



2015/16  
ANNUAL REPORT



### Australian Genome Research Facility

Suite 219, 55 Flemington Road,  
North Melbourne, VIC 3051.

Telephone: +61 3 9321 3701

Fax: +61 3 9329 2957

[www.agrf.org.au](http://www.agrf.org.au)

ABN 63 097 086 292

© Australian Genome Research Facility Ltd 2016.

A not-for-profit, full service genomics capability, providing access to a national network of state-of-the-art facilities, technology, expertise and innovation.

Our member organisations are the University of Queensland and the Walter and Eliza Hall Institute of Medical Research.

### Our nodes:



### Funded by:





## CONTENTS

Chairman's message .....	4
CEO's report .....	5
AGRF at a glance .....	7
Year at a glance .....	11
Highlights .....	12
Innovation .....	13
Industry impact .....	16
Collaboration .....	22
Engagement and education .....	24
Senior leadership .....	26
Our funding partners .....	28
Governance .....	30

# CHAIRMAN'S REPORT



Australian Genome Research Facility (AGRF) was established by the Commonwealth Government in 2001 as a not-for-profit Major National Research Facility (MNRFF) to provide a critical mass of quality state-of-the-art genomic capabilities and services to Australian research institutes and industry. AGRF continues to be recognised as an important national facility and is a recipient of Commonwealth NCRIS/CRIS grants.

The last year has been an exciting year of change and opportunity for AGRF.

Following his long and strong leadership, founding chair Professor Ken Roberts and long term non-executive director, Dr Liz Dennis retired from the Board. Both were pivotal in the creation, early development and growth that has resulted in AGRF becoming Australia's largest and most comprehensive genomic facility to the research and industry sectors. 2015 -16 provided AGRF close to three thousand clients and collaborators.

The year also saw the retirement of AGRF's Chief Executive Officer Dr Susan Forrest. Sue held the position from 2004, leading and contributing to all aspects of AGRF's growth, culture, innovation and diversification of platforms, services, operations, promotions and governance.

On behalf of the AGRF family, clients, collaborators and the Board, I publically express our collective appreciation and thanks to Ken, Liz and Sue for their long term dedication and support of AGRF.

These personnel changes provided AGRF with the opportunity to refresh the Board membership and the position of Chief Executive Officer. In October 2015 three new non-executive directors joined the Board; Dr John Bell, Professor Graeme Suthers and Mr Andrew Macdonald, bringing valuable experience in public policy, research, and business to the Board. Following an extensive national executive search, the Board was very pleased to appoint Dr Irene Kourtis as AGRF Chief Executive Officer in July 2016.

I also wish to acknowledge and express appreciation to Professor Nick Samaras, Deputy Chair AGRF for undertaking the role of interim CEO during the extensive recruitment process for the new CEO.

With these new changes in place, we took the opportunity to review AGRF's future strategic direction, market opportunities, financial and operational performance targets and procedures to commence a number of exciting new initiatives aimed at delivering these objectives and ensuring AGRF continues to deliver the most contemporary genomics capabilities. Details of these initiatives are presented in this report.

These include competing and planning for relocation of AGRF's current headquarters and Melbourne laboratories to the new Victorian Comprehensive Cancer Centre (VCCC).

Another highlight is the Genomics Innovation Hub, in partnership with key Melbourne research institutions to provide shared access to innovative genomics technologies for the purpose of testing, development, and conduct of pilot projects. AGRF also contributed to the Melbourne Genomics Health Alliance (MGHA) and explored significant new collaboration capabilities with a number of Australian research intensive universities and centres, covering everything from obtaining joint benefits through economies of scale and purchasing platforms and consumables to create new targeted joint genomics centres and funding. The contribution of Bioplatforms Australia (BPA) to many of these initiatives is also acknowledged and appreciated.

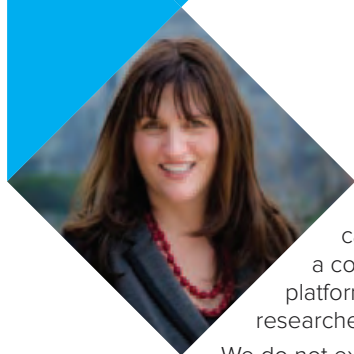
It is pleasing to report the 2015/16 financial year again delivered a positive result with both revenues and EBITA above budget. The credit for this is AGRF's management and staff who continued to deliver the most commendable dedication and persistence in response to the complex challenges of increasing competition, restraints and uncertainties in government funding and continued technological advances. Our integration with the scientific community continues to develop with the technical expertise of our staff being sought more and more by our research clients to assist in structuring their projects.

Finally, having been humbled in being asked to take over the role of Chair from Professor Roberts, I wish to thank AGRF's member organisations, University of Queensland and the Walter and Eliza Hall Institute and the Board for the privilege and their confidence in offering the position. Building on the legacy of our predecessors I look forward with enthusiasm to AGRF continuing to grow and prosper, both in business as well as in the provision of Australia's genomics capabilities and needs.

A handwritten signature in black ink, appearing to read 'Rob Lewis', with a stylized flourish at the end.

Rob Lewis

## CEO'S REPORT



AGRF has grown to become Australia's leading national genomics capability; facilitating full access to a comprehensive range of genomic platforms, bioinformatics and services, for researchers, collaborators and clients.

We do not exist in isolation; our success is shared success. To achieve our goals, we strongly value and rely on productive partnerships with external organisations, continued support from our funding partners and the support of broader genomics community. Importantly, our success can be attributed to the intellectual agility and vision of our people.

AGRF had its strongest year to date as a result of hard work, commitment, and reliable high quality sequencing data produced from our large range of services. Whilst much of the focus for genomics is on next-generation sequencing, 2015/16 saw a strong growth in genotyping. We also saw considerable growth in sectors such as: agriculture, environment, diagnostics and biomedicine. We've spent the last year focusing on making an impact to industry and this is reflected in the extended industry client base. We are incredibly proud of our achievements this year and they have provided us with a strong platform to build on for the future.

We operate in a dynamic environment where technology is taking us into a world of rapid change and constant innovation. We see great opportunity to embrace change and we understand the importance of continued innovation to build our capability and service growth areas.

Genomics continues to develop as one of the most powerful contributors to every aspect of research, industry and living systems in general. This is best seen in the Health and Medical Sciences sector, with the growth of clinical genomics, personalised and precision medicine. This will drive the emphasis of community and personal health and wellbeing towards preventative solutions. The development of this and other revolutions in genomics requires an ongoing adaptive capability that is coordinated, integrated throughout the areas of relevant interest and scale as well as being internationally relevant and connected.

Partnerships and collaborations have been significant in 2015/16. AGRF is a founding partner of the Melbourne Genomics Health Alliance (MGHA), with the aim of integrating genomics into everyday healthcare. AGRF is contributing to Australia's national policies, capacity building and ongoing competitiveness by providing national leadership in new initiatives such as the Genomics Innovation Hub; which will acquire, test, develop and apply cutting edge genomics technologies to address high priority research needs.

Our innovation and development scientists play a critical role in the introduction of new methodologies and technologies to ensure AGRF remains at the cutting edge of our genomic capability.

A key technology highlight of the year is the collaborative effort between AGRF and the University of Melbourne to jointly acquire the Chromium™ System,

providing Australia with one of the first opportunities outside the United States to utilise this powerful new genomic technology towards research that can significantly improve patient outcomes.

An important and exciting strategic development in early 2016 has been securing a coveted place in the state-of-the-art Victorian Comprehensive Cancer Centre (VCCC) following a worldwide search. This exciting development will see AGRF work collaboratively with other world-leading research groups and cancer experts at the VCCC to quickly translate the latest breakthroughs in cancer research into clinical practice, delivering even better care and outcomes for patients.

This is one of the most exciting times to be involved in genomics as it drives a significant portion of the innovation agenda for Australia. We expect that genomic information will not only transform personal medicine, but also all of the biologically-based industries - medicine, healthcare, agriculture, natural products and the environment.

To support the dynamic landscape, we continually review our quality services and seek efficiencies to ensure our resources support the requirements of the future.

Our customers remain our highest priority and we continue to improve the way we interact and communicate with them every day. Our strategic focus continues to build infrastructure, access to the best genomics technology platforms, expertise and capacity that optimise scientific outputs and maximise the time our customers can spend making discoveries.

We continue to measure our progress and we actively seek feedback from our customers using our Net Promoter Score (NPS) to build on the improvements seen in the last financial year. While we have made significant progress, we know we have more to achieve. We have a clear strategy and our focus for the year ahead remains on improving our customer service, ongoing investment in infrastructure, technology and building capacity toward the genomic revolution.

I thank our Board of Directors, for their commitment and expertise to guide the ongoing success of AGRF. In addition I would like to acknowledge the significant contribution of my predecessor, Sue Forrest who has been with AGRF since its inception and steered AGRF through exciting and challenging times.

AGRF looks forward to an exciting year ahead as we lead genomic services and innovation with the dedication and enthusiasm from all of our staff and we sincerely thank them.

A handwritten signature in black ink, reading 'Irene Kourtis'.

Dr Irene Kourtis





## AGRF

We believe in improving the quality of life through transformational life sciences.

We seek to empower Australia to be recognised for world-class genomics and innovation.

By exchanging and collaborating in knowledge expertise, providing access to innovative and state-of-the-art genomic technologies, we enable Australian academia and industry to advance leading edge genomic research.

### OUR VALUES

#### COLLABORATION

A shared purpose to harness dynamic collaborations and work with each other and clients to deliver meaningful impact.

#### INNOVATION

Inspired by discovery. Working with our clients and internally to deliver resourceful solutions and value through innovation.

#### INTEGRITY

Building long-term relationships and trusted partnerships through behaviour that reflects mutual respect, honesty, responsibility, transparency and fairness.

#### CUSTOMER FOCUS

Delighting our customers is the heart of everything we do. A can-do attitude and a healthy team spirit is part of our DNA.

#### EXCELLENCE

Our work is done with relentless ambition to maintain the highest standards and quality to exceed expectations, consistently.

### OUR VISION

To be a key enabler of world-class genomic science.

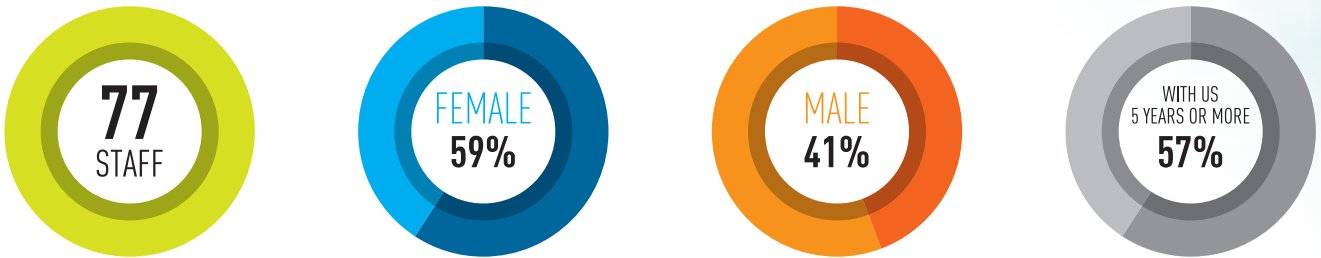
### OUR MISSION

To provide Australia with a world-standard, research integrated, capability delivering genomic solutions to the biomedical, agricultural and environmental sectors to address key scientific questions for Australia.

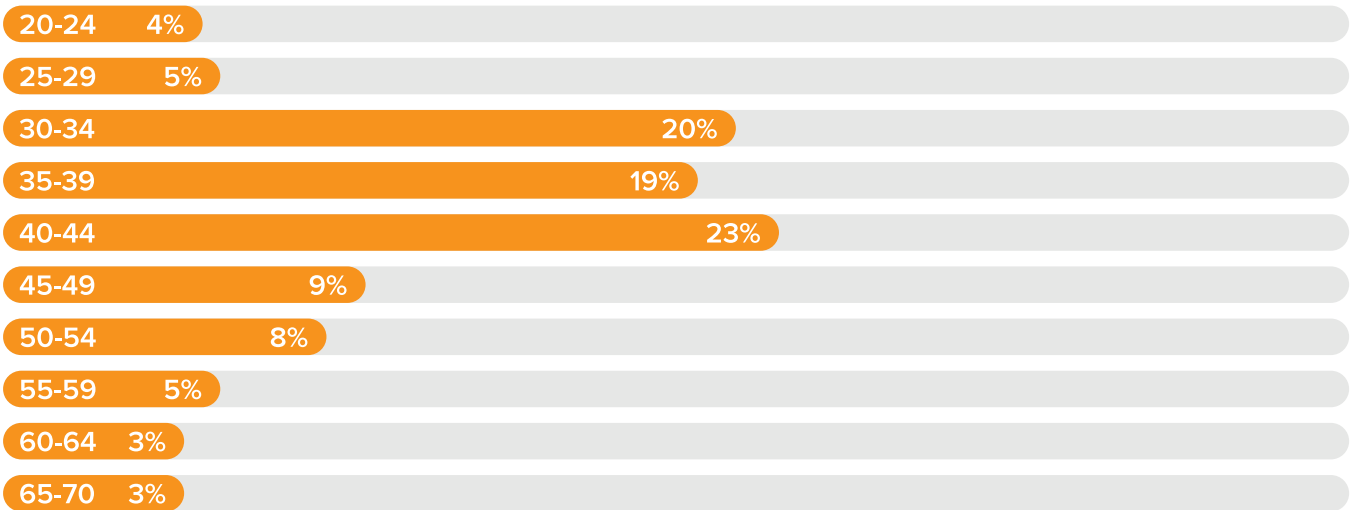
# AGRF AT A GLANCE

**OUR PEOPLE** AGRF values the contribution of its people, and knows that only through our people will our goals be achieved. Excellence in service delivery, research and innovation requires great staff and we have the right leadership, teams and talent in place to take us confidently into the future.

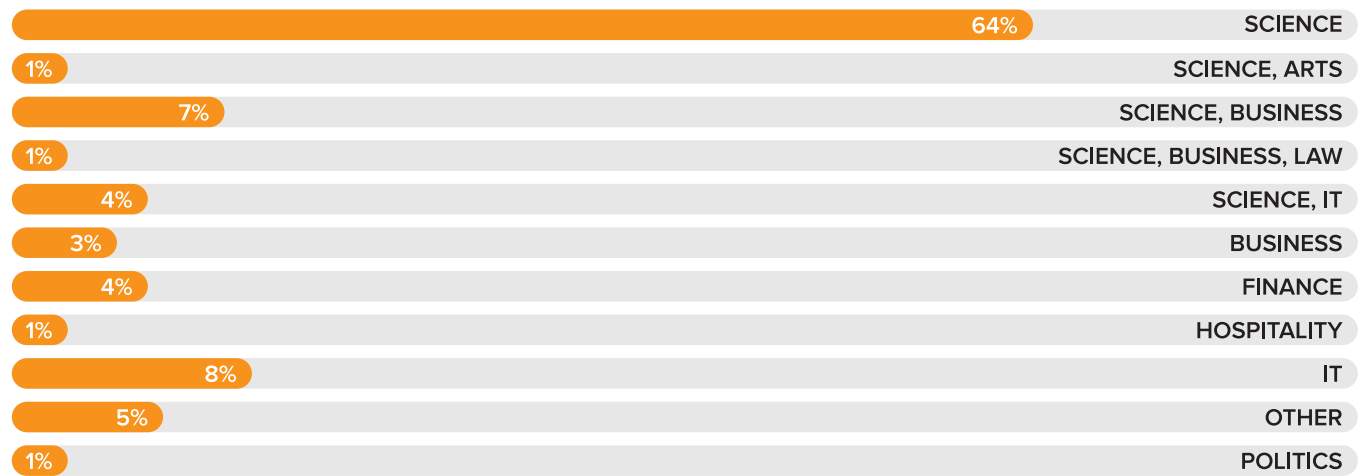
**WORKPLACE DIVERSITY** We believe that a diverse workplace is essential for success. We're committed to creating and maintaining a workplace that reflects the diversity of the customers and communities we serve.



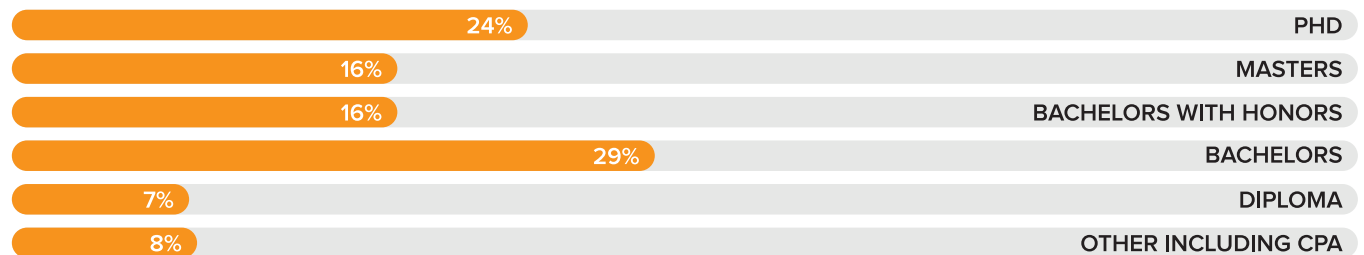
## AGE DIVERSITY



## AGRF STAFF EDUCATION DISCIPLINE



## AGRF HIGHEST QUALIFICATION ACHIEVED





## DEAN'S COMMENDATION FOR DOCTORAL THESIS EXCELLENCE



*Gai McMichael, Senior Scientist (Adelaide).*

**SENIOR SCIENTIST, DR GAI McMICHAEL** was awarded the Dean's Commendation for Doctoral Thesis Excellence by the University of Adelaide for an outstanding PhD.

Dr McMichael's doctoral research explores the genetic contribution to cerebral palsy using whole-exome sequencing in a cohort of sporadic cerebral palsy cases, and in families with more than one individual with a confirmed diagnosis of cerebral palsy.

Cerebral palsy is the most frequent cause of physical disability in childhood. Its prevalence (1 in 400 children) has changed little in 50 years, the causes remain largely unknown and the contribution of genetic causes have not been widely examined.

The study highlights the genetic heterogeneity and complexity of cerebral palsy. The findings show 14% of sporadic CP cases had a potentially pathogenic gene variant, and in the families with more than one affected individual, a potentially causative gene variant was also found.

Cerebral palsy is of major importance to the affected individuals, their families and society. Identifying genetic causes of cerebral palsy allows improved recurrence risk counselling, increases reproductive options for some families and opens the way for treatment based on an improved understanding of the individual's, or a group of individuals', specific genetic diagnosis.

# OUR FACILITY



**5 nodes across Australia** and access to 2 PC2 laboratories.



**ISO/IEC 17025:2005** accredited protocols. Providing technical capabilities to ISO 15189 labs for clinical genomics.



**52 lab technicians and senior scientists** providing comprehensive support.

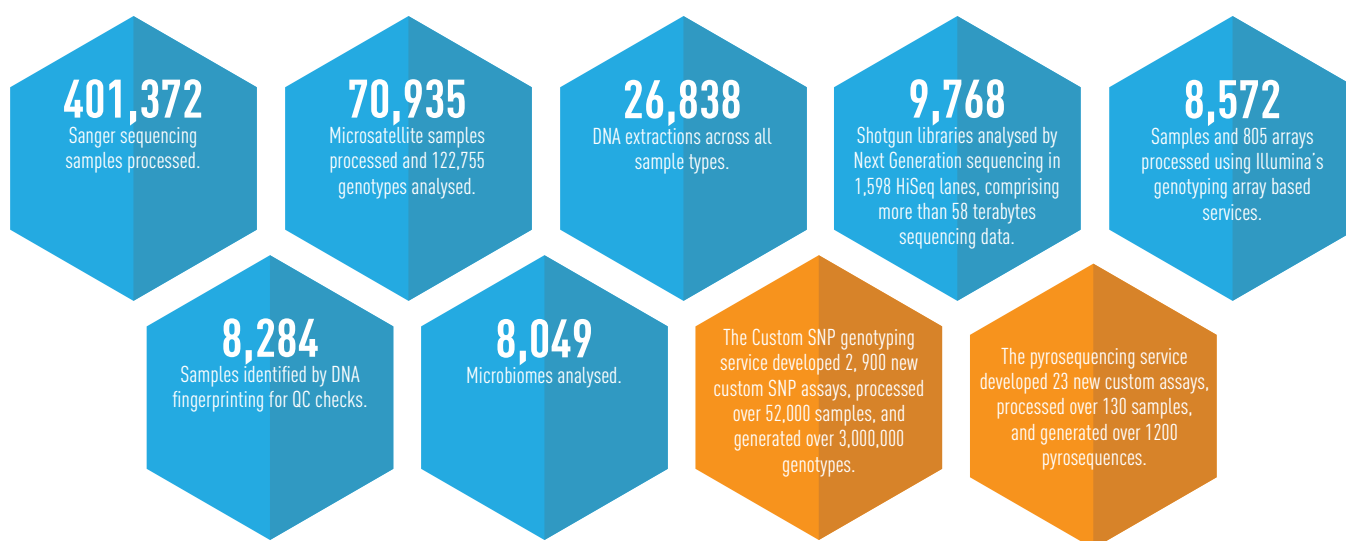


**Over \$19 million invested** in current genomics platforms, delivering significant capacity and capability.

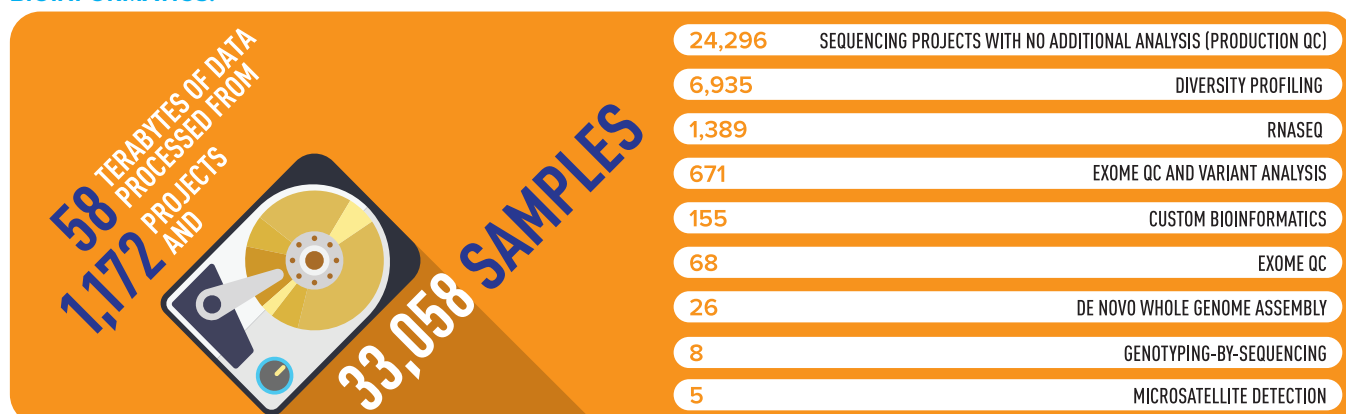
## STATE OF THE ART INSTRUMENTATION:

8	5	4	2	2	1	1	1	1
8 x Applied Biosystems 3730xl 96 Capillary DNA Analyser (Sanger Sequencing Service)	5 x Illumina MiSeq (Nextgen/Massive Parallel Sequencing)	4 x Illumina HiSeq 2500 (High throughput Nextgen/Massive Parallel Sequencing)	2 x Applied Biosystems 3730 48 Capillary DNA Analyser (Fragment Analysis Service)	2 x Illumina iScan (Microarray SNP Genotyping)	1 x Illumina MiniSeq (Nextgen/Massive Parallel Sequencing)	1 x Applied Biosystems Ion Torrent (Nextgen/Massive Parallel Sequencing)	1 x Sequenom/Agena Compact (MS Array SNP Analysis)	1 x Illumina NextSeq500 (Nextgen/Massive Parallel Sequencing)

## OPERATIONAL SNAPSHOT:



## BIOINFORMATICS:

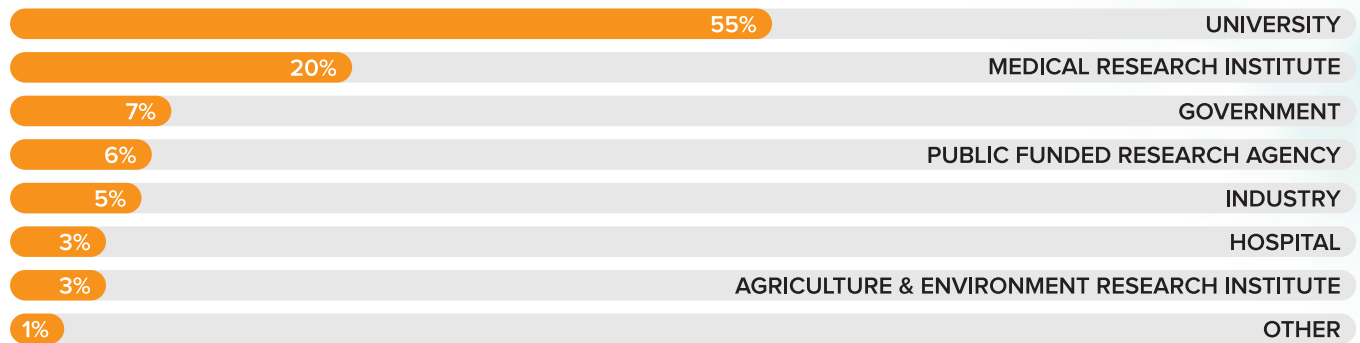


# YEAR AT A GLANCE

2772

CLIENTS SERVICED

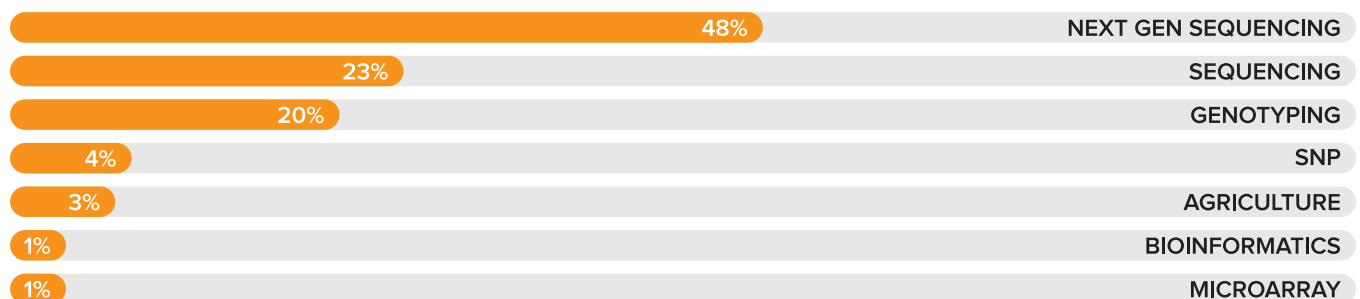
## AGRF CLIENTS 2015-2016



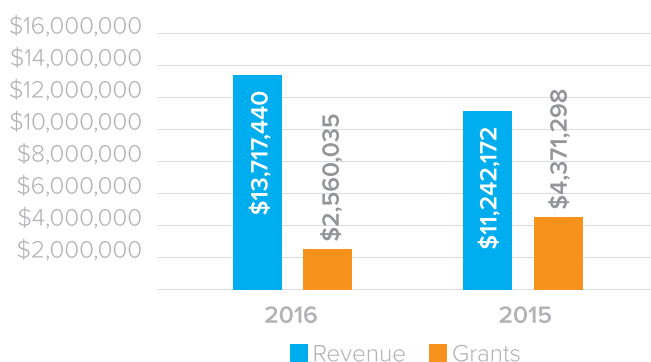
## CLIENTS BY CATEGORY



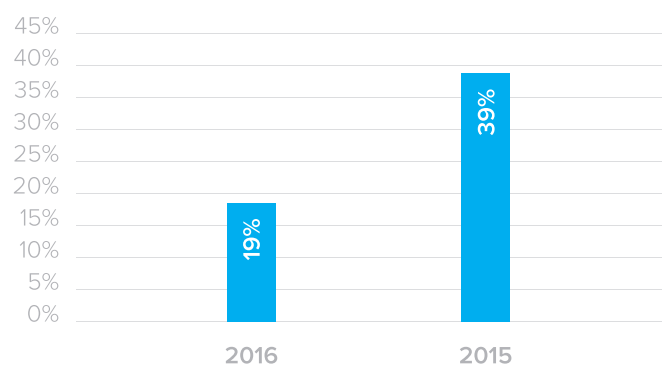
## AGRF REVENUE BY SECTION 2015-16



## REVENUE vs GRANTS



## REVENUE FROM GRANTS



**OUR BUSINESS MODEL IS BASED ON FULL COST RECOVERY** Our service fees include reagents, staff time, instrument maintenance and operational infrastructure that allow AGRF to continue to serve the Australian scientific community as an independent entity. All revenues are reinvested into the community, our facilities, technology and expertise to enable our services to remain cutting edge and of the highest standards.

# HIGHLIGHTS

## NEW CEO

AGRF welcomed new Chief Executive Officer, Dr Irene Kourtis in June 2016.

AGRF's Chairman, Rob Lewis, said: "The Board is delighted an executive of Irene's calibre is leading AGRF". Irene has an outstanding reputation for her leadership capabilities, strategic thinking and business acumen.

Dr Kourtis, was most recently chief executive officer of Children First Foundation: a Melbourne based charity providing life-saving and transformational surgery for children from developing countries. Before joining Children First Foundation, Irene was the head of enterprise and business development for the Victorian Institute of Forensic Medicine.

Dr Kourtis holds a PhD from the MacFarlane Burnet Centre for Medical Research (Burnet Institute) and has over 15 years of experience in research and development in medical and animal health. She is also a graduate of the Australian Institute of Company Directors and holds a graduate diploma in intellectual property law.

## AGRF JOINS WORLD-CLASS RESEARCH GROUPS AT THE VICTORIAN COMPREHENSIVE CANCER CENTRE

AGRF successfully secured a coveted place in the state-of-the-art Victorian Comprehensive Cancer Centre (VCCC), following a worldwide search.

Level thirteen of the VCCC is a new home for the Peter Mac led Immunotherapy Research Program, AGRF, Cooperative Research Centre for Cancer Therapeutics and the Innovative Clinical Trials Centre.

Together, organisations that occupy level thirteen work collaboratively with other research groups and cancer experts at the VCCC to translate the latest breakthroughs in cancer research into clinical practice, delivering even better care and outcomes for patients.

The VCCC hosts up to 1200 cancer researchers, featuring cancer research and clinical facilities for Peter Mac, Melbourne Health, research facilities for the University of Melbourne and education facilities. The 13-storey VCCC, located in the heart of Melbourne's biomedical precinct in Parkville, was funded by the Commonwealth and Victorian Governments.

## NEW LOOK FOR AGRF

We've been hard at work over the past 19 years building the AGRF brand and making it a successful member of the genomics community. We have evolved our organisation, grown in numbers, expanded our services and contributed to projects that have made an impact. With all these exciting changes happening, it was time for a new visual expression of our brand — one that marries our past to our present and sets the course for where we're headed in the future.

Our new logo was launched December 2015.





# INNOVATION

**AGRF'S** innovation and development team actively participates in initiatives that allow AGRF to rapidly develop and deploy new services relevant to the Australian life science community and be recognised as a premier hub for testing and development of new technologies.

This initiative ensures a pool of knowledge is accessible to the research community by delivering cost savings through operational enhancements and enabling access to relevant cutting edge technologies and applications that really make a difference to the scientific community.

In addition, the group's responsibilities include:

- Discussion of developments in the scientific and technological environment and emerging market needs
- Planning and execution of development projects
- Working with technology companies to test and develop new instruments, applications, and services
- Keeping up to date in global and local trends in research and technology
- Maintaining currency of technology portfolio
- Development and coordination of project funding and grant opportunities

## COLLABORATIVE ACQUISITION OF WORLD-LEADING GENOMICS SYSTEM: CHROMIUM™ SYSTEM

### AUSTRALIAN GENOME RESEARCH FACILITY AND THE UNIVERSITY OF MELBOURNE

jointly acquired the Chromium™ System from US company 10x Genomics®, to provide Australia with one of the first opportunities outside the United States to utilise the powerful new genomic technology towards research to improve patient outcomes.

10x Genomics® has changed the definition of genetic sequencing by providing an innovative genomics platform that dramatically improves the capabilities of existing sequencing technologies. Using a microfluidics-based molecular barcoding solution, the Chromium™ System allows researchers to sequence DNA at much higher resolution and investigate the activity of individual cells.

The Chromium™ System supports continued innovation in whole genome and large-scale sequencing technology that is crucial to improvements in understanding the root-causes and the potential therapeutic avenues such as those arising in complex, rare and recalcitrant tumors.

This acquisition marked the beginning of an expanded collaborative relationship with researchers to acquire, test and develop new and disruptive technologies that are crucial to maintaining Australia's place at the forefront of genomics research. This collaborative acquisition delivers on the mission of AGRF to support Australian researchers and enable world class genomic science.



# BENEATH THE SURFACE OF LAKE HILLIER



## THE EXTREME MICROBIOME PROJECT

The eXtreme Microbiome Project (XMP) is a scientific effort to characterise, discover, and develop new pipelines and analytical protocols for extremophiles and novel organisms.

This project was initiated as part of the Association of Biomolecular Resource Facilities (ABRF) Metagenomics Research Group (MGRG), USA, in 2014 as a consortium of microbiologists, geneticists, oceanographers, and bioinformaticists with a goal to evaluate, study, and refine methodologies related to any aspect of metagenomics and microbiome studies.

This includes study designs, controls, detection methods, and bioinformatics pipelines and software. The goal is to identify the species that thrive in such environments, understand how they compare to related species and how they evolve to such habitats, as well as to mine the data for potential new drugs.

## THE OXFORD NANOPORE AT LONDON CALLING CONFERENCE

**KEN MCGRATH, NATIONAL SANGER SEQUENCING MANAGER**, was invited to deliver a plenary presentation at the Oxford Nanopore London Calling conference in May 2016, showcasing his work using the MinION sequencer to profile the metagenomes of microbial environments, as part of eXtreme Microbiome Project.

The London Calling conference gathers scientists from the Nanopore Community to share their experiences of using nanopore sensing technology in their work. The Nanopore Community includes a diverse group of scientists exploring a wide range of applications including human genomics, metagenomics, environmental, pathogens and surveillance.

The Oxford Nanopore Technologies (ONT) MinION is a revolutionary new device capable of directly sequencing single DNA molecules via translocation through a protein pore. The MinION is a portable USB-powered sequencing device that provides real-time data and fast, simple workflows.

As part of this study, AGRF travelled to and sampled one of these extreme microbial environments to learn more about the organisms that inhabit the lake. Ken McGrath (AGRF Brisbane) led the expedition to Lake Hillier, to collect samples from a number of locations including the lakeside bank, the water in the lake, and the lake sediment below the salt crust at the bottom of the lake. Preserved using either dry ice, ethanol, or a DMSO/salt preservative solution, the samples were returned to AGRF labs for DNA extraction and genetic analysis.

Analysis of the genetic material from the lake shows that the lake is alive with microbial activity. The halophiles (salt-loving organisms) include bacteria, algae, and archaea, and together contribute to the unique and distinct colour that is characteristic of Lake Hillier.

From Lake Hillier, which is about 35 percent saline and has a pH of 7.4, the team has identified *Dunaliella* — the pink algae that give the lake its color. *Dunaliella* had always been the suspected culprit for Lake Hillier's fluorescent pink hue, but had never been characterized.



Ken McGrath, National Sanger Sequencing Manager.



# PARTNERING TO DRIVE INNOVATION AND ACCELERATE GROUND-BREAKING ADVANCES

**ESTABLISHED IN APRIL 2016** by AGRF and the University of Melbourne, the Genomics Innovation Hub brings together the critical mass of resources to develop and test powerful new genomics technologies.

Together with other partners including; the Peter MacCallum Cancer Centre, the Walter and Eliza Hall Institute of Medical Research, and the Murdoch Children's Research Institute, the Genomics Innovation Hub is focused on building an innovation ecosystem to significantly accelerate ground breaking advances in genomics research.

The Hub will allow sharing of research and resources in a way that no single institution can do on its own to acquire, test and develop new and disruptive technologies that are crucial for Australia to be at the forefront of genomics research.

The Hub is further strengthened through the support of Bioplatforms Australia and the National Collaborative Research Infrastructure Strategy.

## GENOMICS INNOVATION HUB

### STEPPING UP THE CHALLENGE OF INNOVATION

Bringing resources together to diffuse cutting-edge genomics technologies.

### STATE OF THE ART TECHNOLOGIES

Access to Australia's first 10X Genomics Chromium system. Early access to cutting edge technologies such as the Oxford Nanopore Technologies PromethION.

### MANAGING COST EFFICIENCY

Open access to a cutting-edge technology portfolio and competencies.

### BUILDING INNOVATION ECOSYSTEMS

Through common research, collaboration, education and technology development.



### CREATING COMPETITIVE ADVANTAGE THROUGH ASSAY DEVELOPMENT AND DELIVERY

Sanax Medical and First Aid Supplies is a commercial supplier of forensic sampling kits. With a new Australian quality standard pending, SANAX wanted to create a competitive position by becoming the first Australian provider to be granted this certification, and contacted AGRF to develop a DNA detection methodology. This was achieved in March 2016, and SANAX has continued to work with AGRF to routinely provide the testing for batch verification in their supply chain. This fundamental work has led to new product opportunities for SANAX in national and international markets.

# INDUSTRY IMPACT

**GENOMICS** and related biosciences are advancing at an extraordinary pace as new discoveries are made that enable the development of innovative products and services. As a consequence, the emergence of new applications for genomics technology are driving productivity, product commercialisation and commercial competitiveness.

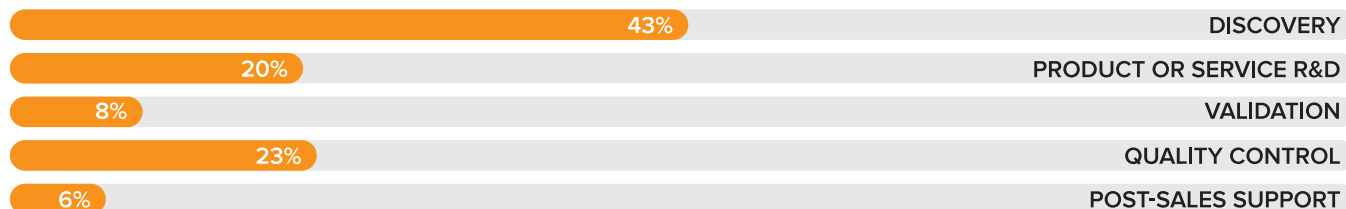
## COMMERCIAL CUSTOMERS WE SERVE



By facilitating access to innovative technology, expertise and comprehensive support, we've supported industries through the entire innovation pipeline, translating new knowledge and techniques to applied outcomes.

From discovery to delivery, our services have led to new biomarker discoveries, the development of novel assays, and the delivery of genomic assays that are core to an organisation's business operation.

## OUR CONTRIBUTION TO COMMERCIAL CUSTOMER INNOVATION PIPELINE



## DELIVERING GENOMICS INSIGHT, FROM DISCOVERY TO SERVICE DELIVERY

### DISCOVERY

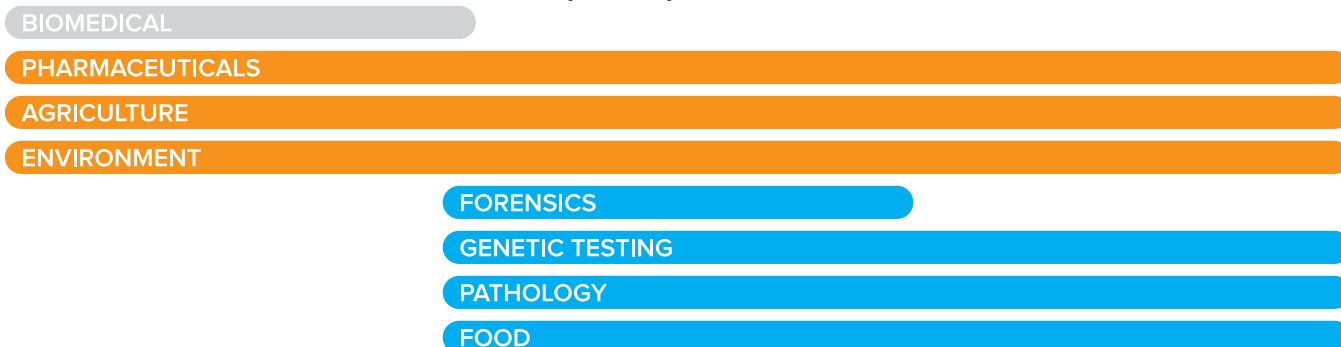
Genomics techniques are used to discover biological markers that can lead to new information, such as therapeutic or diagnostic products.

### DEVELOPMENT

We help design, develop, validate and implement novel assays for a broad range of applications relevant to areas such as pharmaceuticals, pathology, agriculture and horticulture, genetic testing and forensics.

### DELIVERY

A reliable, commercially savvy provider of predesigned assays in business to business contracts to support broader client functions.



# DISCOVERY AND IDENTIFICATION OF THE UNIQUE BIODIVERSITY IN PILBARA, WESTERN AUSTRALIA

**THE PILBARA** region in Western Australia has some of the world's most ancient natural landscapes, dating back two billion years and stretching over 400,000 square kilometres. Recognised as the ideal site to discover ancient fauna, Western Australia offers a unique opportunity to study, discover and identify new species, both terrestrial and marine.

The Pilbara is also known as the engine room of Australia and home to a massive mining industry in crude oil, salt, natural gas and iron ore.

To learn more about the impact of mining to the Pilbara fauna, Western Australia Museum (WAM) was awarded the Net Conservation Benefits Fund – Conservation Systematics of the western Pilbara fauna.

The project led by the Western Australian Museum is designed to support on-ground conservation outcomes by providing a more thorough understanding of the systematics and composition of selected terrestrial and marine fauna of the western Pilbara.

Part of the project involved applying genetic approaches to biodiversity to understand biological diversity at all levels, from genes, populations and species to ecosystems. AGRF has supported the project generating more than 15,000 sequences every year, from thousands of specimens, to help fast forward the process and answer many questions along the way.

These approaches are increasingly complementary to traditional morphological research into species identities and help determine taxa that are undescribed, cryptic or have restricted geographic ranges, and may need active conservation initiatives.

The research team will publish this information online, and make it accessible to public and scientific communities locally and around the globe.

## ABOUT THE WESTERN AUSTRALIAN MUSEUM

The Western Australian Museum is the State's premier cultural organisation, housing WA's scientific and cultural collection. For over 120 years the Western Australian Museum has been making the State's natural and social heritage accessible and engaging through research, exhibitions and public programs. This project is funded by the Gorgon Project's Barrow Island Net Conservation Benefit Fund, which is administered by the Department of Parks and Wildlife. The Gorgon Project is operated by an Australian subsidiary of Chevron and is a joint venture of the Australian subsidiaries of Chevron (47.3%), ExxonMobil (25%), Shell (25%), Osaka Gas (1.25%), Tokyo Gas (1%) and Chubu Electric Power (0.417%).





## DNA FINGERPRINTING TO BOOST SUGARCANE BREEDING PRODUCTIVITY

### THE AUSTRALIAN SUGARCANE INDUSTRY

is one of Australia's largest and most important rural industries. There are approximately 4,000 cane farming entities growing sugarcane on a total of 380,000 hectares annually to supply sugar to Australian and international consumers - generating up to \$2.0 billion in export earnings for Queensland.

To ensure that Australia's sugarcane industry continues to be productive and profitable, Sugar Research Australia (SRA) operates 10 research farms, laboratories, and offices across the Australian sugarcane industry with a research effort that extends across the industry and supports all growers and millers.

One of the main objectives for SRA is to maximise economic profits for the industry (growers and millers) through genetic improvement of new varieties.

AGRF worked with SRA on a project that focuses on quality control in a plant breeding and selection programs to ensure a unique identification

of sugarcane varieties. This was done by implementing variety audit programs and using DNA markers to uniquely identify new varieties at critical stages of the selection and multiplication process.

A more reliable and unambiguous means of identification is essential to prevent downstream consequences such as poor productivity and disease risks. Since completion of the projects SRA has implemented the variety identification service which is incorporated into the sugarcane selection program as a routine variety audit system. This has resulted in earlier identification and resolution of errors in the propagating and multiplication process. Overall, applying genomics has proven to be a more reliable and objective method for identification of sugarcane varieties that boosts productivity.

## OUR QUALITY MANAGEMENT SYSTEM FRAMEWORK DRIVES CONTINUOUS IMPROVEMENT

**QUALITY** and the provision of quality data is an integral part of our everyday routine; our culture and why we take pride in what we do. Over the last 19 years, AGRF has established reliable and large-scale logistical and technical systems to deliver quality data and timely outcomes to both our academic and commercial users.

We continued our commitment to providing quality services to the genomic community through continuous improvement of our quality management system.

NATA accredited since 2001 in the field of Biological Testing against ISO17025:2005: General requirements for the competence of testing and calibration laboratories, and assessed by NATA every 18 months for continued compliance, the Perth, Brisbane, Sydney and Melbourne nodes were all reaccredited by NATA in 2016 with the Adelaide node reassessment due late 2016.

We continue to work towards expanding our service portfolio to respond to technology and platform changes. We have a responsibility to use our expertise to support Australian researchers and enable world class genomic science.

As part of this commitment we established an Innovation and Development committee with the aim of introducing new services quickly, as well as assessing new kits and applications within the AGRF accredited Quality Management System framework. This initiative ensures service validation and quality control pipelines are assessed and documented to deliver quality genomic services to our customers.

## STRENGTHENING BIOINFORMATICS

**BIOINFORMATICS** is vital to the life sciences and the benefits they deliver in health, the environment and agriculture. AGRF's bioinformatics team had a strong and successful year with contributions to significant key large projects that include: whole genome assembly and annotation, methylation studies, microbial genomics, genotyping and the range of RNAseq analysis.

Australian scientists are generating large amounts of data through genomics research and our bioinformatics capability allows them to analyse their data efficiently.

The bioinformatics team was involved with several key projects including the ARC Research Hub for Advanced Prawn Breeding, the Melbourne Genomics Health Alliance, and developed protocols and analysis pipelines for MinION sequencing.

AGRF encourages training in bioinformatics, by developing and presenting workshops with Bioplatforms Australia and promoting Software and Data Carpentry workshops. In addition, AGRF is also involved in community groups such as the Australian Bioinformatics and Computational Biology Society and COMBINE - a group for Australian students in bioinformatics and computational biology and the ABACBS,

AGRF became a node of EMBL Australia Bioinformatics Resource (EMBL-ABR) - a distributed national research infrastructure providing bioinformatics support to life science researchers in Australia. AGRF's role is to contribute to the development and provision of training in data, tools and platforms to enable Australia's life science researchers to undertake research in the age of big data. This training will help build Australia's bioinformatics capability and skill.

*Sushma Chandrashekar, Laboratory Technician.*



# RESEARCH ACHIEVEMENTS

## PUBLICATIONS



### AGRF CO-AUTHORED PUBLICATIONS

- Anderson, A. L., Stanger, S. J., Mihalas, B. P., **Tyagi, S.** & Nixon, B. 2015, 'Assessment of microRNA expression in mouse epididymal epithelial cells and spermatozoa by next generation sequencing'. *Genomics Data*. Vol.6, pp.208-211.
- Nixon, B., Stanger, S. J., Mihalas, B. P., Reilly, J. N., Anderson, A. L., Dun, M. D., **Tyagi, S.**, Holt, J. E. & McLaughlin, E. A. 2015, Next Generation Sequencing Analysis Reveals Segmental Patterns of microRNA Expression in Mouse Epididymal Epithelial Cells. *PloS One*. Vol.10, Issue. 8.
- Nixon, B., Stanger, S. J., Mihalas, B. P., Reilly, J. N., Anderson, A. L., **Tyagi, S.**, Holt, J. E. & McLaughlin, E. A. 2015. 'The MicroRNA Signature of Mouse Spermatozoa Is Substantially Modified During Epididymal Maturation'. *Biology of Reproduction*. Vol. 93, Issue. 4, pp.1-20.
- Watson-Haigh, N. S., Revote, J., Suchecki, R., **Tyagi, S.**, Corley, S. M., Shang, C. A., & McGrath, A. 2016, 'Towards an open, collaborative, reusable framework for sharing hands-on bioinformatics training workshops'. *Briefings in Bioinformatics*. 2016, pp.1-8.
- Chamova, T., Guergueltcheva, V., Gospodinova, M., Krause, S., Cirak, S., Kaprelyan, A., Angelova, L., Mihaylova, V., Bichev, S., **Chandler, D.**, Naydenov, E., Grudkova, M., Djukmedzhiev, P., Voit, T., Pogoryelova, O., Lochmüller, H., Goebel, H. H., Bahlo, M., Kalaydjieva, L. & Tournev, I. 2015, 'GNE myopathy in Roma patients homozygous for the p.I618T founder mutation'. *Neuromuscular Disorders*. Vol. 25, Issue, 9, pp.713.
- Li, X., Zhu, Y.-G., **Shaban, B.**, Bruxner, T. J. C., Bond, P. L., & Huang, L. 2015, 'Assessing the genetic diversity of Cu resistance in mine tailings through high-throughput recovery of full-length copA genes'. *Scientific Reports*. Vol. 5.
- Sadedin, S. P., Dashnow, H., James, P. A., Bahlo, M., Bauer, D. C., Lonie, A., Lunke, S., Macciocca, I., Ross, J. P., **Siemering, K. R.**, Stark, Z., White, S. M. Melbourne Genomics Health Alliance, Taylor, G., Gaff, C., Oshlack, A. & Thorne, N. P. 2015, 'Cpipe : a shared variant detection pipeline designed for diagnostic settings'. *Genome Medicine*. Vol.7, Issue. 1, pp.1-10.
- Stark Z., Tan T.Y., Chong B., Brett G.R., Yap P., Walsh M., Yeung A., Peters H., Mordaunt, D., Cowie S., Amor D.J., Savarirayan R., McGillivray G., Downie L., Ekert P.G., Theda C., James P.A., Yapito-Lee J., Ryan M.M., Leventer R.J., Creed E., Macciocca I., Bell K.M., Oshlack A., Sadedin S., Georgeson P., Anderson C., Thorne N., **Melbourne Genomics Health Alliance**, Gaff C., White S.M., 2016, 'A prospective evaluation of whole-exome sequencing as a first-tier molecular test in infants with suspected monogenic disorders'. *Genetics in medicine : official journal of the American College of Medical Genetics*.
- Stock, O., **Gordon, L.**, Kapoor, J., Walker, S. P., Whitehead, C., Kaitu'u-Lino, T. J., Pell, G., Hannan, N.J. & Tong, S. 2015, 'Chorioamnionitis Occurring in Women With Preterm Rupture of the Fetal Membranes Is Associated With a Dynamic Increase in mRNAs Coding Cytokines in the Maternal Circulation'. *Reproductive Sciences*. Vol.22, Issue.7, pp.852–859.
- Moghaddas, F., De Nardo, D., Baker, P., **Gordon, L.**, Sadedin, S., Oshlack, A., Akikusa, J., Allen, R., Munro, J., Ellis, J. & Masters, S. 2015, 'Whole exome sequencing in systemic juvenile idiopathic arthritis'. *Pediatric Rheumatology*. Vol. 13, no. Supplement 1, p. O2.
- Saffery, R., & **Gordon, L.** 2015, 'Time for a standardized system of reporting sites of genomic methylation'. *Genome Biology*. Vol.16, Issue.1, pp.85.
- Wohlmut, H., Leach, D., **McGrath, K.**, **Gordon, L.**, Mouatt, P., & De Voss, J. 2016, 'Is DNA Barcoding Using Universal Barcodes A Useful Test For Botanical Raw Materials, Extracts And Products?' *Planta Medica*. Vol.82, Issue.5.
- Bissett, A., Fitzgerald, A., Meintjes, T., Mele, P. M., Reith, F., Dennis, P. G., Breed, M. F., Brown, B., Brown, M.V. Brugger, J., Byrne, M., Caddy-Retalic, S., Carmody, B., Coates, D. J., Correa, C., Ferrari, B. C., Gupta, V. V. S. R., Hamonts, K., Haslem, A., Hugenholtz, P., Karan, M., Koval, J., Lowe, A.J., Macdonald, S., **McGrath, L.**, Martin, D., Morgan, M., North, K.I., Paungfoo-Lonhienne, C., Pendall, E., Phillips, L., Pirzl, R., Powell, J. R., Ragan, M. A., Schmidt, S., Seymour, N., Snape, I., **Stephen, J. R.**, **Stevens, M.**, **Tinning, M.**, Williams, K., Yeoh, Y. K., Zammit, C. M. & Young, A. 2016, 'Introducing BASE: the Biomes of Australian Soil Environments soil microbial diversity database'. *GigaScience*. Vol.5, pp. 21.

### KEY JOURNALS CITED

Nature Communications  
Nature Plants  
Cancer Research  
BMC Evolutionary Biology  
Antonie van Leeuwenhoek



Human Mutation  
Journal of Experimental Botany  
Molecular Psychiatry  
Plant Pathology



# COLLABORATION MELBOURNE GENOMICS HEALTH ALLIANCE

**AGRF** is a proud member of the Melbourne Genomics Health Alliance, which brings together genomics expertise and resources from across Melbourne.

The Alliance links the clinical, research and teaching strengths of its seven founding members to integrate genomic information into everyday healthcare and clinical research for the betterment of patients. The Alliance is clinically driven, with all decision making guided by clinical principles and with patient preference and welfare front-of-mind. A key motivation for the creation of the Alliance is the ethical sharing of clinical genomic data from multiple accredited testing laboratories.

AGRF together with the Alliance members: The Royal Melbourne Hospital, The Royal Children's Hospital, The University of Melbourne, The Walter and Eliza Hall Institute of Medical Research, the Murdoch Children's Research Institute, Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Peter MacCallum Cancer Centre, Austin Health and Monash Health are building a path forward for patients, clinicians and researchers to benefit from the vast potential of genomics.

AGRF continued to be a part of the demonstration phase and was involved in new flagship planning, pipeline implementation and execution. In addition, AGRF is working closely with clinicians in the delivery of genomic testing to targeted groups of patients, alongside usual approaches to diagnosis to determine where genomics can be best utilised across the Victorian health care system. This work will make it possible for patients to receive more rapid diagnoses and targeted treatments.

AGRF staff are continuing to play key roles on the Steering, Genomics, Bioinformatics and Diagnostic Advisory committees. In the current flagship the AGRF will sequence over 200 exomes with the data progressing through the analytical pipelines and facilitate curation and research reports to clinicians.


## DEVELOPING OPENLY ACCESSIBLE TRAINING CONTENTS AND HANDS-ON WORKSHOPS

A training partnership between the CSIRO Bioinformatics Core and Biplatforms Australia (BPA) was formed with a focus on drawing trainers from across both organisations and their respective networks, to form an open collaborative framework for developing and maintaining reusable hands-on training workshop content.

The purpose of the framework is to empower non-bioinformaticians, through hands-on training courses to allow them to take ownership of the analysis of their own data. This initiative also aims to improve knowledge and understanding of bioinformatics approaches and help with skill shortage in the area.

To ensure trainers have access to optimised self-explanatory, reusable and open content, the framework provides access to all the information required for running and teaching a workshop. This means hands-on bioinformatics training workshops can be developed in a way that facilitates sharing and timely reuse.

AGRF's Bioinformatics Supervisor, Sonika Tyagi is part of the team that worked on the framework. Sonika's background is in genomics and her main focus is on high-throughput sequence analysis. Sonika's focus is on developing computational methods and protocols for transcriptomics, post-transcriptional gene regulation analysis, and exome and variation analysis.



Sonika Tyagi, Bioinformatics Supervisor.



## A COLLABORATIVE WIN FOR THE BIOSCIENCE RESEARCH COMMUNITY

Working with selected Adelaide-based facilities and institutions, a BioSA Research Infrastructure Fund (RIF) was awarded to facilitate a purchase of the newly released Illumina MiniSeq platform to better serve the needs of the bioscience research community.

*Francois Monty, Next Generation Sequencing Supervisor .*

### DISCOVERY PROJECTS

AGRF engages with Australian universities in suitable Australian Research Council Discovery grants. In these collaborations, AGRF engages with academic researchers to provide in-kind support of technical and bioinformatic expertise, and in return gain access to rare samples and novel and challenging data.

In 2015, AGRF began working with researchers in South Australia and Western Australia to test the hypothesis that plant species with greater propensity for gene flow (dispersers) should display weaker signals of local adaptation, but greater capacity to adapt, compared to species with a lower propensity for gene flow (persisters).

The outcomes of this research will allow decision makers of the future to identify the best seed sources to promote ecological adaptation to a changing Australia.

*Researchers: Prof Andrew Lowe; Dr Martin Breed; Dr Margaret Byrne; Prof Martin Lascoux; Dr John Stephen; Dr Giovanni Vendramin.*

### LINKAGE PROJECTS

AGRF continued to collaborate with Australian universities as an industry partner in several Australian Research Council Linkage grants working on the genomes of Neolithic cereals, epigenetic changes in bison related to past climate change, and the history of Aboriginal occupation of Australia.

Major pre-publication advances took place in all of these projects. Singularly exciting insights into the early dispersal, and subsequent settlement, of Australian Aboriginal peoples are expected to be released in 2016, stemming from work lead by the University of Adelaide's Australian Centre for Ancient DNA and the South Australian Museum.

### LIEF - ADVANCED DNA IDENTIFICATION AND FORENSICS FACILITY

AGRF engages with Australian universities as a partner in seeking infrastructure funding through federal, philanthropic and charitable sources. An excellent result with Australian Research Council funding was achieved by collaborating with two of South Australia's leading universities to establish a facility for forensic-style analysis of non-human biological material, including food, timber, and timber products.

The facility's goal is to enhance synergies between academic research, service delivery and forensic application of DNA identification technologies.

*Researchers: Prof Andrew Lowe; Prof Adrian Linacre; Dr Eleanor Dormontt; Dr Rebecca Johnson; A/Prof Jeremy Austin; Prof Michelle Waycott; Prof Stephen Donnellan; Prof Andrew Austin; Dr Shanan Tobe; Dr John Stephen; Dr Linzi Wilson-Wilde.*

The Illumina MiniSeq platform adds speed and flexibility to the suite of DNA analysers in service. It features run times as low as seven hours, with standard and high-output modes, making it ideal for projects analysing small DNA fragments, targeted research applications like cancer sequencing and projects requiring fast data return. The output data has been validated by AGRF for use in a range of service applications.

Members of this collaboration are:

**Dr. Greg Nattrass**, SARDI Gene Expression and Genotyping Facility

**Assoc. Prof. Jeremy Austin**, Advanced DNA Forensics Facility, University of Adelaide

**Prof. Andrew Lowe**, Genetics and Evolution, University of Adelaide

**Prof. Alan Cooper**, Australian Centre for Ancient DNA, University of Adelaide





### **BIOPLATFOMRS AUSTRALIA (BPA) FRAMEWORK DATASET PROGRAM**

AGRF continued its contribution to the Bioplatforms Australia national framework dataset projects which aim to help deliver large scale, high quality, and quantitative data needs to address scientific challenges faced by Australian researchers.

These projects recognise that generation, availability and accessibility of data is a key form of infrastructure. Projects have covered the generation of a database relating soil microorganisms to 900 key sampling sites across the continent and Australia's Antarctic, the molecular characterisation of human stem cells and the molecular barcoding of cryptic species on the surface of the Pilbara and its many hidden underground aquifers.

AGRF provides a key resource for data generation for all of these national datasets. Further, AGRF's Dr Mabel Lum assumed a coordinator role in the project team that seeks to catalogue the changes in gene expression and metabolic products of clinically important antibiotic-resistant bacterial pathogens as they adapt to growth in the human blood environment.

The contribution of five AGRF staff was also acknowledged in co-authorship of a seminal paper describing the Australian soil microbiology dataset in the major journal *GigaScience* in May 2016.

# ENGAGEMENT AND EDUCATION

**AGRF** actively participates and is regularly represented in a range of engagement activities such as in-house educational workshops, special interest group meetings, seminars and support local scientific meetings and conferences.

These state based events keep the science community informed and up to date on the changing trends affecting genomics while developing strong alliances in the scientific community.

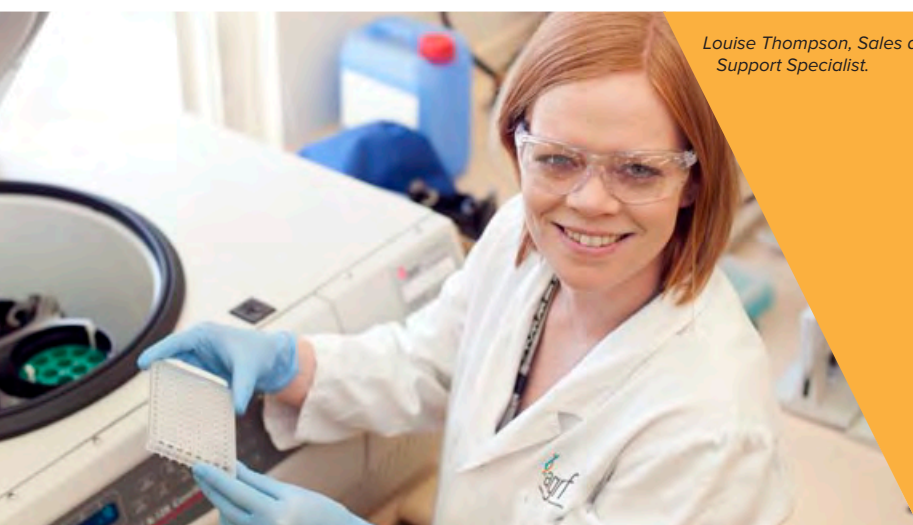


## International conference presentations

Ken McGrath, National Sanger Sequencing Manager, presented at **Association of Biomolecular Resource Facilities (ABRF)**, Florida, February 2016

Ken McGrath, National Sanger Sequencing Manager, presented at **“London Calling” for Oxford Nanopore**, London, May 2016

Lavinia Gordon, Bioinformatics Manager, presented at **The Genome Analysis Centre (TGAC)** in Earlham Institute (Norwich, England) in March 2016



*Louise Thompson, Sales and Marketing Support Specialist.*

## Workshop and seminar presentations

Ken McGrath, National Sanger Sequencing Manager presented at **Winter School Mathematical and Computational Biology** July 2015 and **Australasian Genomic Technologies Association (AGTA)** October 2015.

Lavinia Gordon, Bioinformatics Manager, presented at **Metagenomics@Melbourne** Nov 2015, **Open Source and Bioinformatics conference** February 2016 (Linux Conference Australia).

Matthew Tinning, National Next-Generation Sequencing Manager, presented at **Epigenetics SA meeting 2016**.

Sonika Tyagi presented at six **NGS Bioinformatics hands-on workshops** and **EMBL-Australia Phd Course**, 26th June 2015.



*Michael Ingbritsen, Laboratory Technician.*

## Poster presentations

### 37th Lorne Genome Conference, Lorne, Victoria, 14-16 February 2016

Jafar S. Jabbari, Gupta Vadakattu, Ken McGrath, Rachael McNally, Lavinia Gordon, Rust Turakulov and Kirby Siemerling (2016) Increasing the Efficiency of Metabarcoding Sequencing with Dephasing Spacer Primers: Effect on 16S Amplicon Sequencing and Taxonomic Resolution.

Alejandro Dubrovsky and Sonika Tyagi (2016). HTS-CID-miRNA: Computational Identification of microRNAs in High Throughput Sequencing data.

### Australian Genomic Technologies Association (AGTA) Conference, Hunter Valley, NSW, 11-14 October 2015

Jafar S. Jabbari, Lavinia Gordon, Matt Tinning, Marcel Dinger, Maria Lubka-Pathak, Dahlia Saroufim, Kirby Siemerling, David Miller (2015). Human Whole Genome Sequencing with Low and Ultralow DNA Inputs.

### Australian Genomic Technologies Association (AGTA) Conference, Hunter Valley, NSW, 11-14 October 2015

Rust Turakulov, Gai McMichael, Paul Gooding, Jafar S. Jabbari (2015). Evaluating Reproducibility of GBS Analysis.

### Proceedings of Molecular Microbiology Meeting, Bicentennial Park, NSW 2-3 March 2016

Jafar S. Jabbari, Bhawana Nain, Gupta Vadakattu, Ken McGrath, Rachael McNally, Matthew Tinning, Lavinia Gordon, Kirby Siemerling (2016) Increasing the Efficiency of Metabarcoding Sequencing with Dephasing Spacer Primers: Effect on 16S Amplicon Sequencing and Taxonomic Resolution.

### Association of Biomolecular Resource Facilities (ABRF), 20 - 23 February 2016

Ken McGrath (2016) The eXtreme Microbiome Project (XMP) Presents: "Methodgenomics". Comparing methods for analysing the microbial communities of Lake Hillier – an Australian bright-pink hypersaline lake.

Melinda Ziino, Genotyping Supervisor.





# SENIOR LEADERSHIP

**THE SENIOR LEADERSHIP TEAM** is responsible for strategic vision ensuring AGRF remains a viable, innovative accountable and world-class facility.

**Irene Kourtis** - CEO

BSc (Hons), PhD, GradDiplLaw, GAICD

**Shane Herbert** - Sales and Marketing Manager

BSc (Hons)

**Kirby Siemering** - Director of Science and Technology

BSc (Hons) PhD

**John R. Stephen** - National Operations Manager

BSc (Hons) PhD

**Ian Wilson** - General Manager Finance and Business Support

FCPA AGIA







*Chloe McDermott, Laboratory Technician.*



## OUR FUNDING PARTNERS

What we do is made possible with the support from our funding partners. We are supported by Commonwealth Government infrastructure funding schemes administered through Bioplatforms Australia.



**BIOPLATFORMS**  
AUSTRALIA

# NCRIS

National Research  
Infrastructure for Australia

An Australian Government Initiative

Investment funding has been provided through the Commonwealth Government National Collaborative Research Infrastructure Strategy (NCRIS), the 2009 EIF Super Science Initiative and the Collaborative Research Infrastructure Scheme.

The federal grant supports AGRF's operational infrastructure that allows genomic service delivery to the Australian research community. All revenues are applied to support AGRF facilities, technology and expertise to enable cutting-edge and quality service.

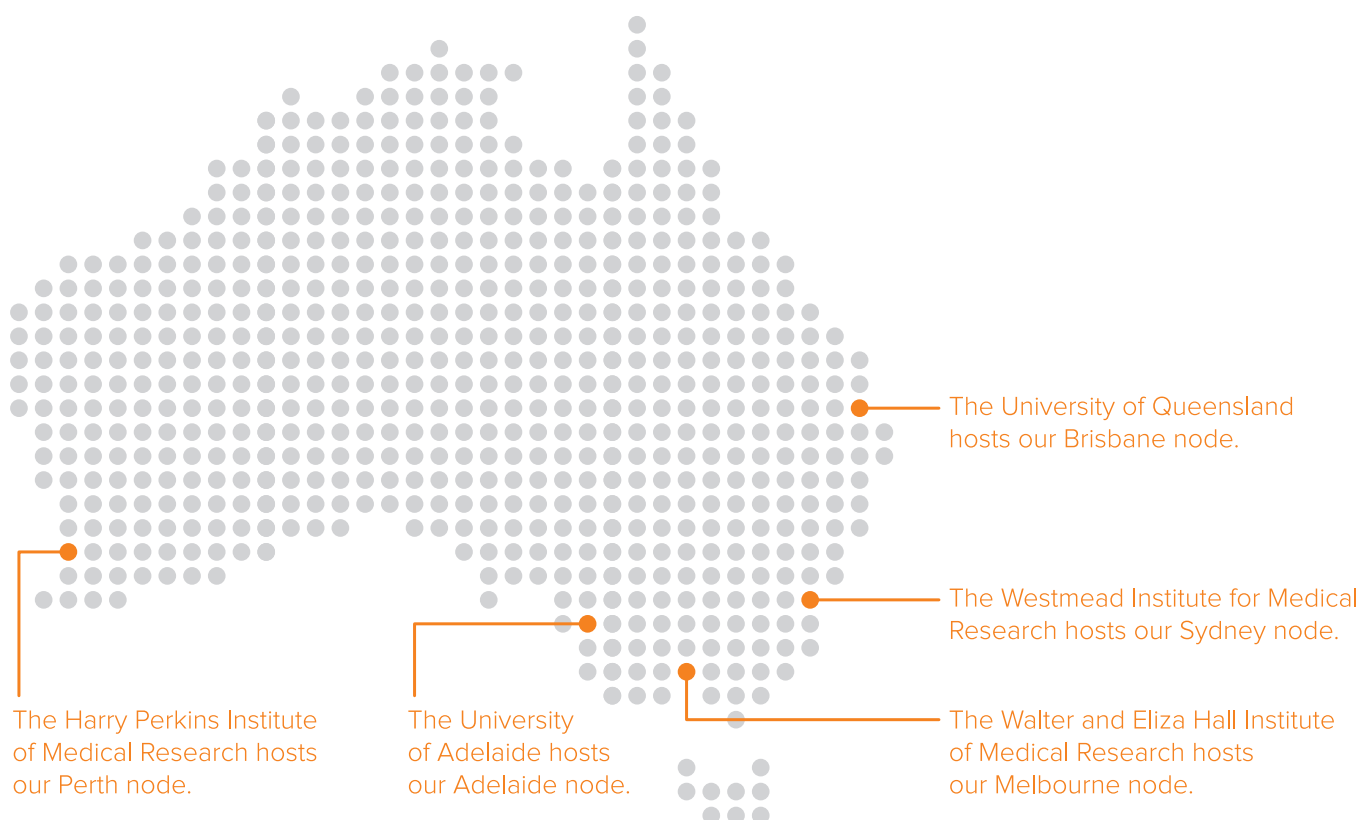




### Our host institutes

AGRF is hosted by a number of universities and institutes with laboratories in Brisbane, Melbourne, Adelaide, Sydney and Perth. This collaborative network enables world-class scientific outcomes in academia and industry.

Each AGRF node provides a gateway to our national network of state-of-the-art facilities, technology and expertise.



# GOVERNANCE

The Australian Genome Research Facility was governed during the financial year to June 30 2016 by seven directors, led by Professor Rob Lewis, who are responsible for the oversight of policies, strategic direction and risk management.

## **The directors during the year were:**

### **Professor Robert Lewis** (Chairman)

BSc (Hons), DSc

FTSE, FSARDI, PSM

Member of the Finance, Audit & HR Committee.

Key responsibility: Liaison with the agricultural and environmental sectors; AGRF's representative for Genomics Australia.

### **Professor Nick Samaras** (Deputy Chairman)

BSc (Hons), PhD, MBA

FAIM, FAICD, FWCLP

Member of the Finance, Audit & HR Committee.

Key responsibility: Advising on current technology and market trends; industry engagement.

### **Professor Benjamin Kile**

BSc (Hons), LLB (Mon), PhD

Member of the Finance, Audit & HR Committee.

Representative from Walter and Eliza Hall Institute of Medical Research.

Key responsibility: Liaison with the medical research sector.

### **Professor Brandon Wainwright**

BSc (Hons), PhD

Representative from UQ, Queensland Government liaison.

### **Dr John Bell**

BSc, MSc, PhD

FTSE, FRACI, Comp I.E. Aust, MAICD.

### **Mr Andrew Macdonald**

BSc, BBus, CPA, MAICD.

Chairman of the Finance, Audit & HR Committee.

### **Professor Graeme Suthers**

MBBS BSc (Med) PhD FRACP FRCPA GAICD.







