There has never been a more exciting time in biomedical science.

After decades of hard work, increasing understanding of the cellular and molecular basis of diseases, and what must have often seemed somewhat optimistic claims that these discoveries will translate into better clinical outcomes, the payday has arrived. The major breakthrough this year, and one that has culminated thirty years of effort, has been the discovery of two untreatable cancers of all sorts, including melanoma.

The other truly exciting horizon is finally a way of harnessing our body’s immune system to destroy previously untreatable cancers of all sorts, including melanoma.

In 2014 back on 2014 as a hugely successful year for Centenary in terms of the number and quality of discoveries made that will ultimately fuel the biomedical revolution and improve future therapeutics and diagnostics for patients. These discoveries span across our chief interests of cancer, inflammation and cardiovascular disease and the mechanisms that drive these illnesses.

Our publications, appearing in some of the most prestigious international journals, such as Nature, Nature Immunology, Nature Reviews Immunology, Nature Communications, Immunity, Cell, Developmental Cell, Ageing Cell, Journal of Investigative Dermatology, PNAS and Current Biology, have put us proudly amongst the very best in biomedical science. We are honoured to be, surrounded by such talented and hard working colleagues that are no doubt shaping the future of medical research.

In spite of our successes, 2014 has also been a challenging year. The funding climate for medical research has changed, and until the $20 billion Medical Research Future Fund becomes fully operational, we need to become less reliant on sources of funding from the Federal and State Governments. In 2014, the rate of funding of projects by NHMRC dropped to about 15% (from approximately 23% a few years before) placing great stress on many scientists, including ones at Centenary.

To face these challenges efficiently and productively, we will diversify our methods to source funding from other national and international bodies. Our team has responded to these challenges admirably, and has been successful in raising a record amount of $5.9 million from non-NHMRC granting bodies last year. In addition Serena Stewart, the new head of our Marketing and Fundraising team, has systematically put into place a strategy and developed a team to significantly improve our fundraising capabilities and engagement with our donors (individual donors, families, corporate organisations, trusts and foundations, community groups and many more) and the general public, ensuring sustainable sources of income to support our scientists in making their next major breakthrough.

In the past, Centenary’s brand (though distinctive) has not reflected the focus of our work, nor the enormous contributions we make to saving lives. Thus, with the great assistance of Suanne Colley of BrandPlus Asia we have embarked on refining our brand with a stronger and more concise message that communicates better with our stakeholders and donors. You will see the major changes in this report and we shall be revealing some further details in 2015, the 30th anniversary of our incorporation as a medical research institute.

Centenary continues to maintain a truly outward looking stance. Australia-wide, we are now known for initiating the Centenary Institute Lawrence Creative Prize (CILCP), which recognises the most talented young scientists in Australia and promotes their careers.

More locally, we are enthusiastic members of Sydney Research, Sydney Catalyst, the important arm of the NSW Cancer Institute supporting all stages of cancer research. We work with Sydney Research and with our long-term partners Sydney University and RPA Hospital in mounting and developing plans for a campus-wide organisation of research efforts for optimal efficiency and impact.

This year we were most fortunate to have had Professor Axel Ullrich, Director of the Max Planck Institute for Biochemistry, Germany and a Member of our Scientific Advisory Board as Guest-of-Honour at our Annual General Meeting. He has our sincere thanks for making the long trip to be with us.

We farewell Professor Susan Pond AM from our Board of Governors and thank her for her valuable contribution over the past five and a half years. We take this opportunity to welcome Dr Chris Roberts, CEO of Cochlear, who will join our Board of Governors in early 2015.

Many thanks to Professor Barbara Fazekas for her assistance and guidance during her term as Assistant Director. We also thank Professor Wolfgang Weninger for his ongoing efforts as the new Assistant Director.

Congratulations also go to Dr Xiangan Zheng and Dr Mainthan Palendira on their appointment to Associate Faculty.

As mentioned, we welcome Serena Stewart, our new Head of Fundraising and Marketing – already we see an invigoration of fundraising and marketing activities. At the same time, we farewell Jill Atherton who previously held this position and thank her for her contributions in the past year.

Finally we would like to thank our Governors, Faculty, Foundation, staff, our Scientific Support Team, headed by COO Dr Nick Pearce, and our Marketing and Fundraising team, for their tireless efforts in supporting and promoting the Institute. Importantly, a very special thanks to our donors for their wonderful support of our research efforts.
**Board of Governors**

**The Hon Michael Egan AO (Chairman)**
Appointed Chair in 2005

Mr Egan, a former Treasurer of NSW (1995-2005), is Chancellor of Macquarie University, Chairman of the Newcastle Coal Infrastructure Group Pty Ltd and a member of the Council of NHMRC. During his 25-year parliamentary career Mr Egan held several ministerial positions.

**Mr John Samaha (Deputy Chairman)**
Appointed Governor in 2003

Mr Samaha leads the Australian litigation and contentious regulatory practice of global law firm Allen & Overy. He has represented many leading financial institutions and corporations, as well as executives, from a wide range of sectors, especially banking, wealth management, financial markets, resources, real estate, IT and telecommunications.

**Dr Teresa Anderson**
Appointed Governor in 2007

Dr Anderson is Chief Executive of the Sydney Local Health District with over 30 years experience in the public health system as a clinician and manager. Dr Anderson is a Board member for Medicare Locals. He sits on the board of Crown Limited.

**Mr Joseph Carrozzi**
Appointed Governor in 2008

Mr Carrozzi is a Managing Partner at PricewaterhouseCoopers (PwC). He is admitted as a Barrister at Law in NSW, a Fellow of the Institute of Chartered Accountants in Australia and a Fellow of the Tax Institute of Australia. Joseph is also Chairman of Australia’s Italian Chamber of Commerce and Industry, and Vice Chairman of the GWS Giants.

**Ms Elizabeth Dibbs**
Appointed Governor in 2013

Ms Dibbs held senior legal positions throughout her career, including General Counsel of PricewaterhouseCoopers prior to her retirement. Ms Dibbs now focuses her energy on the not-for-profit sector. She is Pro-Chancellor of the University of Western Sydney, a Director of United Way Australia and an active member of Chief Executive Women.

**Mr Graham Kelly**
Appointed Governor in 2006

Mr Kelly is non-executive Chairman of listed GDI Property Group and a Director of Harness Racing NSW. He has been non-executive Chairman of various other listed companies, including TAB Limited. He was formerly a Partner of law firm FreeHills and was an Inspector of ICAC, and a Director of the Medical Research and Compensation Foundation.

**Ms Deborah Willcox**
Appointed Governor in 2013

Ms Willcox is the Director of Operations at the Australian Government’s review of Medicare Locals. She served as a Director of Harness Racing NSW and as Chief of Staff in the portfolios of Planning, Housing and Aboriginal Affairs.

**Dr Susan Pond AM, FTSE**
Appointed Governor in 2009

Dr Pond AM, FTSE is Adjunct Professor at the University of Sydney, Vice President of the Academy of Technological Sciences and Engineering, and Board Member of ANSTO, Innovation Australia and Bioton Ltd. Susan’s term expired in August 2014.

**Mr Alastair Davidson**
Appointed Governor in 2004

Mr Davidson has held executive positions in the banking and financial services industry for over 30 years in the UK, US and Australia and is a member of the Institute of Chartered Accountants in Scotland. He is an Executive of Australasian Wealth Limited, a listed asset manager, in Sydney, and a non-executive Director of Biotech Capital.

**Dr Mathew Vadas AO FAHMS**
Appointed Governor in 2007

Professor Vadas followed his medical training with a PhD at the Walter and Eliza Hall Institute. He was the inaugural Director of the Hanson Centre for Cancer Research (now Hanson Institute) in Adelaide and has been the Executive Director of the Centenary Institute since 2007.

**Professor John Horvath AO**
Appointed Governor in 2007

Professor Horvath was the Commonwealth Chief Medical Officer from 2003 to 2009 and is a Fellow of the Royal Australasian College of Physicians. Professor Horvath recently oversaw the Australian Government’s review of Medicare Locals. He sits on the board of Crown Limited.

**Professor Bruce Robinson AM**
Appointed Governor in 2007

Professor Robinson is Dean of the Faculty of Medicine, University of Sydney, and Head of the Cancer Genetic Laboratory at the Kolling Institute. In 2003, he was awarded the Dalichi Prize by the Asia and Oceania Thyroid Association. Professor Robinson is the Founding Chairman of the Hoe Mai Australia Vietnam Medical Foundation.

**Professor Josephine Sukkar**
Appointed Governor in 2011

Ms Sukkar is co-owner and Principal of construction company Buildcorp. She is a Director of YWCA NSW, Opera Australia and a Fellow of the Institute of Chief Executive Women.

**Professor Richard Flavelle CBE FRSc**
Appointed Governor in 2013

Professor Flavelle served as a Director of The Trust Company from 2010-2013, and is also involved with the Museum of Contemporary Art, Sir John Monash Foundation and Australian Rugby Union.

**Professor Michael Good AO**
Appointed Governor in 2004

Professor Good is recognized for his cancer research and teaching. His research interests include the biology of lymphoid malignancies and the identification of novel therapeutic targets.

**Dr Susan Pond AM, FTSE**
Appointed Governor in 2009

Dr Pond AM, FTSE is Adjunct Professor at the University of Sydney, Vice President of the Academy of Technological Sciences and Engineering, and Board Member of ANSTO, Innovation Australia and Bioton Ltd. Susan’s term expired in August 2014.

**Professor Sir Marc Feldman AC FAA FRS FRCPath FMedSci (Chair) HFSA**
Head, Kennedy Institute of Rheumatology, National Institute for Health Research, Department of Rheumatology, University of Oxford

**Professor Richard Flavelle CBE FRSc**
Department of Immunology, Yale School of Medicine, Connecticut, USA

**Professor Ian Frazer AC, FRAS, FAA, MB ChB(Edin), MD(Melb)**
CEO & Director of Research, Translational Research Institute, Queensland

**Professor Matthias W. Hentze, MD**
Director, European Molecular Biology Laboratory, Germany

**Professor Michael Good AO**
BSc MBBS PhD MD DSc
Institute of Glycomics, Griffith University, Gold Coast Campus

**Professor Dr Axel Ullrich**
Max Planck Institute for Biochemistry, Department of Molecular Biology, Germany

**Mr Joseph Carrozzi**
Managing Director, PwC

**Ms Deborah Willcox**
Director, harness Racing NSW

**Professor John Horvath AO**
Commonwealth Chief Medical Officer

**Ms Elizabeth Dibbs**
General Counsel of PwC

**Dr Mathew Vadas AO FAHMS**
Chairman of the Hoc Mai Australia Vietnam Medical Foundation
"We have developed the first 3D model of the distribution of immune cells in living skin. It takes us from something like a paper map to Google Street View."

Dr Philip Tong, Immune Imaging.
to celebrate as we reflect back on how Centenary’s scientists have made major contributions to improving diagnostics and treatments for patients and finding cures for some of the most chronic diseases affecting today’s society.

GIVING BRINGS A SENSE OF FULFILLMENT

Throughout the year, the income generated through our donor appeals and acquisition campaigns has greatly assisted Centenary’s scientists to continue their vital research into understanding the complexities and underlying mechanisms of chronic diseases like cancer (prostate, breast, liver, lung, and melanoma), genetic heart conditions, liver disease, skin allergies, tuberculosis, skin disease and ageing – an increasingly important focus area as the average life expectancy is only set to increase over the next decade.

We sincerely thank our generous donors for their ongoing commitment to our vision of improving human health through excellence in medical research.

COMMUNITY FUNDRAISING HAS NEVER BEEN EASIER

Efforts were taken to ensure our 2014 community fundraisers were kept regularly up-to-date on the impact their contributions (either financial or in-kind) had made on the work of Centenary’s scientists, especially those in the early stages of their career. It’s an unfortunate reality in research that many researchers aren’t able to follow through on their creative ideas, passions or curiosity because of a lack of funding; therefore, support from our active community members is vital. It is those ‘seemingly crazy’ ideas that need funding as often they have unexpectedly important results. This year, we would like to express great thanks to the members of the community who helped raise over $20,000 to encourage innovation and creativity in medical research.

The introduction of additional fundraising avenues in 2015 will allow people to give regular donations or utilise the system to promote and fundraise for their community events simply and easily. By simplifying the giving process and encouraging regular donations, Centenary can count on a more reliable source of income, helping us to plan ahead with less administration costs and increasing the amount available to support our scientists’ vital work.

BEQUESTS

Our dedicated and long-term supporters shared our vision of believing that medical research is one of the key components in our health system, ensuring future generations live healthier, longer lives. Bequest gifts are vital to the on-going work of our researchers and represent a generous and lasting legacy of an individual’s pledge to make a difference. This continued investment in the Centenary Institute enables discoveries and life changing advances, which will improve the long-term health of every one of us, and for this, we are most grateful.

TRUSTS & FOUNDATIONS

This year has seen a great continuation of new and existing support from various trusts and foundations. Through this funding stream, Centenary has been able to build its portfolio of specific projects in the areas of cancer, inflammatory and cardiovascular diseases. We would like to sincerely thank all of those who have generously supported our fight against these increasingly prevalent conditions.

As Winston Churchill said, “Healthy citizens are the greatest asset any country can have”. Support from the community is a hugely powerful tool; it is what enables Centenary’s researchers to continue their vital research around chronic diseases that affect so many Australian families – now and in the future. As the Centenary Institute continues to grow, as does our relationships with our donors and stakeholders, it is these individuals and groups that achieve a collective impact, providing a lifetime for the Institute and driving awareness of why medical research is the best hope we have to improve human health through scientific excellence. As a member of the Board and Chairman of the Foundation Committee, thank you for sharing our vision of improving human health through excellence in medical research and joining us in our mission to discover and bring to use innovative therapeutics and diagnostics. Your commitment and your loyalty are greatly valued by not only the Centenary Institute, but by the Australian population.

JOSEPH CARROZZI | FOUNDATION CHAIR
THE GALA DINNER

The dinner, generously hosted by PricewaterhouseCoopers for its 6th year, saw 140 guests come together to enjoy quality wine, music, conversation and an auction full of fantastic prizes.

THE SOIRÉE WITH SCIENTISTS

The evening was generously hosted by Foundation Committee Members, Julie and Simon Ford. The Ford’s have very kindly hosted this annual event since 2011, providing a wonderful opportunity for the general public to meet Centenary scientists in person and hear more on how they are trying to save lives and improve patient outcomes - a rare experience for many.
Summer of 2014 was marked by a sunny and sold-out YCF Hawaiian fundraiser on a spectacular Darlinghurst rooftop.

DJs Harry Hunter, Desperate Sluts, ROOF and Mike Who got the tropical crowd dancing. Food and drinks flowed care of Tsingtao, Kopparberg, Vodka O, Tequila Blu, Splitrock & Tiro, Bulleit, Brasserie Bread and Havericks Meats.

The event raised a total of $4,103 and gained the YCF press mentions with Pedestrian, Out In Sydney, Concrete Playground, Broadsheet, The Beast, Pagesdigital and Time Out Sydney.

CO-LAB | JULY 2014

In July, YCF got arty and produced CO-LAB, a group show curated by Georgie Pope and Jess Holburn from CHASM Gallery in response to the scientific imaging being created by Centenary scientists.

Exhibiting artists included Beastman, Anna Langdon, Rafaella McDonald, Oliver Tanner, Dreamcatcher, Will Cooke and Yiwon Park.

The pop-up exhibition was open for one night only and proceeds from the sale of all works were split evenly between the artists and the Young Centenary Foundation to fund grants for life saving research across cardiovascular, cancer and inflammatory diseases.

YCF raised $5,650 and received a huge amount of press coverage from the likes of the Sydney Morning Herald, Time Out Sydney, Broadsheet, The Beast, Pagesdigital, Backyard Opera, Eastside Radio and Concrete Playground.

CITY2SURF | AUGUST 2014

10 YCF runners took on the 14km dash from city to surf in August as part of the Centenary Institute’s Run For Research team, and collectively, the YCF raised $5,260.
Meet Olive

Olive raised $1,823.25 for Centenary in the 2014 City2Surf.

Olive ran with her Mother and Aunty, in memory of her Papa, who had just two weeks earlier lost his battle with a genetic heart condition. Olive started with a fundraising goal of $700 and was supported by the generosity of her friends and family.

Thank you Olive, your Papa would be very proud!

FUNDRAISING

shown their belief in the contribution medical research has to our health and well-being.

Families like the Bamford’s who lost their son and brother Peter in 2004 to Sudden Arrhythmia Death Syndrome (SADS), a genetic heart condition most common in young people.

Since 2008, the Peter ‘Wally’ Bamford Memorial Concert has been held at Peter’s ‘favourite drinking hole’ the Old Canberra Inn on the weekend closest to his birthday. Organised by family and friends and with amazing support from the local community, the memorial concert has now raised over $30,000 for the Centenary Institute Medical Research Foundation.

2014 is the 10th anniversary of Peter’s passing. His family and friends have not only raised invaluable money but also enormous community awareness for Centenary’s Molecular Cardiology Program (headed by Professor Chris Semsarian) and their research in the area of genetic heart conditions. Every dollar raised contributes directly to our research.

We extend our heartfelt thanks and appreciation to all our community fundraisers, their families, friends and colleagues.

Coming together to save lives.

We have an amazing community of people who do wonderful things which contribute significantly to raising funds and advocating for medical research.

During the past year dedicated individuals, families, groups and organisations have committed their time and resources to supporting Centenary. Running marathons, walking the City2Surf, hosting open air movie nights and organising concerts are just some of the ways our community fundraisers have publicly shown their belief in the contribution medical research has to our health and well-being.

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GENE AND STEM CELL THERAPY

Our Gene and Stem Cell Therapy Program is focused on better understanding regenerative medicines to develop effective treatments for cancer, heart disease and genetic diseases. Regenerative medicine is the process of replacing or regenerating human cells, tissues or organs to restore or establish normal function.

UNDERSTANDING DISEASE

We are focused on understanding how cancer cells work.

Cancer is caused by the accumulation of mutations (errors) in our DNA. Cancer-causing mutations activate oncogenes or inactivate tumour suppressor genes. Multiple DNA mutations lead to the development of cancer.

One tumour suppressor gene called CTCF is a DNA binding protein that is important for normal organisation of the chromatin, found in our chromosomes. Mutations and deletions of the CTCF gene occur in many cancer types including blood cancer. We are working to understand how CTCF functions in normal cells, and how changes in the CTCF gene lead to cancer development.

FINDING A CURE

In the laboratory, we are focused on identifying the triggers that switch genes on and off in cancer cells with the long-term goal of developing new cancer therapies.

By integrating the Centenary Institute’s Bioinformatics expertise into all of our research areas, we have significantly increased the outcomes of our research in the lab.

Our research has discovered new ways to target blood cancer. It has also identified key nutrient pumps which are vital to the growth of prostate cancer cells.

Using these discoveries and our knowledge of how cancer cells work, we are striving towards better therapeutics for the treatment of cancer.

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IMMUNE IMAGING

The Immune Imaging Program investigates how the immune system in the skin fights infections and tumours, and how our body’s immune responses lead to skin allergies. Eczema and atopic dermatitis are two common allergic conditions. Up to 30% of children in Australia suffer from atopic dermatitis, and 2-3% of the general population suffer from psoriasis, a common skin disease.

UNDERSTANDING DISEASE

We are using high-end imaging technologies, such as multi-photon microscopy, to dissect in real-time the working of the immune system in the skin. Centenary houses one of Australia’s leading imaging facilities to enable this research.

We study the pathogenesis of several inflammatory skin diseases such as psoriasis and atopic dermatitis. We are also investigating how we can manipulate the immune system for more infective strategies against melanoma and common skin infections, for example those caused by ‘golden staph’.

Golden staph infections are a leading cause of infections in the hospital setting and account for more deaths in the developed world than HIV or tuberculosis infections.

STAFF

PROFESSOR JOHN RASKO AO
HEAD OF PROGRAM

Saving Lives

Our research is aimed at finding new therapies for cancer, degenerative and genetic diseases.

STAFF

PROFESSOR WOLFGANG WENINGER
HEAD OF PROGRAM

Saving Lives

Our research can save lives by helping us understand how the immune system fights disease and infection.

STAFF

SOMETHING TO REMEMBER

In a sentence

Saving Lives

Our research can save lives by helping us understand how the immune system fights disease and infection.

STAFF
**LIVER IMMUNOLOGY**

The Liver Immunology Program is studying the unique relationship between the liver and the immune system. Livers dampen down immunity to such an extent that they can be transplanted without rejection in some cases. Livers may not only be tolerated, but may also prevent the rejection of other organ grafts from the same donor, a process known as immune tolerance.

**FINDING A CURE**

The ultimate goal of our research is to improve treatments in organ transplantation, as well as deliver effective prevention and treatment of chronic liver disease.

Liver diseases caused by viral hepatitis represent an increasing health burden to the community. Hepatitis C (HCV) infection leads to cirrhosis and liver cancer, the third-leading cause of cancer-related death worldwide.

200,000 Australians are currently infected with HCV, with around 20,000 being diagnosed each year.

Our Liver Immunology Program, which encompasses 20 years of original study, has discovered key new principles governing liver immune function. These discoveries are helping to develop new and improved treatments for liver disease.

**UNDERSTANDING DISEASE**

Our research is helping to improve our understanding of the liver and its impact on immune responses, both wanted and unwanted.

Although the liver’s tolerance effect leads to better outcomes in transplantation, it can be detrimental during infections such as hepatitis B, hepatitis C and malaria. These diseases can use the liver as a means of persisting, which can often lead to chronic infection.

Our Liver Immunology Team provides some important clues to improve the success of human gene therapy.

Having already shown that the liver, like the lymph nodes, can activate T cells (a key cell of the immune system) we are now investigating how the liver induces immune tolerance and how immunity can be enhanced in this organ.

**LIVER INJURY AND CANCER**

The Liver Injury and Cancer Program aims to discover new liver cancer pathways that could be targeted for improvements in treatment and outcomes of patients with progressive liver disease. We also work to discover new biomarkers that could improve diagnosis of liver injury and cancer.

Liver diseases are caused by chronic inflammatory processes. They are driven by many factors including viruses, autoimmune processes, genetic diseases and toxins such as alcohol.

Our work is devoted to understanding pathways at the cellular and molecular levels that drive liver injury and cancer. These pathways may then be identified as therapeutic targets or be used to diagnose and stage liver disease and cancer.

We initially used human liver samples to screen for molecules that we upregulated. Since then we have taken some of these molecules and manipulated them in experimental models. This has allowed us to test whether these molecules actually play a role in causing liver injury.

Liver disease is responsible for one quarter of all organ transplants and if left untreated, results in liver cancer - the fastest growing form of cancer in Australia.

The increasing prevalence of all forms of liver disease, but in particular fatty liver disease with concurrent diabetes, is a huge burden.

Our research spans from test tubes, to animal models, human models and clinical trials.

Throughout 2014 our research identified key new pathways and biomarkers which are helping to develop new liver cancer therapies.
MOLECULAR CARDIOLOGY

Molecular Cardiology is the study of genetic heart disorders. Our major goal is to reduce human disease through the integration of basic science research and clinical cardiology.

UNDERSTANDING DISEASE
Our research is focused on understanding the clinical and genetic basis of inherited heart disease. We use a range of approaches including human gene discovery studies, basic cellular systems, animal models of human disease, and population-based psychosocial and public health studies.

Our research involves state-of-the-art approaches including whole exome sequencing, mRNA and microRNA profiling, and RNASeq. Most importantly, we have the key clinical resources, including well phenotyped individual patients and families, which form the basis of all our genetic studies.

To get to this point, we have developed cohorts and national registries of patients and families with inherited heart diseases. We also utilise the latest in genetic technology in order to form the basis of our novel gene discovery studies.

FINDING A CURE
Around 30,000 Australians die every year from sudden cardiac death. Around four young Australians, under the age of 35, die every week from sudden cardiac death.

We know that there are around 40 cardiovascular conditions caused by underlying genetic faults. We all have around 22,000 genes, but a fault in just one can result in a life threatening heart condition.

We can already see our research directly reducing sudden cardiac death in our communities. Our new gene discoveries are being used as improved diagnostic tools, we are rolling out implantable cardioverter defibrillator therapy and we are actively involved in improving public health measures.

Our research is about saving lives, sudden death prevention, and improved diagnosis and management of patients and families with genetic heart diseases.

STAFF
Richard Bagnall
Senior Research Officer
Charlotte Bunt
Research Assistant
Rajat Das
Senior Research Assistant
Srinivasan
Research Assistant
Carina Caffrey
Research Assistant
Jgita Das
PhD Student
Belinda Gray
PhD Student
Jodie Ingles
Research Officer
Janum Johnson
PhD Student
Lien Lam
Research Officer
Sophia McIvor
Honours Student
Caroline Medis
Research Officer
Laura Meloy
Clinical Research Coordinator
Rahul Padang
PhD Student
Saran Seara
Regency Coordinator
Catherine Sprink
Clinical Research Coordinator
Joanna Sweeting
PhD Scholar
Tatiana Tsoutsman
Research Officer
Joanna Sweeting
Research Officer
Laura Yeates
Clinic Co-ordinator

Solving Lives
We are working to initiate treatment strategies to prevent serious complications, including heart failure and sudden death.

Saving Lives
Our research provides ‘blueprints’ of drug targets involved in anemia and cancer - a critical platform for drug development.

STRUCTURAL BIOLOGY

The Structural Biology Program looks at a detailed 3D structural and functional understanding of the proteins involved in human iron distribution. By determining the structures of proteins involved in these processes, we aim to be able to provide a scaffold for the development of drugs that can effectively ‘tune’ their function and thus provide new treatments for patients, in particular patients with Anemia of Chronic Disease (ACD).

UNDERSTANDING DISEASE
Iron is an essential element, which is acquired from our diet and distributed in our body by a set of specific membrane proteins. In humans the acquisition and distribution of iron is required for a range of vital cellular processes, such as generation of red blood cells.

Errors in the proteins involved in iron distribution can cause a range of disease states, such as cancer and anemia (reduced levels of red blood cells). In long-term hospitalised patients, such as cancer patients or patients with chronic inflammation or infection, there is commonly an imbalance in the iron distribution, leading to Anemia of Chronic Disease.

By understanding membrane protein anatomy, structure and function, we hope to facilitate a structure-based drug discovery.

FINDING A CURE
Studies have shown that 30-80% of cancer patients, 25-50% of chronic kidney disease patients, and between 20-90% of acute and chronic infections are associated with anemia. In these patients, ACD is correlated with heart failure, poor prognosis and lower quality of life.

Perioperative anemia has also been correlated with increased morbidity, mortality, and length of hospital stay.

A systematic review of 60 studies found the relative risk of death in patients with cancer increased by 65% in the presence of anemia.

Every day our research comes one step closer to finding a cure.

We are progressing our aim for the ‘perfect’ drug to treat ACD, with the development of pharmaceutical compounds.
T CELL BIOLOGY

We are studying the diseases of the western lifestyle, with our main focus on allergy (asthma, eczema), autoimmune disease (rheumatoid arthritis, psoriasis, systemic lupus erythematosus) and inflammatory bowel disease (Crohn’s disease, ulcerative colitis). All these conditions share a common factor – subtle abnormalities in the regulatory T cells that are the controllers of the immune system.

UNDERSTANDING DISEASE

We have been studying the basic interactions that control immune responses.

Our research has defined new ways in which the immune system learns to tolerate allergens and to control autoimmune disease.

The T Cell Biology Program has developed sophisticated new methods for analysing the immune cells in blood.

We use these new methods to define ‘immune signatures’ that predict the chance of developing allergy, autoimmunity, or responding to cancer therapies that involve the immune system.

T Cell Biology studies are carried out using our world-first 10-laser flow cytometers. Our CyTOF machine, commissioned in late 2014, is the first in Australia, and will dramatically increase the speed and accuracy of our clinical research.

FINDING A CURE

The impact of our research is far reaching, from cancer to inflammatory diseases. Immune dysregulation and inflammation is the driving factor behind 60% of deaths worldwide.

More specifically, autoimmune diseases affect 15-20% of Australians at some stage in their lives, allergies up to 50% and other inflammatory diseases close to 100%.

In cancer, we are currently profiling the immune system in cancer patients in order to predict who will respond best to therapy. We are also studying the immune response to cancer in animal models.

In inflammation, we are studying how the immune system is controlled at the fundamental level of pro-inflammatory and anti-inflammatory interactions between dendritic cells and CD4 T cells.

TUBERCULOSIS

Our approach to tackling Tuberculosis (TB) is through a range of measures - developing new vaccines and drugs, improving our understanding of TB immunology, discovering new biomarkers and contributing to public policy and practice. As a part of the Centre of Research Excellence in Tuberculosis Control we have the platform to translate new discoveries into more effective tools to control TB.

UNDERSTANDING DISEASE

TB is the major cause of death from a bacterial pathogen in adults; in 2013 alone there were 1.5 million deaths from TB and nine million new TB cases worldwide. In addition it remains an important cause of childhood illness and mortality in high burden countries, with 80,000 deaths in HIV-negative children in 2013.

Of importance to Australia, TB is an enormous and rapidly growing problem in our region, which contains 58% of global TB cases and 56% of multi-drug resistant TB.

As a result, our STOP-TB strategy calls for intensified research into more effective tools to control TB, including completely new approaches to TB vaccines, TB drugs and tools for the diagnosis of active TB and biomarkers to monitor the response to therapy.

FINDING A CURE

We are developing vaccines for delivery to the lung to boost immunity against TB. We are also developing subunit vaccines that contain proteins to stimulate protective immunity against different stages of the TB infection.

Around two million people have latent TB infection, with around 5% risk of developing active TB during their lifetime. As such, we are working to discover new biomarkers to distinguish those with active TB. We are also conducting a genome wide association study to identify genetic variants that contribute to increased susceptibility to TB.

The major threat to TB control is the emergence of drug resistant strains of the infection.

For the past five years we have also been working towards the development of new drugs that are effective against these increasingly prevalent drug resistant strains.
FINDING A CURE

Using our understanding of how the vessel controls endothelial cell integrity, we have recently identified microRNAs (small junk-like DNA) that also play a critical role in changing cell junctions. These microRNAs are altered in disease and are good targets for the development of therapeutic drugs.

We have developed a first-in-class drug that is able to inhibit vascular leak and improve the outcomes of disease, as tested in pre-clinical models of peripheral ischaemia, tumour growth and eye disease.

There is an urgent need for drugs that specifically target vascular leak, as there are none on the market against this aspect of disease. The development of an effective drug against vascular leak will have major impact on human health for a broad spectrum of diseases, including stroke, cancer, cardiovascular disease and eye disease.

UNDERSTANDING DISEASE

Our vascular biology research focuses largely on diseases of the aorta and diseases involving leaky blood vessels, including age-related macular degeneration, peripheral vascular disease, stroke and solid tumour growth.

Vascular leak is a hallmark of chronic inflammatory diseases, as well as the new blood vessels formed in cancer. Thus, an understanding of how vessels become leaky crosses all aspects of cancer, inflammation and cardiovascular disease. It is through this understanding that we are able to develop drugs that may inhibit or limit blood vessel leakiness.

Through our research, we have identified a molecule that is a ‘guardian of our arteries’ and protects us from the hardening of arteries, or atherosclerosis, the basis of heart attacks and strokes. We have also identified factors that can induce vascular leak, as well as factors that can inhibit vascular leak.
AGEING
Is ageing a disease? It is clear that chronological, time-dependent ageing is unstoppable. However, it is also the fact that the rate of ageing is partly controlled under genetic mechanisms, and can be manipulated and delayed. The most ambitious goal of our work is to develop a cure for ageing similar to the treatment for diseases. Our focus is finding a means of ensuring healthy ageing.

We are working to uncover novel genetic factors and pathways that have a crucial role in lifespan determination in order to answer the key question of “what allows for longevity?”

AGNES GINGES LAB FOR DISEASES OF THE AORTA
The main goal of the Aorta Lab is to identify novel pathways and regulators involved in cardiovascular disease, with a specific focus on epigenetic regulation in cellular plasticity.

Cardiovascular disease is a major cause of morbidity and mortality worldwide. The Aorta Lab is focused on identifying key biomarkers, cellular pathways and understanding the complexity of human disease using cellular reprogramming.

BIOINFORMATICS
Cancer, dementia and cardiovascular disease are all serious health problems that are heavily reliant on supercomputers and complex equations to discover better treatment and diagnostic solutions. At Centenary, Bioinformatics gives us the ability to gather data in greater volumes and process it at a much faster rate.

In the next decade, we believe that patient diagnosis for diseases, such as cancer or dementia, will be performed by computer-assisted genomics tests. This type of diagnosis is already undertaken overseas and Australia is not far behind.

CARDIOVASCULAR SIGNALLING
Cardiovascular Signaling studies how blood vessels and the heart form and maintain their function at a molecular and cellular level. The development and function of the heart and blood vessels is a precisely regulated process. This process is essential for the normal function of every organ system.

Understanding how blood vessels form and maintain has important implications in many human disease states, such as congenital vascular diseases, stroke, cancer, wound healing, diabetic complications, coronary artery diseases and vascular dementia.

CELLULAR MECHANOBIOLOGY
Cellular MechanobioLOGY is spearheading the use of complex in vitro and in vivo models for studying the cell-intrinsic cytoskeletal cues and dynamics that govern the invasive migration of tumour cells, the tissue scanning of T Cells and their cytotoxic interaction with tumour cells.

We are also developing image analysis platforms capable of automatically detecting and analysing the kinetics of actomyosin, cell movement and protrusions.

DNA REPAIR
The DNA Repair Laboratory studies antibody mutation in activated B cells, which is initiated by the DNA editing enzyme “AID”. B cells mutate their antibody genes at extremely high rates during infections, to rapidly optimise the ability of the antibodies they make to neutralise the infecting pathogen. “Off-target” mutation of oncogenes by AID underlies most adult B cell cancers.

We seek to understand why AID-induced DNA damage leads to mutation, when similar DNA damage is generally repaired faithfully.
Melanoma is the deadliest form of skin cancer, and Australia has the highest incidence in the world, with 11,569 people diagnosed in 2011. Roughly 1,500 people in Australia will die from melanoma each year.

The Melanoma Cell Biology group is focused on investigating the molecular mechanisms regulating melanoma progression, particularly the role of protein trafficking in melanoma growth and metastasis. We specialise in 3D cell culture models, live imaging, confocal and multi-photon microscopy.

Our research has shown that there are a number of key nutrient pumps (LAT1, LAT3 and ASCT2) that are increased in melanoma, prostate and breast cancer. These pumps facilitate the increased supply of nutrients required for cancer cells to grow. Our research has made significant strides towards understanding the relationship between cancer and nutrition in breast cancer, prostate cancer and melanoma.
FINANCIAL HIGHLIGHTS

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2014 AWARDS

**MATÉ BIRO**
1st Prize presentation award, Cure Cancer Australia Research Symposium, Melanoma Institute Australia, March 2014

**WARWICK BRITTON**
Officer of the Order of Australia for distinguished service to medical research as an academic and immunologist, to humanitarian and public health improvements for the people of Nepal and to the community.

**MAGDELENA BUDZINSKA**
Sydney Medical School ECR PhD Scholarships, 2015

**CHARLOTTE BURNS**
The Human Genetics Society of Australasia (HGSA) NSW branch 2014 Student Prize

**BARBARA FAZEKAS DE ST GROTH**
Nomination as the Burnet Orator - Highest honour of the Australasian Society for Immunology

**NICK KEILAR**
Academy Global Scholarship for Emerging Leaders Program

**HENI MUFILHAH**
Australian Society of Genetic Counsellors (ASGC) Scientific Meeting Student Prize 2014

**CARLO PULITANO**
Academy Global Scholarship for Emerging Leaders Program

**CARLO PULITANO**
President’s Prize - Transplantation Society Australia and New Zealand (TSANZ)

**BEN ROEDIGER**
Young Investigators Award - International Liver Transplantation Society (ILTS)

**ANNA SLOWIACZEK**
Associate Investigator F&G Bauer Foundation Scholarship, Australasian College of Dermatologist

**HUI (EMMA) ZHANG**
ASBMB COMBIO Awards for Best Poster

**THOMAS TU**
Senior author on top scoring abstract - International Liver Cancer Association 8th Annual Conference 2014

**PHILIP TONG**
President’s Medal for the highest mark in the 2014 Pharmacology Examinations for the Australasian College of Dermatologist

**YANG ZHAO**
Poster Award Winner, Inaugural EMBL Australia PhD Symposium, December 2014

**YANG ZHAO**
Runner-up Student Poster Prize, “State of the Heart” Australia Vascular Biology Society, November 2014
The Centenary Institute Lawrence Creative Prize (CILCP) is an exciting initiative that promotes medical research in Australia. It is committed to encouraging a domestic culture of scientific excellence by supporting our most promising young scientists.

The CILCP recognises bold young researchers who are taking the risks to ask the big questions of today – those questions that have most people saying “but that’s impossible”.

2014 WINNER
ASSOCIATE PROFESSOR GEOFF FAULKNER
Mater Research Institute

A/Prof Geoff Faulkner is one of Australia’s most creative young medical researchers with his research focusing on how a common, short piece of DNA affects the operation of the brain.

Geoff thinks the differences in the way each human brain functions could be determined by a segment of mobile DNA, which has the capacity to insert itself into the genome of individual brain cells.

His work may have consequences for how memories form, for brain disorders such as schizophrenia, and even spills over into diseases such as haemophilia, muscular dystrophy and some forms of cancer.

Geoff’s work has been noted internationally and groups worldwide are beginning to use his techniques to check the mobile DNA’s impact on diseases elsewhere in the body. In addition the US National Institutes of Health has established a special fund to finance research into DNA mosaicism in neurons.

Meet the CILCP FINALISTS

2014 FINALIST | DR LUCY PALMER
Florey Institute of Neuroscience and Mental Health in Melbourne

Dr Lucy Palmer wants to know how brain cells in mammals process and integrate the signals they receive from the sensory environment and how this information impacts behaviour.

Lucy obtained two degrees, a Bachelor of Science and Bachelor of Arts, from the University of Melbourne in 2001 during which time she also studied abroad at the University of California, Santa Barbara (2000). She then obtained her Master of Science at the University of Minnesota, USA before returning to Australia to pursue a PhD, which she obtained in 2008 from the ANU.

The results of Lucy’s investigations are far reaching and demonstrate the sort of adaptive changes that might occur in diseases that lead to disruptions in sensory perception such as stroke, traumatic brain injury, epilepsy, schizophrenia and alcoholism.

2014 FINALIST | DR NICOLAS PLACHTA
Australian Regenerative Medicine Institute and EMBL Australia at Monash University

Dr Nicolas Plachta wants to develop better and simpler ways of determining the health of the embryos to be implanted in IVF. He does so by learning more about the very early stages of embryonic life.

Nicolas was born in Argentina, and studied biology at the universities of Buenos Aires and Tel Aviv in Israel. During this time he published his first lead author paper.

He then completed a PhD in stem cell research and neuroscience at the University of Basel and the Friedrich Miescher Institute in Switzerland, working under former Max Planck Institute Director Yves-Alain Barde.

Nicolas is convinced there is plenty more to discover about what happens at the early embryo stage, and what makes a healthy embryo.
6

2014 PUBLICATIONS


Bertolino P and Bagnard D. (2014). Primary 1 cell activation in the liver. Book chapters in Medical Immunology (Springer). Discussion and editorial articles written in chief: MacKay and Ross. 999-899 *for authors.


Melbourne, VIC
Semsarian C, Update on the ANZSCD Study, ASMR Meeting, Scientific Meeting, Wollongong, NSW
the skin, 44th Australasian Society for Immunology Annual
Roediger B, In vivo analysis of mast cell homeostasis in expression contro, Illawarra Health and Medical Research
Rasko J, Intron retention provides a hidden layer of gene expression control, Illawarra Health and Medical Research
Rasko J, Getting something for nothing? Intron retention commonly regulates gene expression, 35th Lorne Conference on the Organisation and Expression of the Genome, Lorne, VIC
Rasko J, Getting something for nothing? Intron retention commonly regulates gene expression, 35th Lorne Conference on the Organisation and Expression of the Genome, Lorne, VIC
Rasko J, Intronic Nonsense: hidden layers of gene expression control uncovered by studying granulopoiesis, 26th Lorne Cancer Conference, Lorne, VIC
Rasko J, Innovations-Advances in cellular therapies relating to haematological conditions, ICRA, Pathology Update 2014, Melbourne, VIC
Rasko J, Updation global therapies, 7th World Congress on Tissue Banking, Melbourne, VIC
Rasko J, Gene and cell therapy update, Pathology Update, Melbourne, VIC
Rasko J, Update in global therapies, WCTB7, Melbourne, VIC
Rasko J, Heterogeneity in the microRNA-ome at CML diagnosis, NDLR 2014 Conference, Outrigger Little Hastings, Noosa, QLD
Rasko J, Heterogeneity in the microRNA-ome at CML diagnosis, NDLR Noosa, QLD
Rasko J, Intronic retention provides a hidden layer of gene expression control, Harry Perkins Institute of Medical Research, Perth, WA
Rasko J, Intronic retention provides a hidden layer of gene expression control, Harry Perkins Institute of Medical Research, Perth, WA
Rasko J, Getting something for nothing? Intron retention downstream regulates gene expression, Lowy Cancer Research Centre, UWS, Kensington Campus, Randwick, NSW
Rasko J, Getting something for nothing? Intron retention commonly regulates gene expression, Lowy Cancer Research Centre, UWS, Sydney NSW
Rasko J, Intronic retention provides a hidden layer of gene expression control, Illawarra Health and Medical Research Institute, Wollongong, NSW
Rasko J, Intronic retention provides a hidden layer of gene expression control, Illawarra Health and Medical Research Institute, Wollongong, NSW
Roadiger B, In vivo analysis of mast cell homeostasis in the skin, ARIH Australian Society for Immunology Annual Scientific Meeting, Wollongong, NSW
Semsarian C, Update on the ANZSCD Study, ASMR Meeting, Melbourne, VIC
Semsarian C, Progress on the ANZSCD Study, Pathology Update, Melbourne, VIC
Semsarian C, Cardiac genetic testing in 2014, UWA Symposium, Perth, WA
Semsarian C, Getting to the heart of sudden death, Athel Hockey Symposium, Perth, WA
Semsarian C, My patient with inherited cardiac arrhythmia syndromes – the role of genetic testing, UCAD Sydney, NSW
Semsarian C, Genetic basis and medical assessment of HCM patients, Baird Conference, Sydney, NSW
Semsarian C, Social media and health care, Expert Viewpoints Meeting, Sydney NSW
Semsarian C, Sudden death in 2014, FRACP RCPA BPT Revision Course, Sydney, NSW
Semsarian C, Update on genetic heart diseases, Sydney Cardiology Group Educational Seminar, Sydney, NSW
Semsarian C, Getting to the heart of sudden death, ASMR Meeting, Sydney NSW
Semsarian C, Caffeine, drugs and the heart, Australian Cardiovascular Health and Rehabilitation Association Meeting, Sydney, NSW
Semsarian C, What can we do about HCM? CV Forum, Sydney NSW
Semsarian C, Preventing sudden cardiac death in the young, Sydney Innovation and Research Symposium, Sydney, NSW
Semsarian C, Getting to the Heart of Sudden Cardiac Death, 21st Century Public Lecture Series, University of Sydney Sydney NSW
Semsarian C, Genetic basis of hypertrophic cardiomyopathy: translation to clinical practice, Bosch Institute Annual Scientific Meeting, University of Sydney Sydney NSW
Semsarian C, Are there individuals for whom strenuous exercise is too risky? Exercise is Medicine Meeting., University of Sydney, Sydney NSW
Semsarian C, Genomics in cardiac, clinical practice: shaping the future of cardiology., Cardiovascular Symposium, Westmead Hospital Week, Westmead Hospital Week, Sydney NSW
Semsarian C, Genetic advances in cardiology, Medical Genetics Symposium, Westmead Hospital Week, Sydney NSW
Semsarian C, The clinician researcher: how to make it happen, University of Sydney Early Career Researcher Seminar Westcock Institute, Sydney NSW
Semsarian C, Sudden death in 2014, FRACP RPA BPT Revision Meeting, Sydney, NSW
Centenary is the whole package: a world class research facility with state-of-the-art equipment, weekly seminars from brilliant national and international researchers and staff who are leaders of their field. To top it off, Centenary is nestled between RPA Hospital and the University of Sydney, so there is always a mix of clinicians, scientists and students to collaborate with and learn from.”
Meet our Scientists

Dr Chandrika Deshpande
Structural Biology - Breast Cancer

"I work with a protein called Breast Cancer Resistance Protein (BCRP), one of the most important proteins known to play a critical role in causing resistance to anti-cancer drugs in patients, thus impeding treatment.

My project, through a basic science approach, addresses the need for improved health care for cancer patients by facilitating the design and development of more effective drugs."

Australian Research Council Equipment
Australian Rotary Health research Fund Scholarship
Cancer Australia Project
Cancer Institute NSW Early Career Fellowship
Cancer Institute NSW Early Career Fellowship
Cancer Institute NSW Early Career Fellowship
Commonwealth of Australia Project
Epigenesys Network of Excellence Project
HeartKids Project
Mamoa Lena and Dino Gustin Foundation Research
Mirs Therapeutics A/S Project
National Australia Bank Project
National Health & Medical Research Council Early Career Fellowship
National Health & Medical Research Council Project
National Health & Medical Research Council Project
National Health & Medical Research Council Project
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National Health & Medical Research Council Project
Perpetual Trust Project
Prostate Cancer Foundation of Australia Young Investigator Project
Sydney Catalyst Travel
The Rebecca L. Cooper Foundation Equipment
The Rebecca L. Cooper Foundation Equipment
Tour de Cure Equipment