



**genomics
aotearoa**

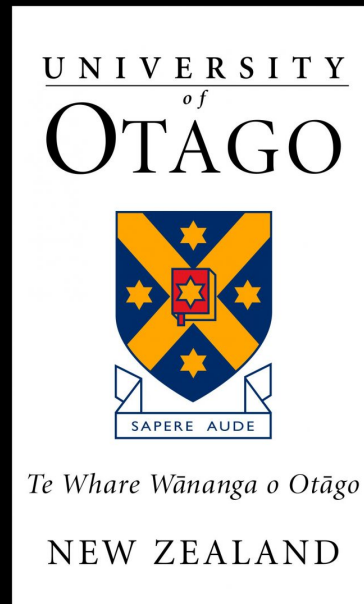
**A/Prof Mik Black
University of Otago
18 February 2019**

What is Genomics Aotearoa?

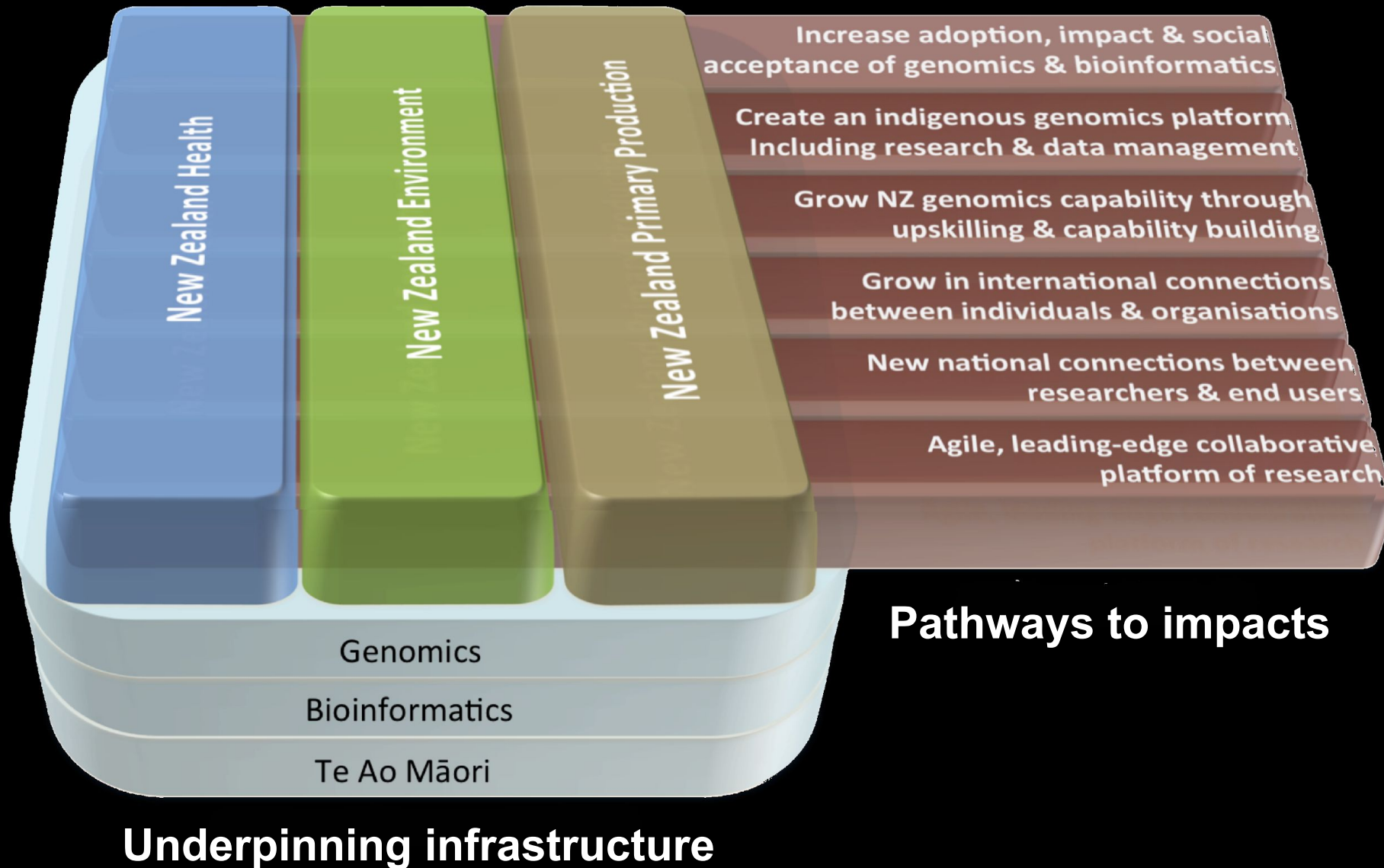
- **An MBIE funded platform to support developments in genomics and bioinformatics**
- **Hosted by University of Otago**
 - **Director: Professor Peter Dearden**
 - **7 University and CRI partners**
 - **Large number of affiliate organisations**
- **Up and running on a range of projects**
- **Funded for 7 years at approximately \$5 million/year**



Partners



Research projects within 3 themes



What are we doing?

- Developing *infrastructure* by doing *research*
- Building a national infrastructure of people
- Working with compute providers to build a NZ data repository and bioinformatic resources
- Aiming to develop new ways to address key gaps in genomics and bioinformatics for NZ
- Training is a big part of our mission



Genomics Aotearoa

- **Identify key (broad) research areas of importance to NZ: Environment, Primary production, Health**
- **Within each theme, identify specific exemplar projects that:**
 - are "typical" within the NZ research community
 - are solving an important problem of relevance to NZ
 - will generate infrastructure, resources or workflows to benefit other (including non-GA) projects.
- **Underpinning each project within each theme**
 - Vision Mātauranga / Te Ao Māori
 - Bioinformatics & Genomics



Projects

- **Health**

- Aotearoa New Zealand Variome Project
- Clinical Oncology / Cell-free DNA
- Bacterial Pathogens
- Epigenome-wide Association Studies

- **Environment and Primary Production**

- High quality genomes
- Better Breeding Values
- Environmental Metagenomics



Postdoctoral research fellows

- **10 postdoctoral research fellows working across our projects.**
 - Spread across Themes, and across sites
 - 9/10 are specifically working on computational challenges
- **Distributed project teams, with collaboration across universities and CRIs.**



Looking ahead

- **The goal is to use the GA research projects to establish the skills, tools and infrastructure that can facilitate the seamless transfer of genomic data for the NZ research community.**
- **As our projects evolve, the Genomics Aotearoa team are looking forward to working closely with partners such as NeSI and REANNZ on HPC applications and large-scale data transfer.**



Genomics Aotearoa is a
collaborative research platform for
genomics and bioinformatics



ABOUT US

**SING Aotearoa internship
programme**



OUR PROJECTS

**Genomic medicine set to address
health inequities**

<https://www.genomics-aotearoa.org.nz/>



Vision Matauranga

- VM coordinator: Ben Te Aika
- Te Kāhui: Wayne Mulligan (chair), Khyla Russell, Aroha Mead, Jacinta Ruru, Melanie Cheung
- SING Aotearoa: Maui Hudson, Katharina Ruckstuhl, Phil Wilcox



sing
AOTEAROA

Summer internship for Indigenous
peoples in Genomics

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GA Bioinformatics

- **Bioinformatics sits within GA as an "underpinning infrastructure"**
- **Links projects together through common tools and skill sets**
- **Helps to define a structure for capability building (e.g., training) and community development/engagement.**
- **Allows some level of coordination and resourcing at a national level.**



Organisational structure

- **Bioinformatics Leadership Team (BLT)**
 - Mik Black (Otago): bioinformatics project lead
 - Kim Handley (Auckland): Environment bioinformatics lead
 - Jenny Draper (ESR): Health bioinformatics lead
 - Rudi Brauning (AgResearch): Primary production bioinformatics lead
- Each team member is involved in at least one of the exemplar projects within their Theme, and is responsible for helping to plan, coordinate and report on the bioinformatics work being done within that theme.



Goals of the BLT

- **Communicate and coordinate bioinformatics activities across GA themes**
- **Work with GA Vision Maturanga Coordinator (Ben Te Aika)**
- **Ensure that mentoring and advancement opportunities are available for GA bioinformatics researchers**
- **Coordinate GA compute, storage and training resources**
- **Provide advice to GA Science Leadership Team**
- **Facilitate capability and community building among NZ genomics and bioinformatics researchers**



Community and capability building

- **Bioinformatics postdoctoral research fellows involved in most GA projects**
- **BLT members have been allocated (small) fractional FTE components to enable additional bioinformatics research on GA aligned topics.**
- **GA bioinformatics postdoctoral research fellows will assist with training...**
 - **development and delivery of bioinformatics workshops**
 - **Carpentries instructor training**
- **...and be involved in national community building activities**



Bioinformatics training



- **Capability building in bioinformatics is an important part of Genomics Aotearoa.**
- **Training**
 - **Carpentries-style training system (workshops)**
 - **GA-appointed national training coordinator (almost there!)**
 - **Partnering with NeSI to deliver joint Carpentries (Data/Software) and Bioinformatics training.**
 - **Rochelle Tractenberg: "Mastery Rubric for Bioinformatics"**
 - **Participation in the SING Aotearoa programme**



Bioinformatics compute

- **NeSI is major provider for GA computational requirements**
 - CPU hours for GA computation projects
 - Dedicated high memory system (4TB)
 - 0.5TB RAM system for virtual machines (e.g., training/analysis environments) and jobs with “moderate” RAM needs.
- **Computational/analytic workflows/interfaces available on NeSI systems (and linked to training materials)**



Bioinformatics storage

- **NeSI provides:**
 - fast, connected storage for computation with large genomic data sets
 - long term archival storage for genomic data sets
- Goal is to set up a *system* that can be used by others (in addition to catering to the specific needs of GA-funded projects)
- Long-term goal: a fully-fledged managed data repository, developed under the guidance of the GA Kahui group.



Genomic Data Repository

- Urgent and unmet need for long-term genomic data storage.
- Extremely important for genomic data from Taonga species.
- Strong desire (and in many cases *requirement*) for genomic data to remain within New Zealand.
- Guidelines for genomics research with Taonga species being developed (Maui Hudson: Te Nohonga Kaitiaki).
 - benefit sharing
 - data guardianship and sovereignty
 - co-development of research programmes



Challenges – “can I get it yesterday?”

- **Access and approval:**
 - “just let me on there and I’ll figure out how much I need”
 - “no one really knows how long it will run for...”
- **Data transfer: genomic data are large(ish), and seem to need to move around a lot.**
- **Virtualisation/Containers**
 - Training: virtual environments for workshops
 - Research: portable customised computational environments
- **Software: “but it runs on my laptop – why doesn’t it work on NeSI?”**



Take home: stuff is happening

- **Bioinformatics Leadership Team is meeting regularly**
- **Postdoctoral research fellows have been hired**
- **Project work is underway**
- **Compute and storage resources are being utilised within GA projects (we are keeping NeSI busy)**
- **Training is coming – one workshop already run (twice), and training coordinator is almost in place.**
- **Community building: aiming for an annual meeting to facilitate interactions within the NZ bioinformatics and genomics research communities.**





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Thank you