



To commemorate the graduation of Sienna Diagnostics from the Bio21 Incubator, a Bio21 Industry Breakfast Forum was held in early December with expert speakers sharing their insights into the journey of a start-up.

From top to bottom: Dr Kerry Hegarty (Managing Director, Sienna Cancer Diagnostics); Professor Tom Healy (Professorial Fellow & Chair of Science Board, Particulate Fluids Processing Centre, The University of Melbourne); Professor Tony Bacic; and Dr Anna Lavelle (CEO Ausbiotech).

Photos: Helen Varnavas and Maggie Scott, Bio21 Institute.



Aaron Brown
Photo: Helen Varnavas.

Graduate Profile

Aaron Brown

Graduate student Mr Aaron Brown is in his final year of his PhD in organic chemistry. Having completed his BSc Honours at the Bio21 Institute under the supervision of Associate Professor Craig Hutton, Aaron continued on to PhD studies working to synthesise a molecule found in 'false smut balls', a fungal disease that afflicts rice plants.

It has been established that the molecule, known as ustiloxin, is active against certain cancer cells. This means it could be used as a potential lead compound for the development of anti-cancer therapies.

"There is a limited supply of this molecule that we can source from nature. My research has been focussed on developing a synthetic route to this compound to enable further research". AARON BROWN

As a recipient of a Bio21 Institute Postgraduate Travel Award, Aaron was able to share his studies to an international audience, presenting a poster at the 15th Tetrahedron Symposium in London, and giving a talk at the 20th International Conference on Organic Synthesis (ICOS20) in Budapest. He was also able to take a step further in his goal to pursue a research career by visiting laboratories and meeting academic scientists in Lyon, France.

When asked about major highlights from his trip, Aaron emphasised a presentation at ICOS20 by Chemistry Professor Stephen Kent from University of Chicago. "Professor Kent is a pioneer of native chemical ligation and the synthesis of large peptide fragments. I found him to be a really inspiring lecturer," said Aaron.

ICOS20 also actively encouraged their attendees to network by providing sit-down lunches where students and academics alike could gather and talk.

"I found meeting young academics very interesting as I learned what it's like going from PhD to post-doc, as well as gaining insight into various career paths. It was fun swapping stories that only fellow chemists could understand," Aaron said.

"Spending time with international researchers in my field has given me a better sense of the opportunities available for PhD graduates, and I have returned to Melbourne with a fresh perspective on my own work".

BIO21 Brief

Professorial appointment for Stuart Dashper

Congratulations to Stuart Dashper from the Oral Health Cooperative Research Centre (CRC) and Faculty of Medicine, Dentistry and Health Sciences (Dental Science) who was promoted to the role of Professor in November. He is Project Leader with the CRC and has been researching the causes of the two common oral diseases Dental Caries and Periodontitis for over 20 years.

As one of Australia's leading oral microbiologists, Professor Dashper is helping to change the way we think of how bacteria exist in the oral cavity and their roles in health and disease. This has led to pioneering work on new technologies that investigate how these bacteria form polymicrobial biofilms (dental plaque) on the surfaces of the teeth and how these bacteria interact with each other to cause disease.

New Associate Professorial appointments

Congratulations to Biochemists Danny Hatters and Stuart Ralph and Chemists Paul Donnelly and Craig Hutton, who have all been promoted to Associate Professor by The University of Melbourne.

300kv biological cryoTEM upgraded

Following a successful ARC LIEF13 grant, the 300kV biological cryoTEM equipped with STEM (scanning transmission electron microscopy) and EELS (electron energy loss spectroscopy) has now been upgraded. The upgrade provides 3D structure determination of protein in their native state in cryo; 3D ultrastructure of micron thick sections of cells or tissues using STEM tomography; chemical composition analysis of sample in their native state in cryo condition at nm resolution. The new technology is the first of its kind in Australia with such capabilities.

The total upgrade cost \$1.3million and adds to the Institute's advanced microscopy capability. The partners in the successful ARC LIEF grant included the University of Melbourne, Bio21 Institute, Walter and Eliza Hall Institute and RMIT University.

MNI Interdisciplinary Seed Funding Grant

Dr Yuning Hong was awarded a seed grant from the Melbourne Neurosciences Institute. Dr Hong (Chemistry) will lead the grant with Dr Danny Hatters (Biochemistry & Molecular Biology), Professor Dennis Velakoulis (Neuropsychiatry) and Professor Trevor Smith (Chemistry) in an interdisciplinary project to build new biomarker assays.

The research aims to implement new biosensors that report on changes to cells predicted to occur very early in neurodegenerative diseases involving protein aggregation (such as Alzheimer's, Parkinson's, Motor Neuron and Huntington's diseases). Such research can lead to improvements in clinical drug trials at earlier stages of disease; often many years before the onset of clinical symptoms.

Knowledge Week discovers the Parkville Biomedical Precinct

In October, the Bio21 Institute was part of the City of Melbourne's Knowledge Week activities that showcased Institutes in the Parkville Biomedical Precinct. Members of the general public were able to visit and explore one of Australia's major precincts, learning more about the medical and bioscientific research, education, clinical practice and the production of pharmaceuticals and biotechnology products, including the collaborations that foster world-leading discoveries and health interventions.

Visitors to the Institute found out more about key research programs and toured the facility.

The Governor of Victoria visits Bio21

The Honourable Alex Chernov AC QC and Mrs Elizabeth Chernov visited the Bio21 Institute in September as part of their tour of the Parkville Precinct. As a unique concentration of biomedical and life sciences institutions in the Parkville Precinct, the Governor and Mrs Chernov were interested in understanding the major contributions to research, knowledge and positive social outcomes.

The Precinct visit was hosted by The University of Melbourne's Deputy Vice Chancellor Research, Professor James McCluskey, in conjunction with respective Institute Directors including Professor Tony Bacic.

EBSS wins CEFPI awards

The Elizabeth Blackburn School of Sciences has received the Award for 'Best Education Initiative or Design Solution for an Innovative Program' at the recent Council of Educational Facility Planners International (CEFPI) Victorian Chapter 2014 Awards ceremony.

Opened in 2014, the specialist science school was established due to the partnership between The University High School, Victorian Government and The University of Melbourne via the Bio21 Institute and Melbourne Graduate School of Education. The award was accepted by EBSS architects ClarkeHopkinsClarke at the event held at the University of Melbourne's new School of Design building.

CEFPI is a professional association whose sole mission is to improve the places where children learn.

Angewandte cover for chemists

Institute-based chemists Professor Richard O'Hair and Dr George Khairallah, along with colleague Dr Gabriel da Silva, have made the cover of *Angewandte Chemie International Edition*, 53: 10979 (2014) for their work to solve the mystery of why water and salt contaminants destroy organometallic reagents.



Dr Gordana Rasic

Postdoctoral Profile

Dr Gordana Rasic

Dr Gordana Rasic is an Ecological Geneticist looking at the genomics of disease vectors and pests. In 2012, she joined Professor Ary Hoffmann's Pest and Environmental Adaptation Research Group at the Bio21 Institute, which investigates innovative and interdisciplinary dengue fever prevention solutions.

Dr Rasic works on population genomics of the dengue fever mosquito *Aedes aegypti* with a focus on the implementation of *Wolbachia*-based strategies to control dengue outbreaks.

An estimated 390 million dengue viral infections occur in humans across 100 countries around the world annually. Biocontrol methods developed by Professor Hoffmann and colleagues from the Eliminate Dengue research program have provided cheap, effective alternatives to the use of insecticides.

"The dengue virus is transmitted by mosquitoes when they feed on dengue infected people and then go on to bite more of them" she explained. "Infecting mosquitoes with the *Wolbachia* bacteria immunises them from the dengue virus. When we release infected mosquitoes into wild mosquito populations, they rapidly spread this dengue-blocking bacteria, therefore minimising the spread of dengue to humans".

Dr Rasic has customised the genomic technique of RADsequencing and created some bioinformatics tools (in collaboration with her partner, bioinformatician Igor Filipovic) to produce cost-effective information on the variation across the genome of a species.

"This versatile technique is utilised to ask various ecological genomics questions in our laboratory. Apart from the routine use on the dengue mosquito, it has been applied to other insect pests, even mammals and plants". DR GORDANA RASIC

Dr Rasic obtained her BSc and MSc in Biology at her hometown University in Belgrade, Serbia and completed her PhD studies at The University of Western Ontario, Canada. In the future, she hopes to establish herself as an academic leading her own biocontrol research group.

Meanwhile, she will spend the next two years at the Bio21 Institute gaining experience in implementation strategies based on scientific research in the field, utilising the Hoffmann group's community research collaborations nationally and internationally in Indonesia, Brazil and Vietnam where there are areas of dengue outbreaks.

CELEBRATING 10 YEARS IN 2015



2015 marks the 10 year anniversary for the Bio21 Institute. Officially opened in June 2005, we are excited as we look back over the past decade, reflecting on the journey that leads us to this significant milestone.

The Bio21 Institute's vision to improve health and the environment through innovation in biotechnology and industry engagement has been realised on many levels as we have worked to bridge inter-relationships across research, industry and community.

A series of events, initiatives and programs will recognise our people, showcase our achievements and share our vision for the next ten years.

We look forward to celebrating ten years at the Bio21 Institute with you and will keep you updated.

Bio21 Institute Website

The Bio21 Institute is currently upgrading its public website.

The site will have a dynamic new look and feel, and will include more stories, images and digital media. Improved functionality will also provide visitors to the site with a greater user experience.

We will keep you updated as we head towards the launch in early 2015.

Bio21 Institute Public Lecture with Professor R Graham Cooks.



Professor Cooks is a pioneer in the conception and implementation of the mass spectrometry methods of MS/MS and of desorption ionization.

In this lecture, he will discuss the mass spectrometry technology recently developed at Purdue University for rapid molecular analysis, which is specific, sensitive and accurate. There is marvellous maths, fascinating physics and cool chemistry behind the development of these tools. The underlying science deals with direct, rapid and chemically specific analysis of complex mixtures. Examples of these applications and the underlying principles will be given with emphasis on cancer diagnostics and drug detection. See the 'What's On at Bio21' column for more details.

Controlled quench: How to shut down a superconducting magnet in under 60 seconds.



A spectacular sight with plumes of vapour was seen from the Bio21 Institute's 'NMR Cave' viewing platform on the morning of 10 September 2014, when a superconducting magnet, part of a 300 MHz NMR spectrometer system, was officially decommissioned to make way for upgraded equipment. The technical term is to 'quench' the magnet and the process is far more involved than simply flipping the 'off' switch.

Visit the Bio21 Website to read more and watch the video: <http://www.bio21.org/news/controlled-quench>

Photo: Screenshot from the video captured by Dr Hamish Grant.

What's on at Bio21

Tuesday December 9

4.00pm to 5.00pm

"Increasing proteomics throughput to study aging and Alzheimer's disease."

A Bio21 Institute Research Theme Seminar presented by Dr. Renā Robinson, Assistant Professor Department of Chemistry, University of Pittsburgh, USA.

This seminar will be followed by networking and light refreshments. Free event, all welcome.

Monday December 15

12.00pm to 1.00pm

"Packaging and Reliability Concerns in Organic Photovoltaic Devices" presented by Professor Samuel Graham, Georgia Institute of Technology.

Free event, all welcome.

Monday December 15

4.00pm to 5.00pm

"Chemical Analysis in Situ using Mass Spectrometers: Operating Rooms, Crime Scenes, Grocery Stores and Factory Floors".

A Bio21 Institute Public Lecture presented by Professor R. Graham Cooks, Department of Chemistry, Purdue University, USA.

This seminar will be followed by networking and light refreshments. Free event, all welcome. Register by email:

reply-bio21@unimelb.edu.au

Tuesday December 16

12.00pm to 1.00pm

"Three Tales of Supramolecular Analytical Chemistry" presented by Professor Eric Anslyn, University of Texas at Austin.

Free event, all welcome.

Wednesday December 17

4.00pm to 5.00pm

"Design Synthesis, and Properties of Organic Semiconductors and Dopants" presented by Professor Seth Marder, Georgia Institute of Technology.

Free event, all welcome.

For the latest updates

For the latest updates about events and seminars at Bio21, please visit the website at www.bio21.org. If you would like to receive regular updates on Bio21 Institute news, seminars and events via email, contact Helen Varnavas to subscribe to the Institute's mailing list: varnavas@unimelb.edu.au

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