



**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
HIKINA WHAKATUTUKI

The NZ Science System: Context, Challenges and Opportunities



Outline

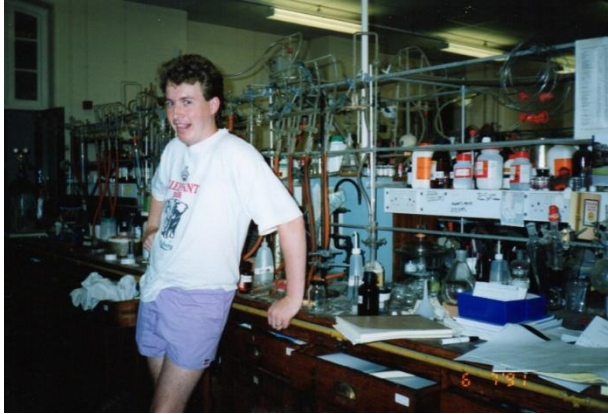
- My background and the context in which I and my colleagues use the outputs and outcomes of eResearch
- The science advisory system
- The NZ Science System and Funding
- Future and current opportunities for eResearch

Context

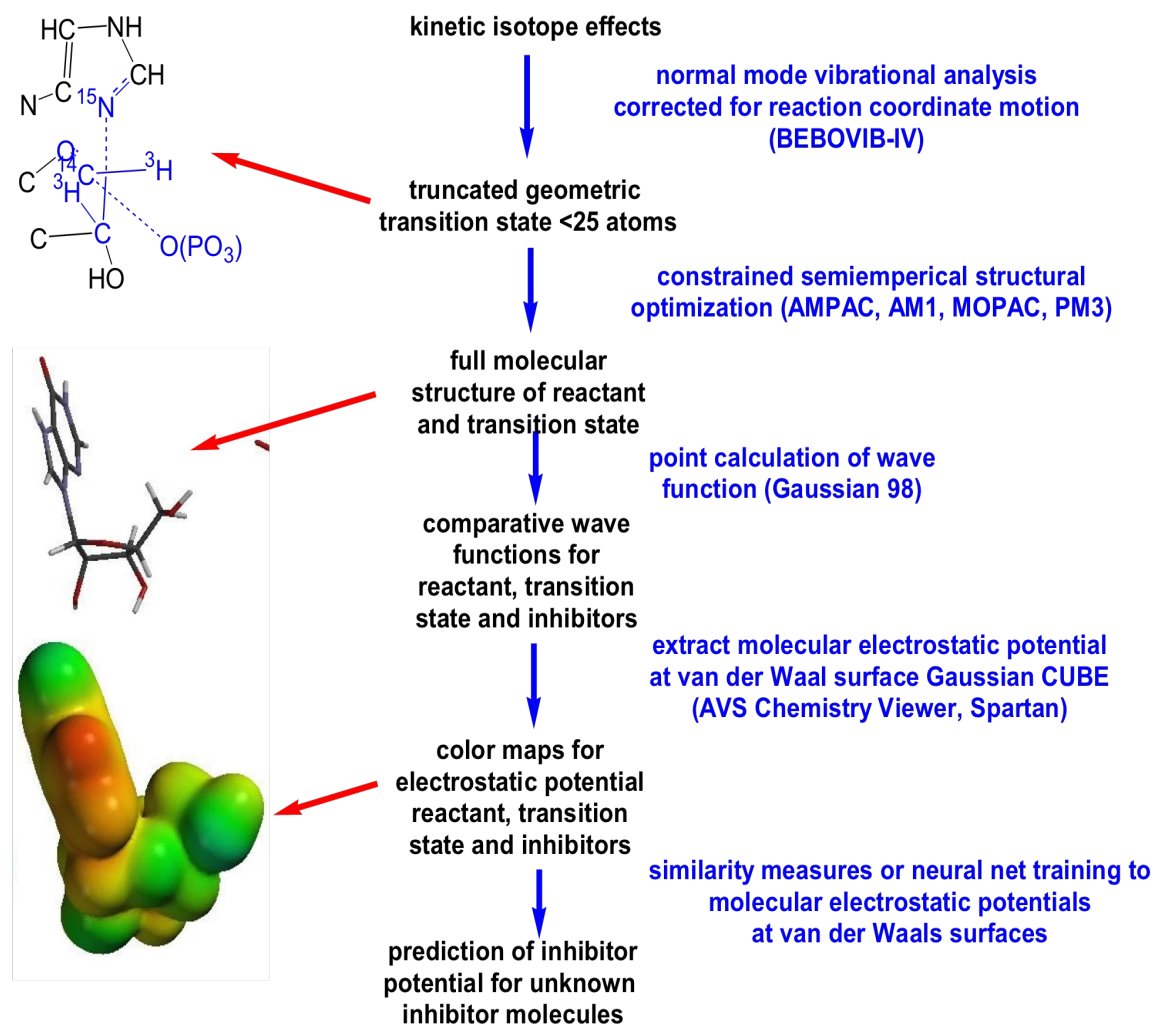


The Impact of eResearch on My Career

- Medicinal chemistry, process development and drug discovery



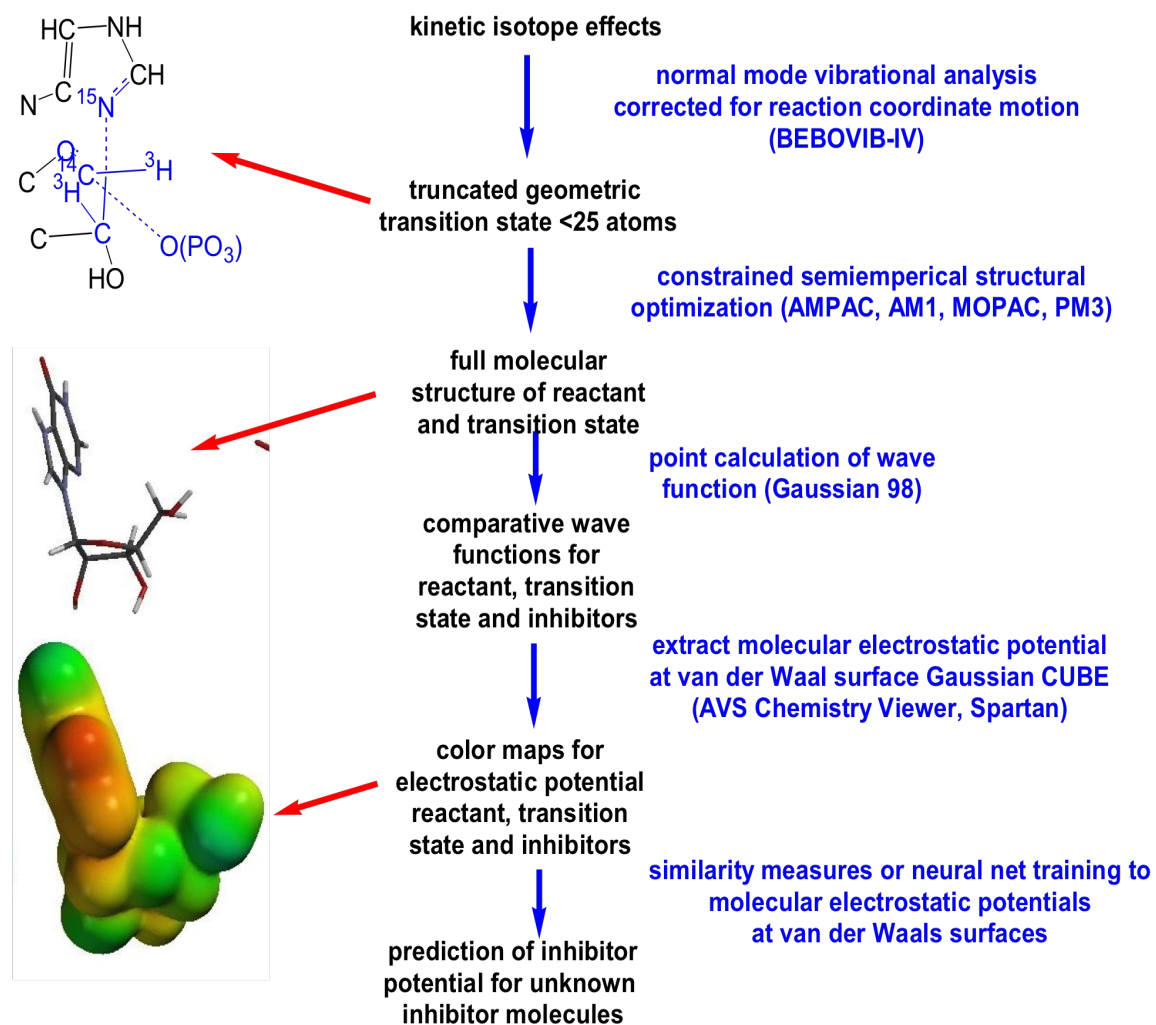
Algorithms Facilitating Drug Discovery



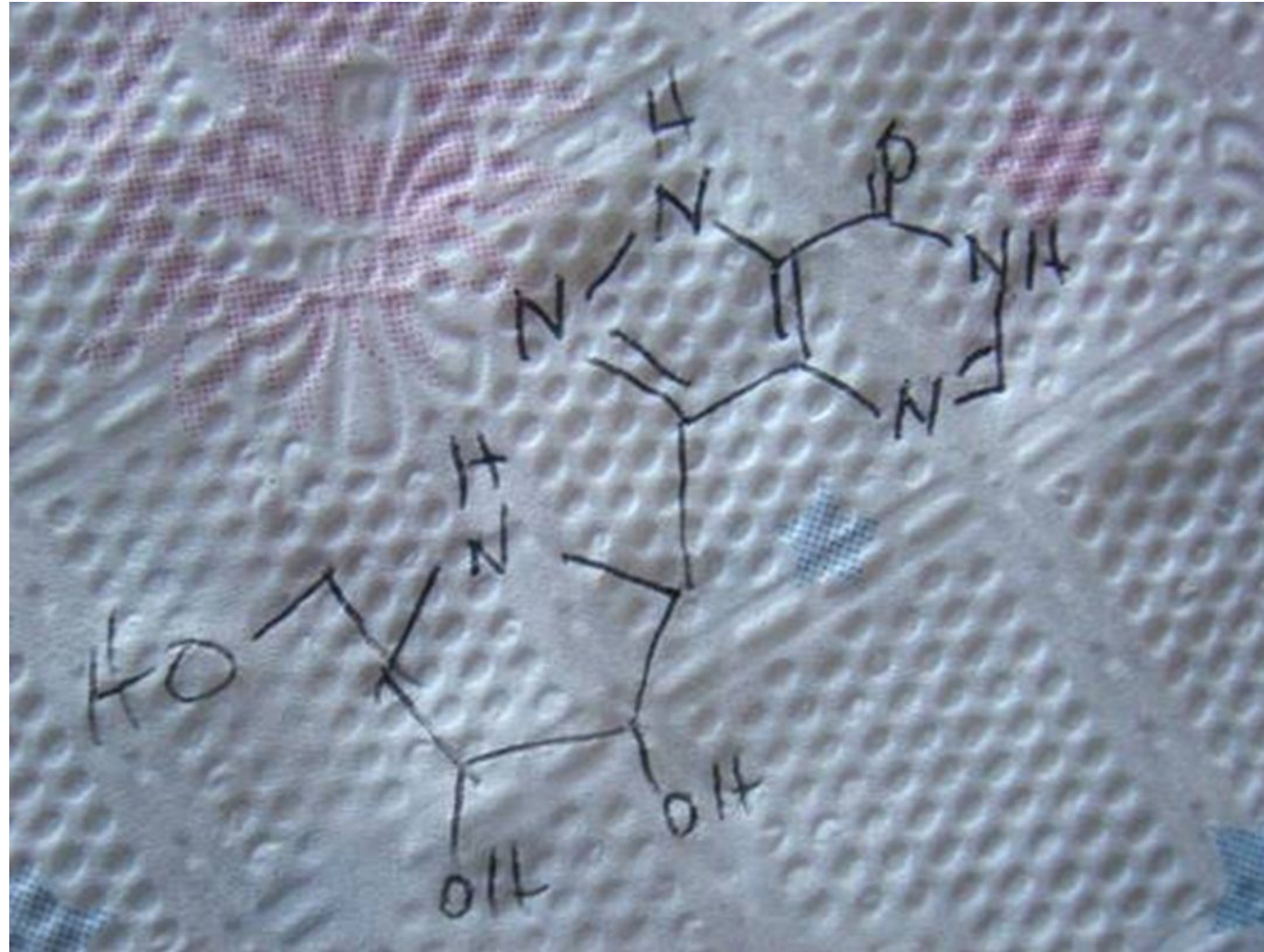
The Manhattan Project



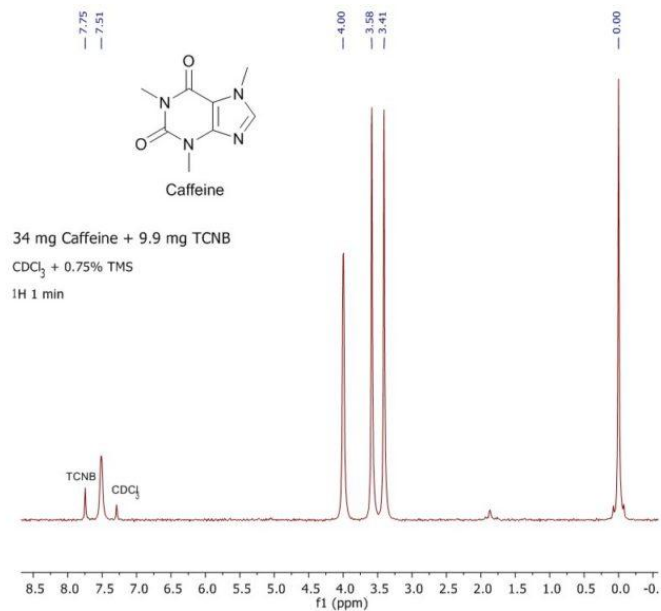
Algorithms Facilitating Drug Discovery



What Does this Really Look Like?



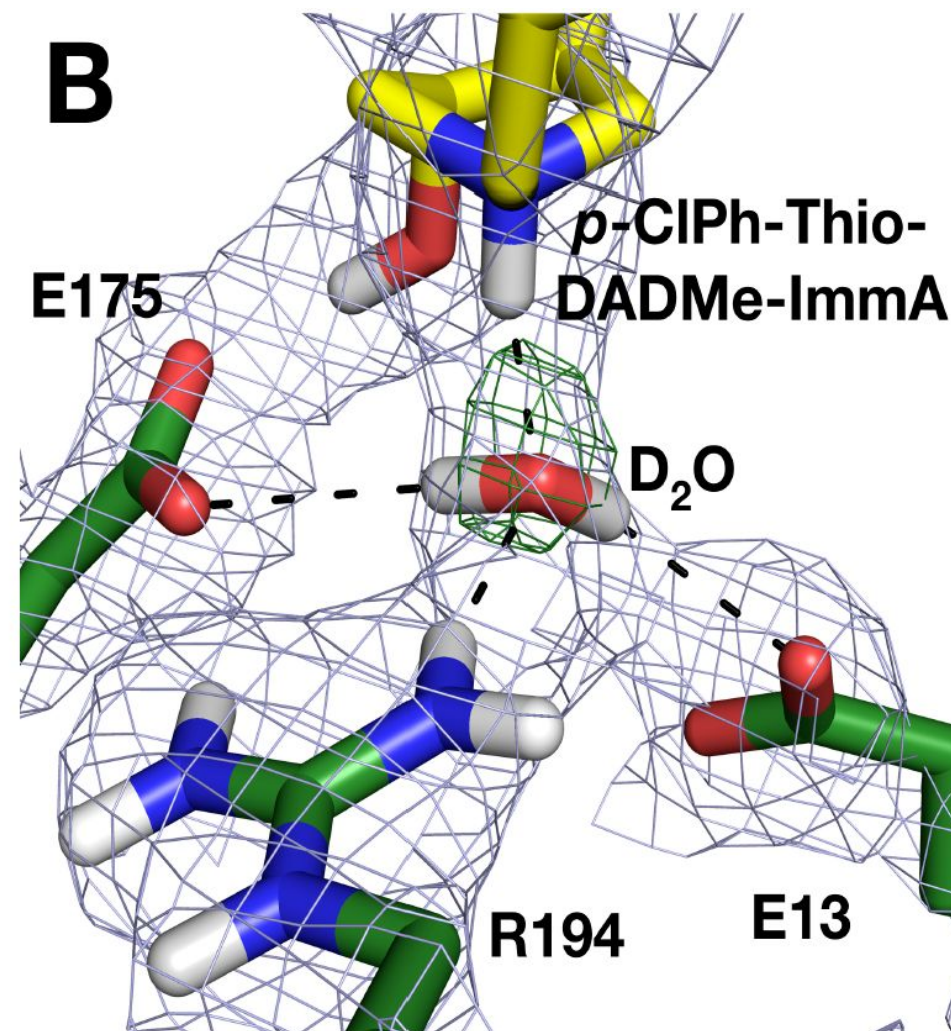
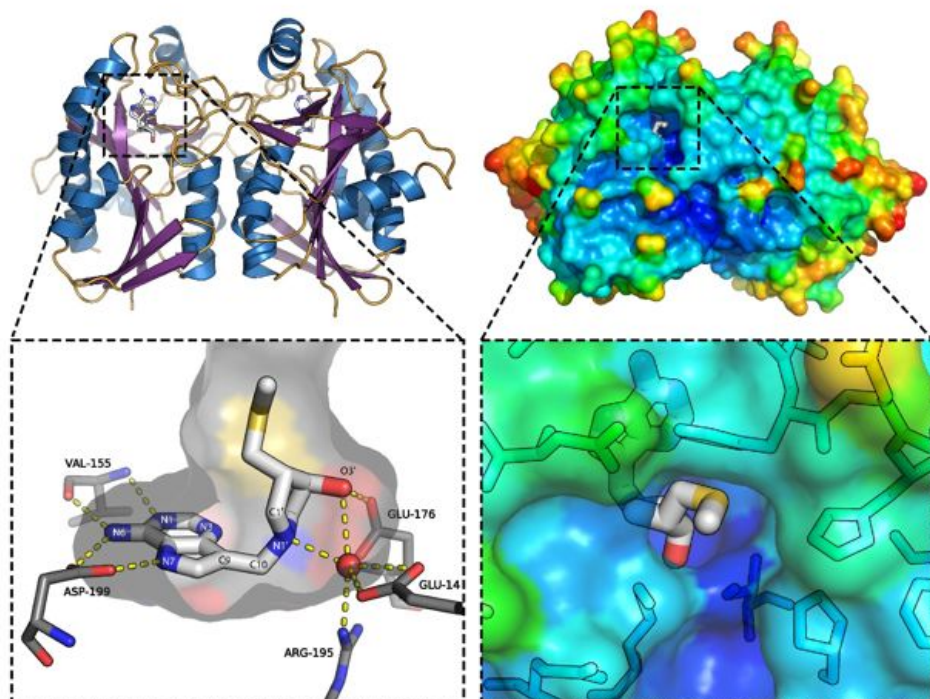
Nuclear Magnetic Resonance



Australian Synchrotron



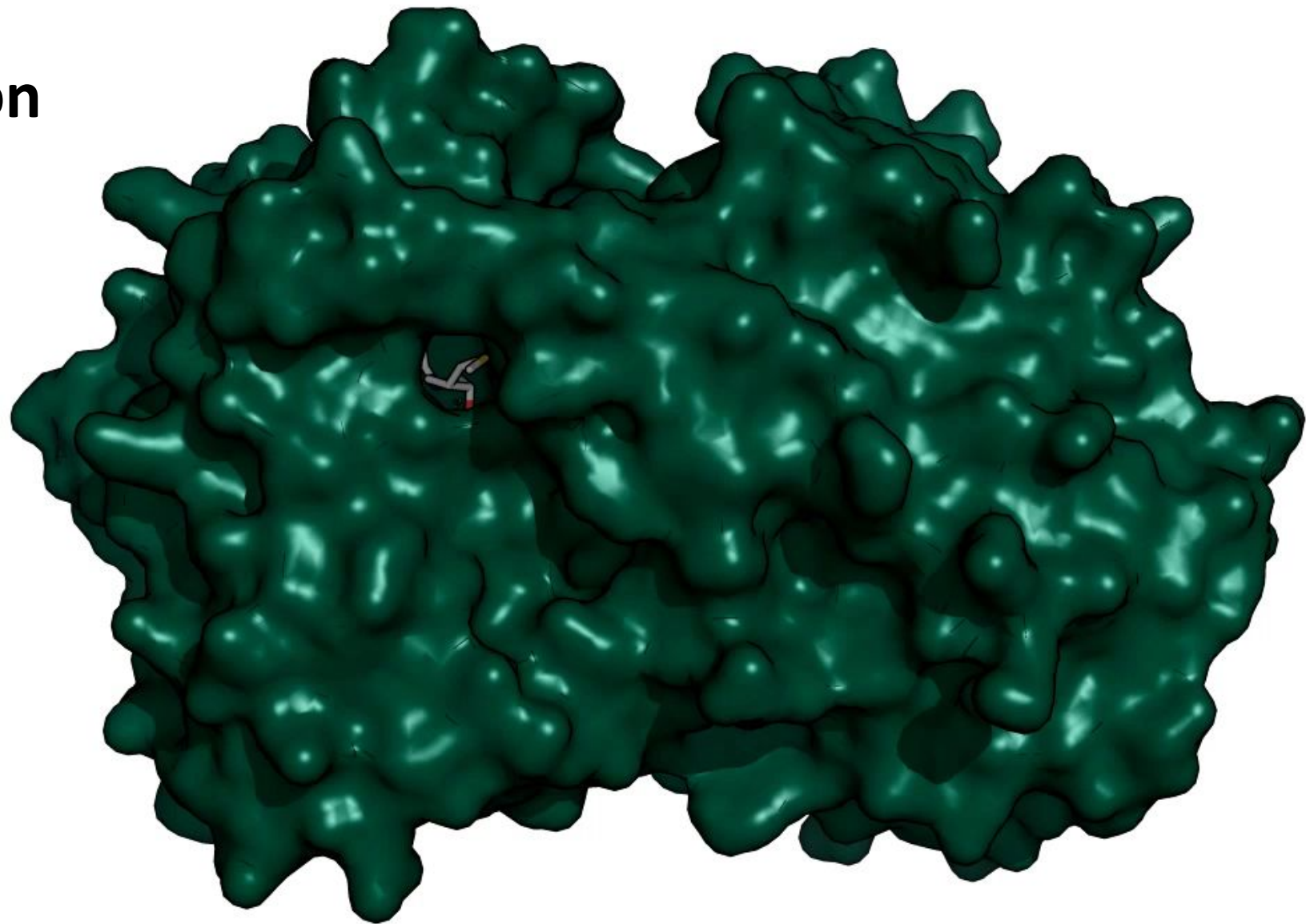
Structural Insight



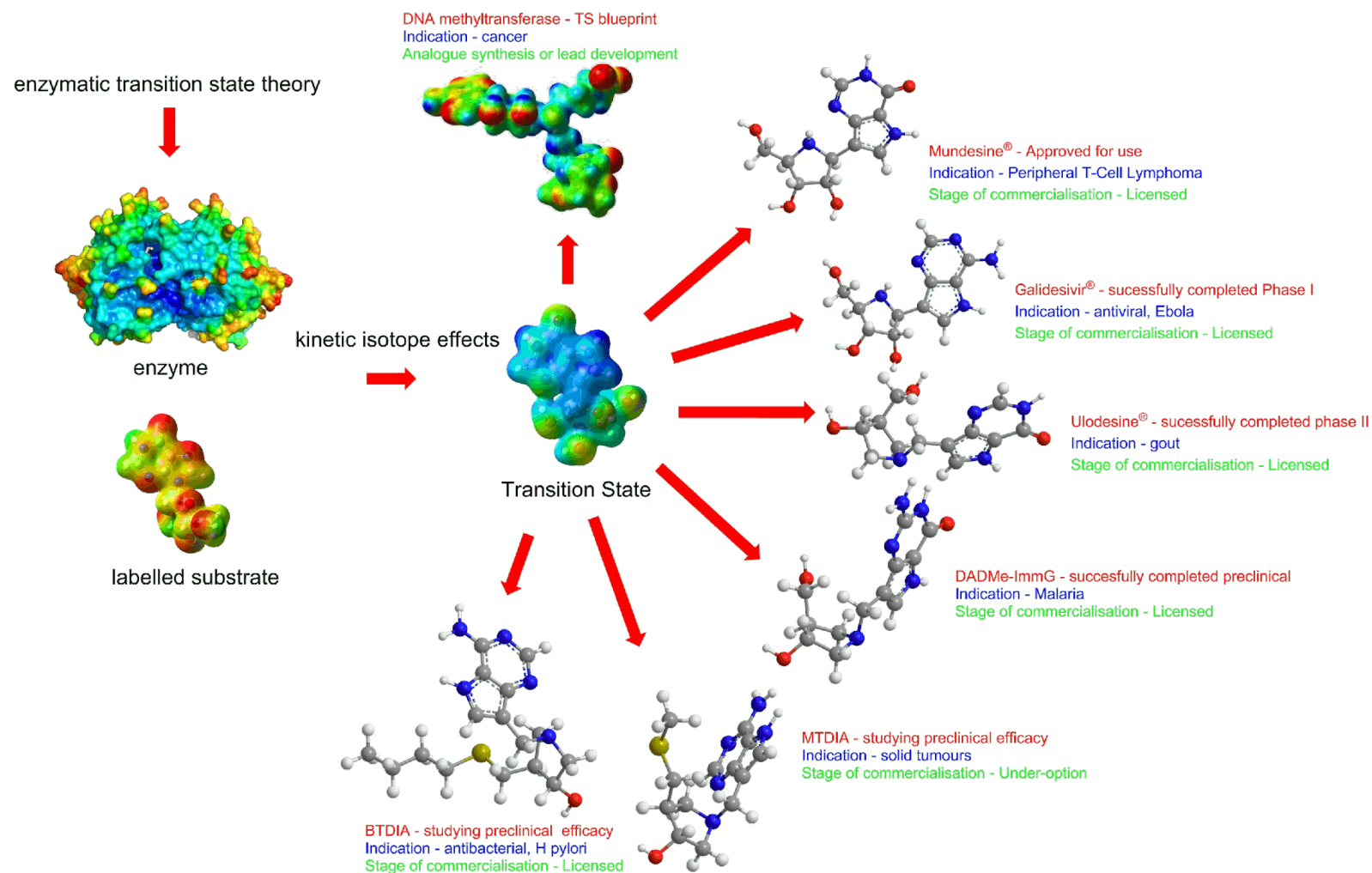
Supercomputing



Visualisation



Outcomes From Our Research

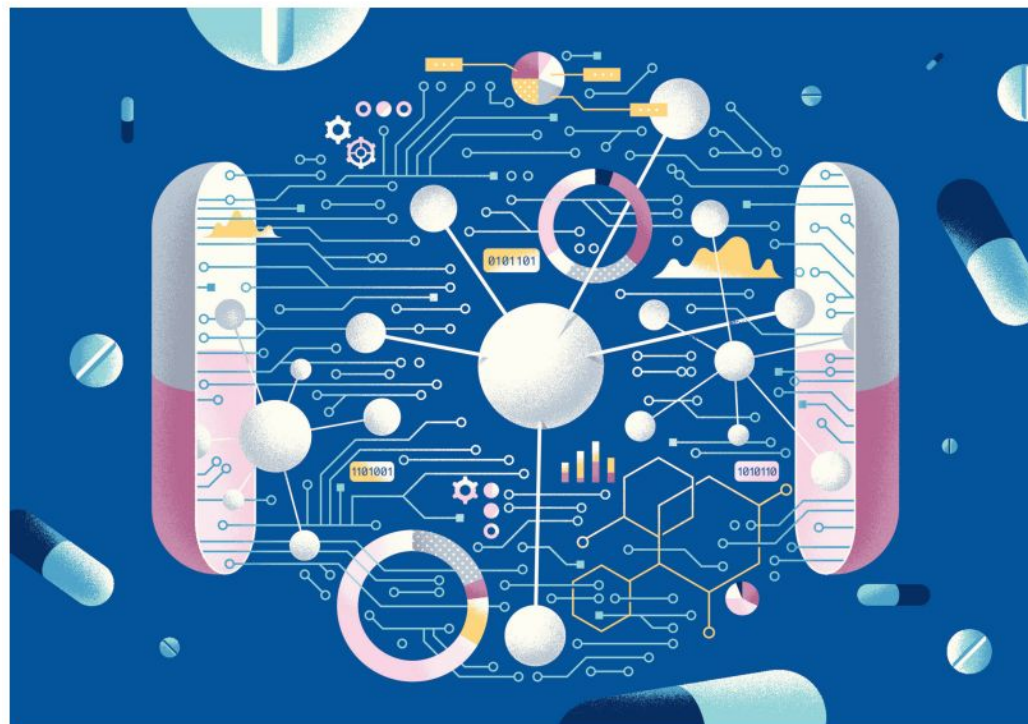


Data Security/Utility



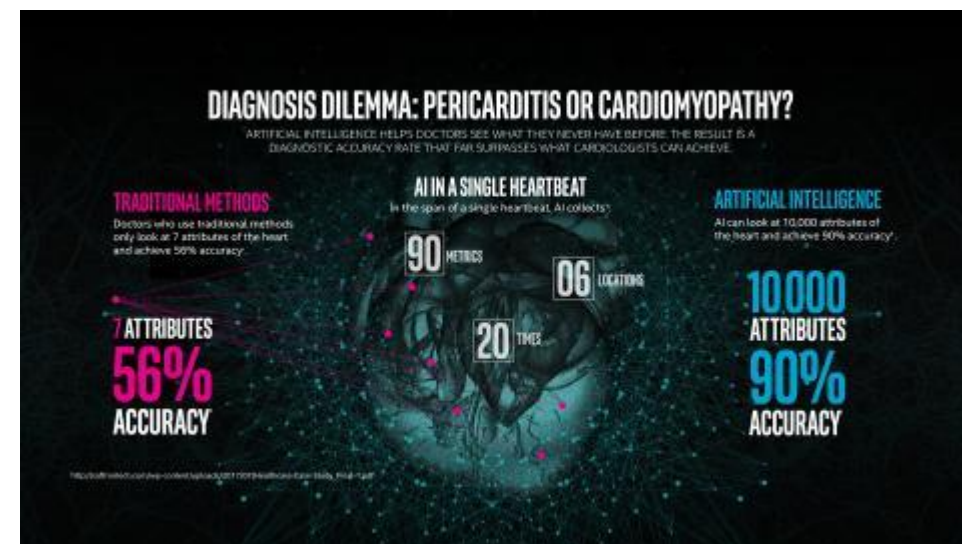
eResearch and Biomedical Research

SPOTLIGHT ON BIOPHARMACEUTICALS CAREERS



Computer-calculated compounds

Researchers are deploying artificial intelligence to discover drugs.



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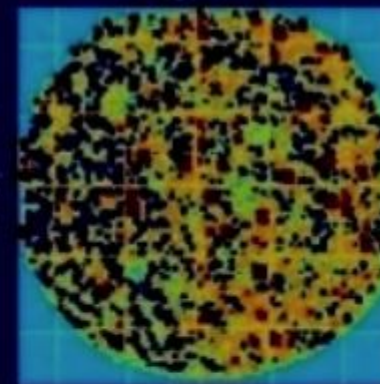
eResearch and Biomedical Research

Heard at the 14th ECDP in Helsinki

Digital pathology: Sometimes AI can outperform experts

Machine learning is adding a new dimension to pathology and already outperforming experts during some tasks, according to several speakers at the 14th European Congress on Digital Pathology (ECDP) who revealed up-to-date developments.

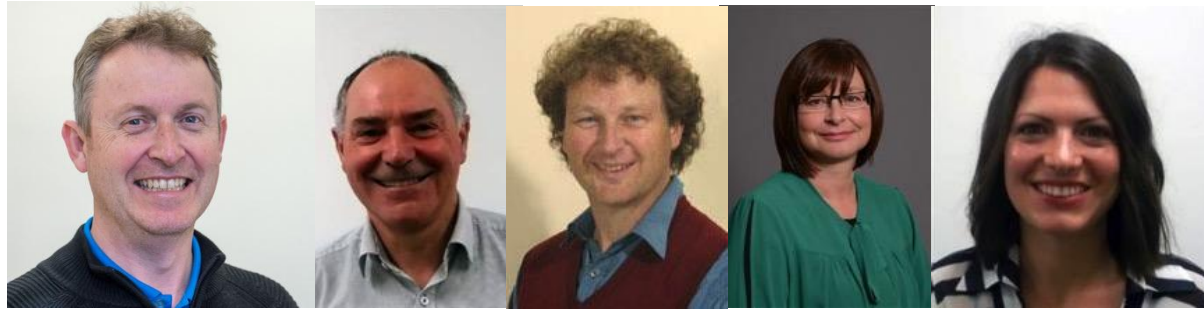
Report: Mark Nicholls



What's a Science Advisor!?



MBIE Chief Science Advisor & the Science Leadership Team



- Provide thought leadership on the delivery of excellence, impact and an agile science system.
- Ensure that the sector's expertise and intelligence are captured in the development of policy and investments.
- Explain MBIE to science sector and vice versa
- Build internal capability in Vision Mātauranga
- Support access to science for other parts of MBIE
- Part of Science Advisor's Forum chaired by PMCSA



Both Sides



Field Research vs Open Plan Research



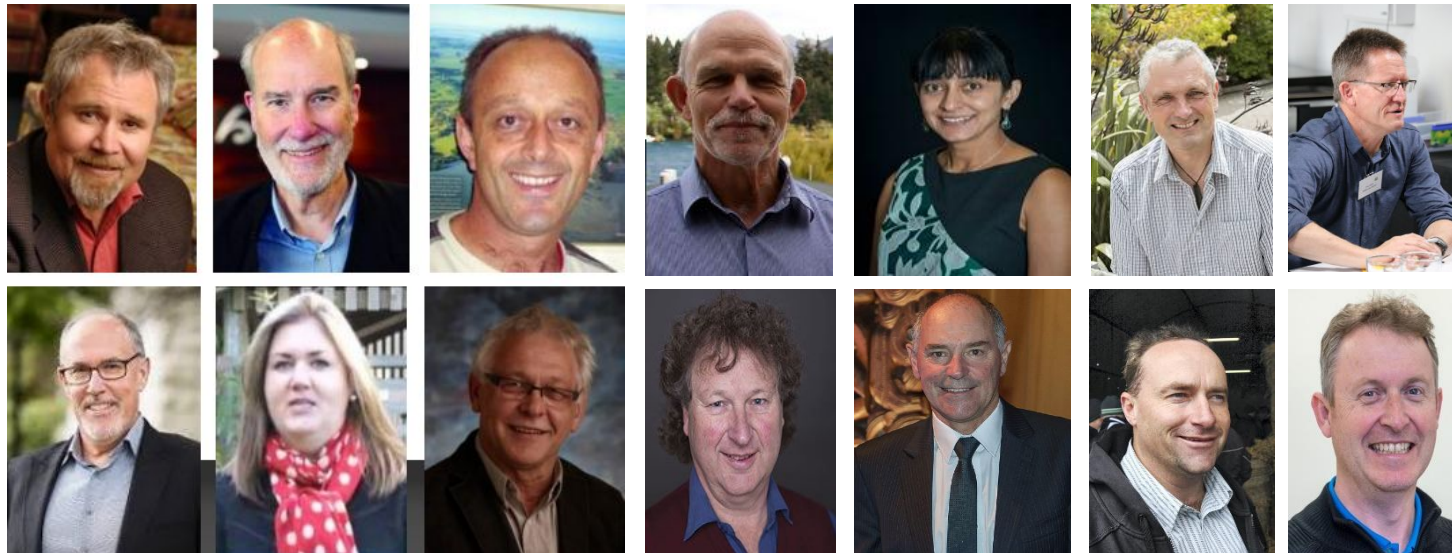
Prime Minister's Chief Science Advisor (PMCSA)

- 2009: PM John Key establishes role
- Senior, practising academic scientist
- Use of science in policy making
 - Scientific advice to PM
 - Public understanding of science
 - Promote NZ's interests through science diplomacy
 - Chair network of science advisors
- Sir Peter Gluckman appointed
- Prof Juliet Gerrard replaces Sir Peter in 2018



NZ Departmental Science Advisors (DSAs)

- Senior, practising scientists, seconded to departments
- Ministry of Business, Innovation & Employment (MBIE)
- Ministries of Social Development, Health, Justice, Education, Environment, Primary industries, Transport,
- Department of Conservation, NZTA, NZ Defence Force



NZ's (Science) Research System



What science should be funded?

A policy perspective

“Research, science and technology is a set of knowledge creation and application activities that address the needs of our nation.”

Scientists’ perspective

“Scientific progress on a broad front results from the free play of free intellects, working on subjects of their own choice, in the manner dictated by their curiosity for exploration of the unknown. Freedom of inquiry must be preserved under any plan for Government support of science ...” Vannevar Bush, 1945



Government Strategy

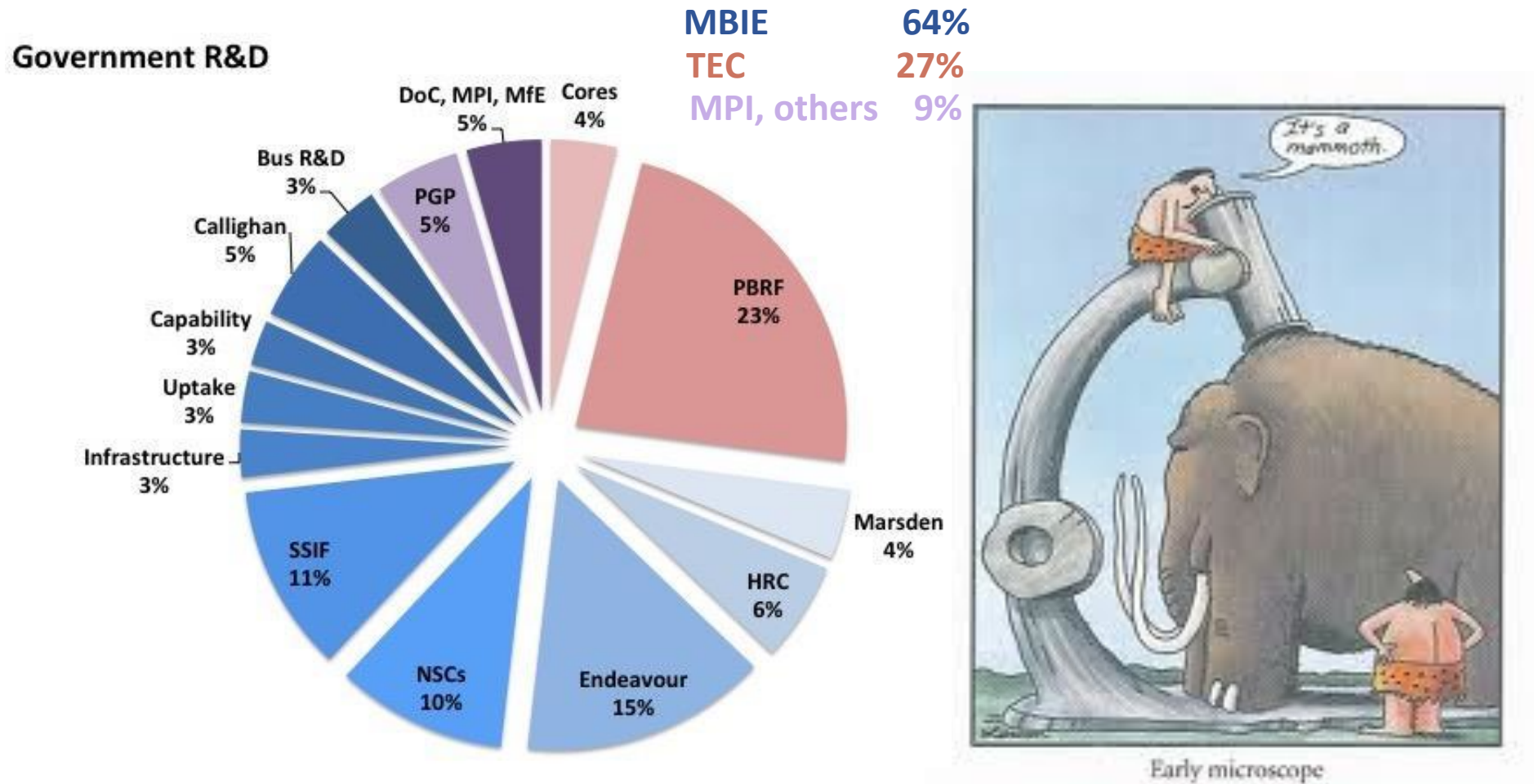


The Government's vision for New Zealand puts the long-term wellbeing of people and the environment at its centre. This includes priorities of reducing child poverty, access to affordable, healthy homes, opportunities for meaningful work, and a just transition to a sustainable, low-emissions economy.

- R&D to 2% of GDP
- New RS&I strategy being developed



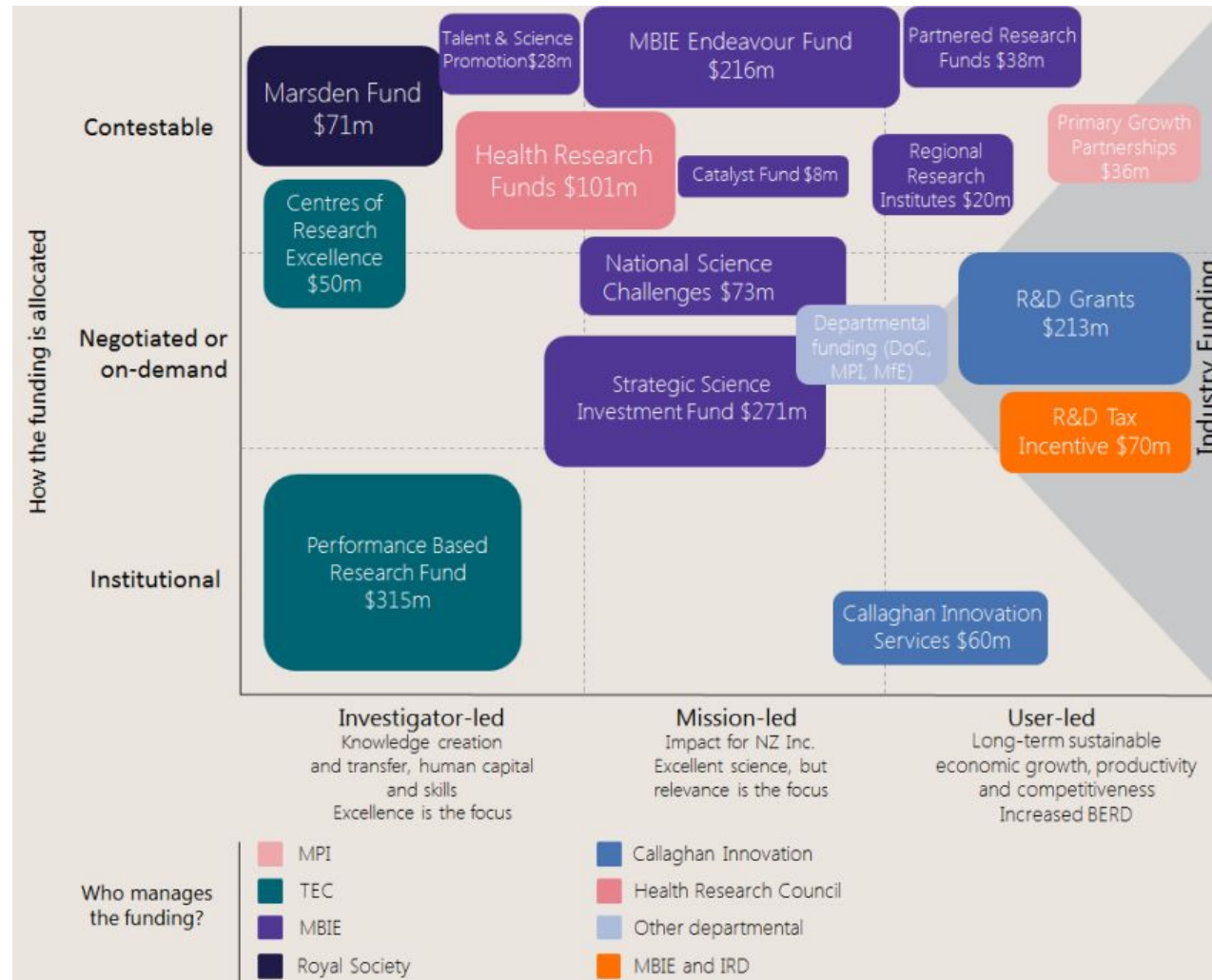
A complicated system?



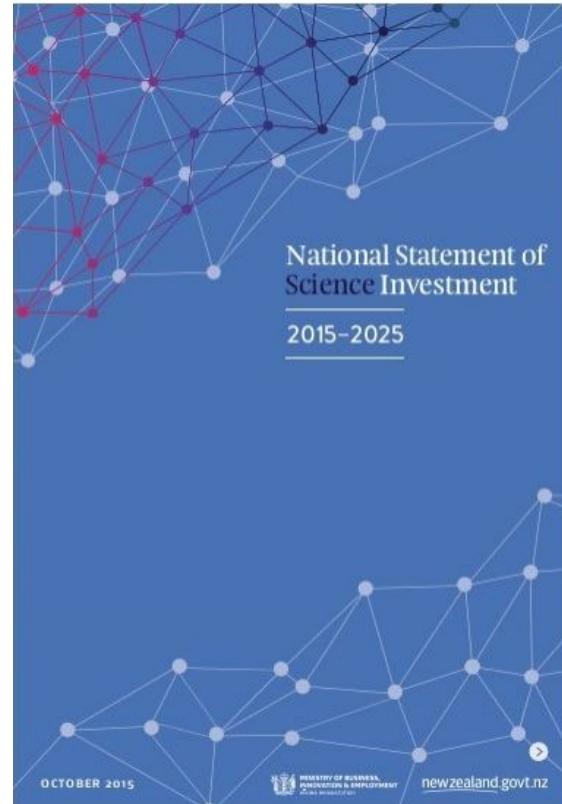
MBIE oversees 2/3 of NZ's research funding



Government R&D Funding



National Statement of Science Investment 2015 - 2025



Research, Science, and Innovation System Performance Report - 2018



Strategic Science Investment Fund



Endeavour Fund



Research, Science, and Innovation Strategy

Consultation workshops

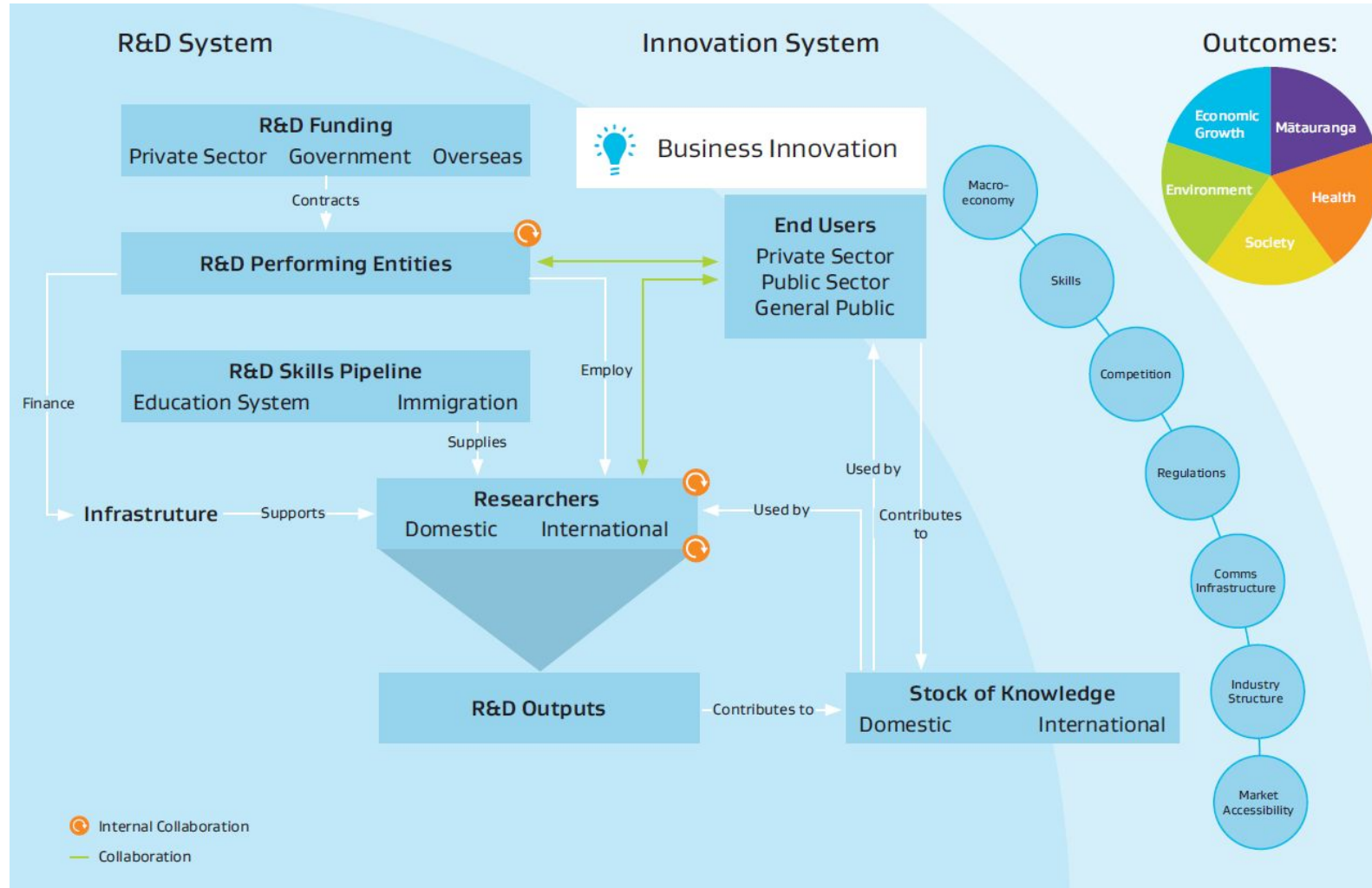
			Notes
10 mins	Welcome, introductions and objectives	Simon	Round table introductions
20 mins	Overview presentation	Simon	- RS&I goals - Rationale - Ambition
10 mins	Q&A	Simon	Focused on the overview. Other questions can be discussed at the end.
30 mins	Exercise 1	Simon to introduce. Simon/Ron/Justine? to facilitate	What is the most important key challenge for New Zealand becoming a global innovation hub? - Based on the experience of your <u>organisation or industry</u>, come up with at least one idea. - In the group, discuss similarities and differences and distill them into a set of common themes.
10 mins	Report back		Table lead reports back key message to the group.
20 mins	Tea break		
10 mins	Elements of strategy	Simon	
40 mins	Breakout session 2	Simon/Ron/Justine? to facilitate	Thinking about the challenge you identified, what actions would enable a step-change in New Zealand's innovation activity? - Discuss ideas, decide on one, and develop a plan to make it happen. - What can the Government do to help with this?
10 mins	Report back		
10 mins	Final Q&A, thanks and next steps	Simon	Discuss key messages with the group.



Health Research Strategy

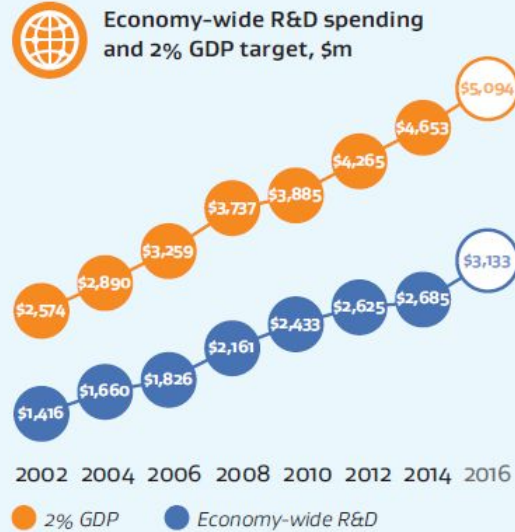


Research Ecosystem

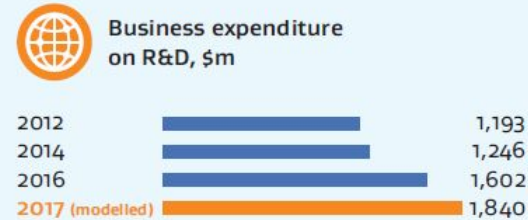


Government Investment in R&D

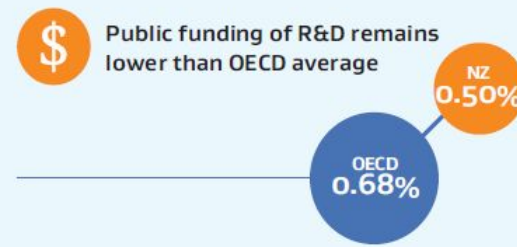
Government target is to raise economy-wide R&D to 2% GDP



Business R&D is growing strongly



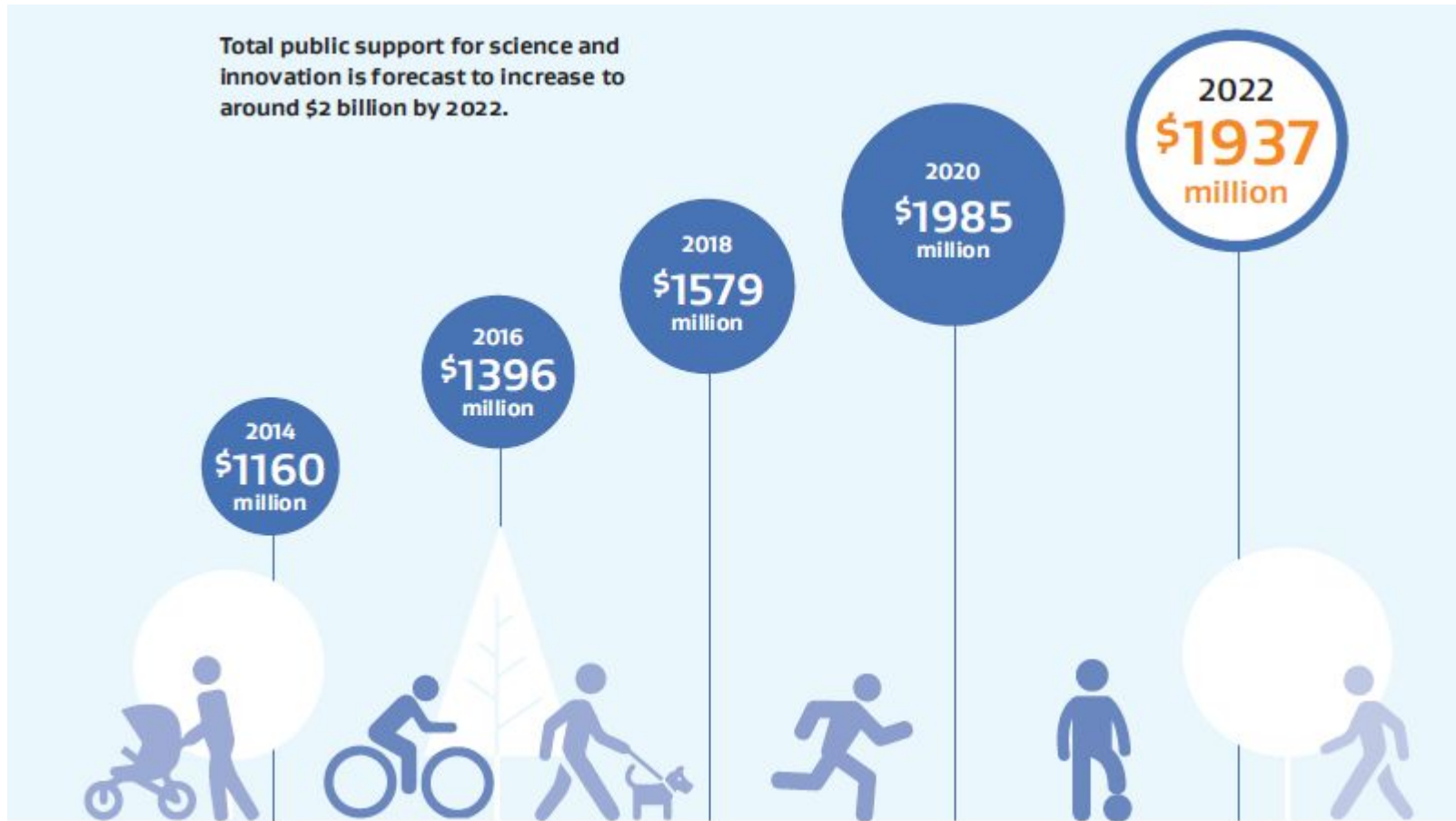
Publicly funded R&D will grow significantly following Budget 2018



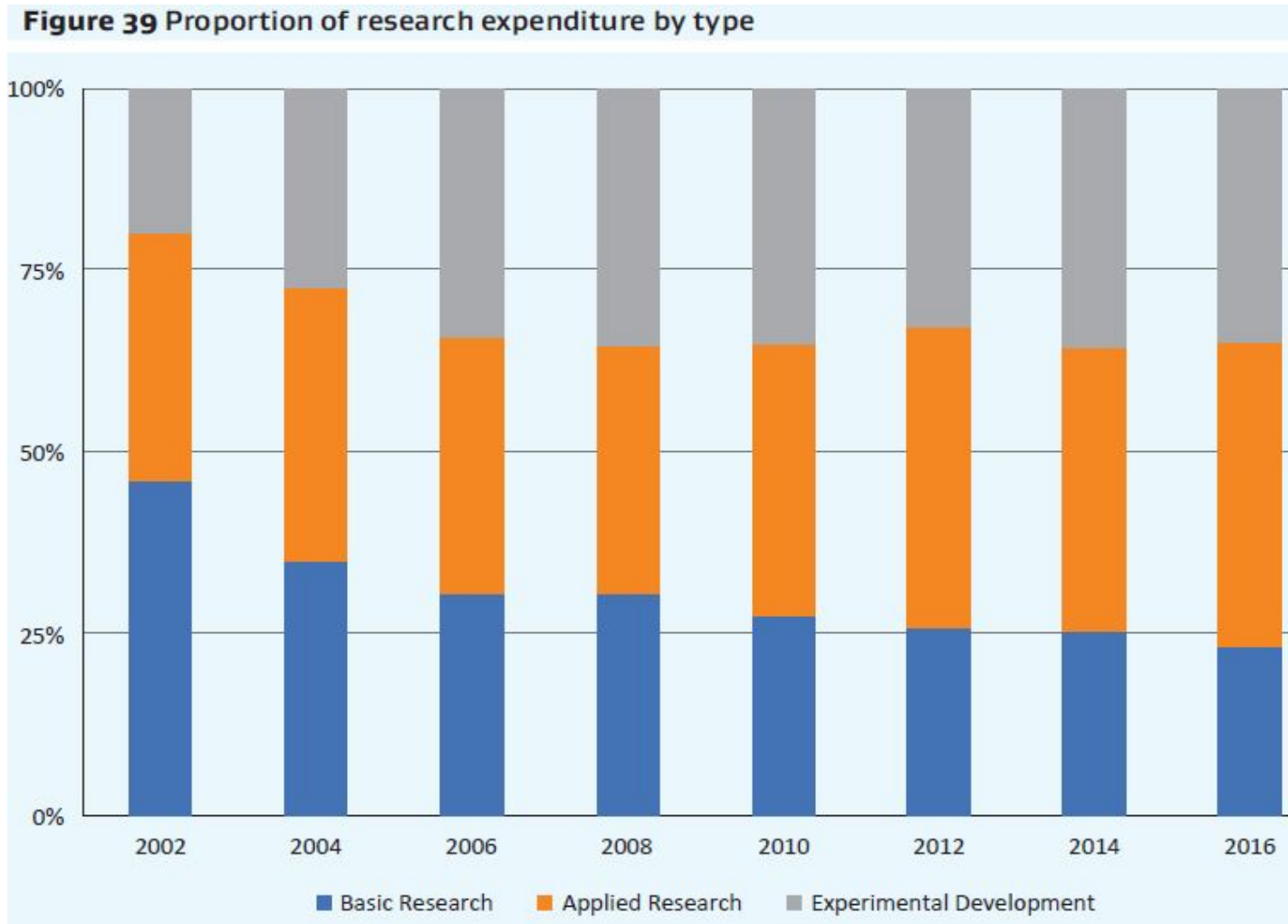
Business, Government and Higher Education all performed more R&D in 2016.



Government Investment in R&D



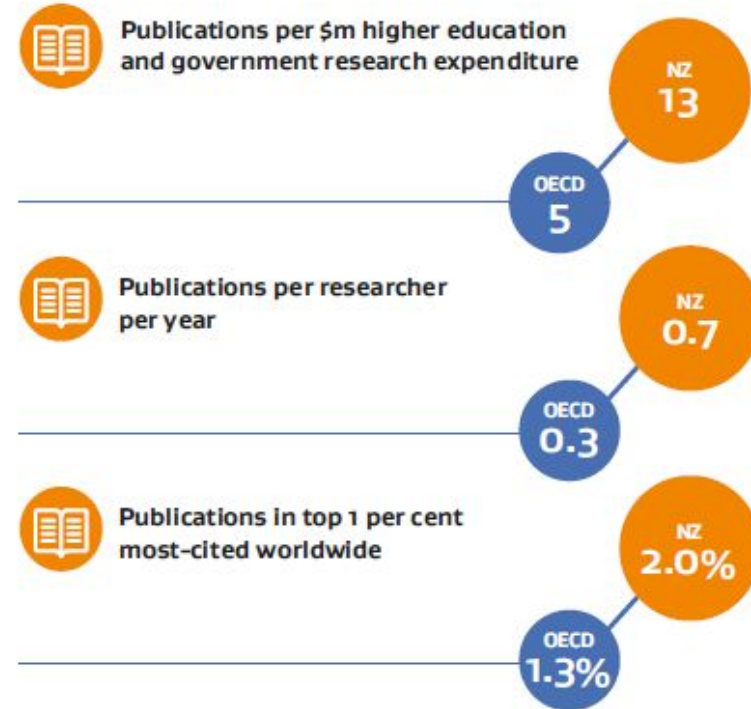
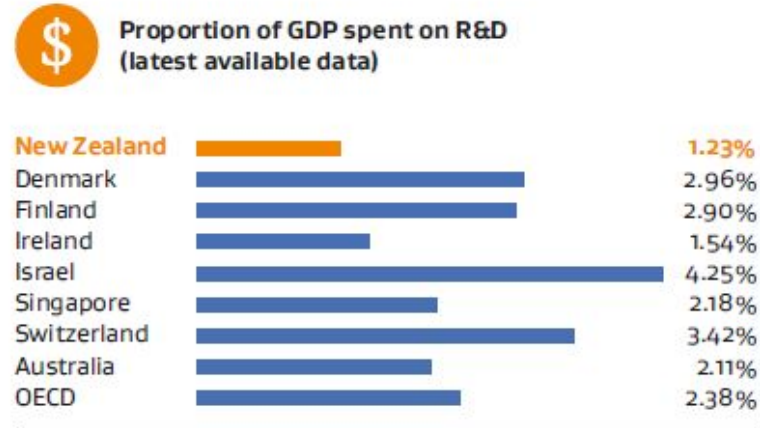
Government Investment in R&D



Government Investment in R&D

Our science system is relatively small...

...but highly productive



Source: Research Science & Innovation System Performance Report (2018)

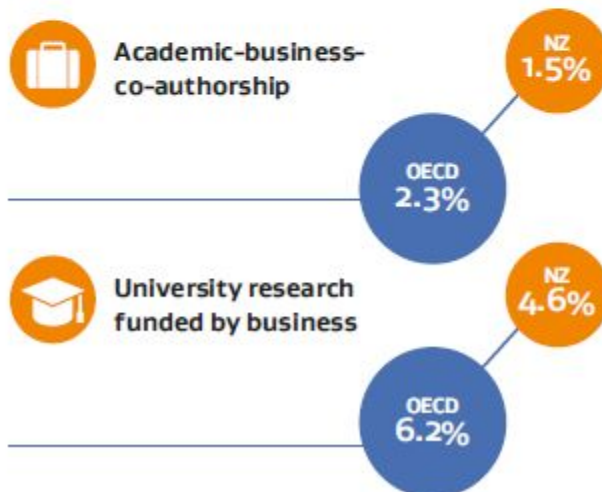


Government Investment in R&D

NZ has high international collaboration rates



Academic-business collaboration remains low



Our economic sophistication is falling behind the global frontier



Source: Research Science & Innovation System Performance Report (2018)

Government Investment in R&D

Business R&D expenditure is low...



Business expenditure on R&D as % GDP
(latest available data)



...but growing strongly



Business R&D increased by
\$356m (29%) from 2014-16



Innovation rates are low



Proportion of firms reporting innovation
(latest available data)



Start-up investment
has quadrupled over
ten years

2006
\$21m
Investment

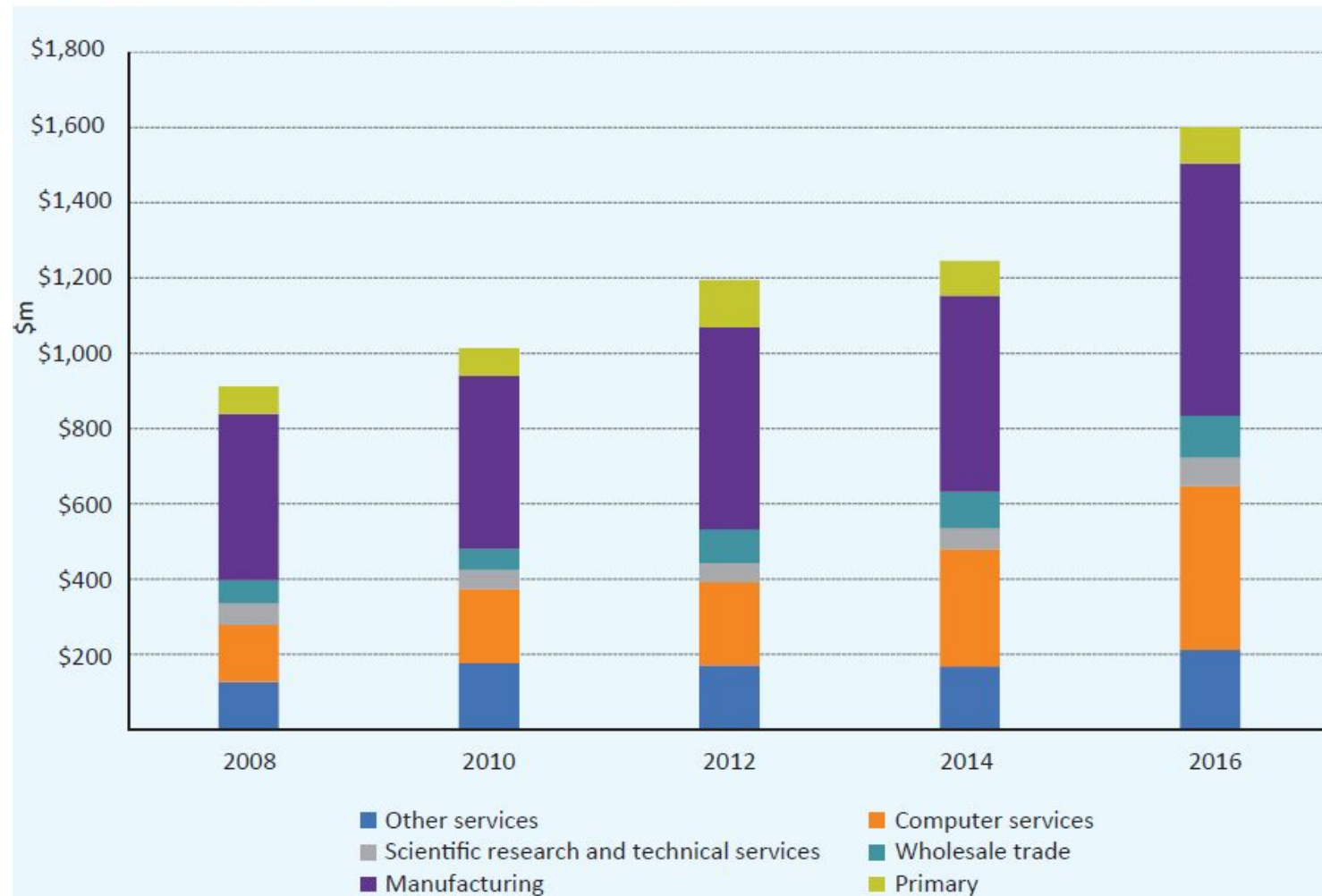


Source: Research Science & Innovation System Performance Report (2018)

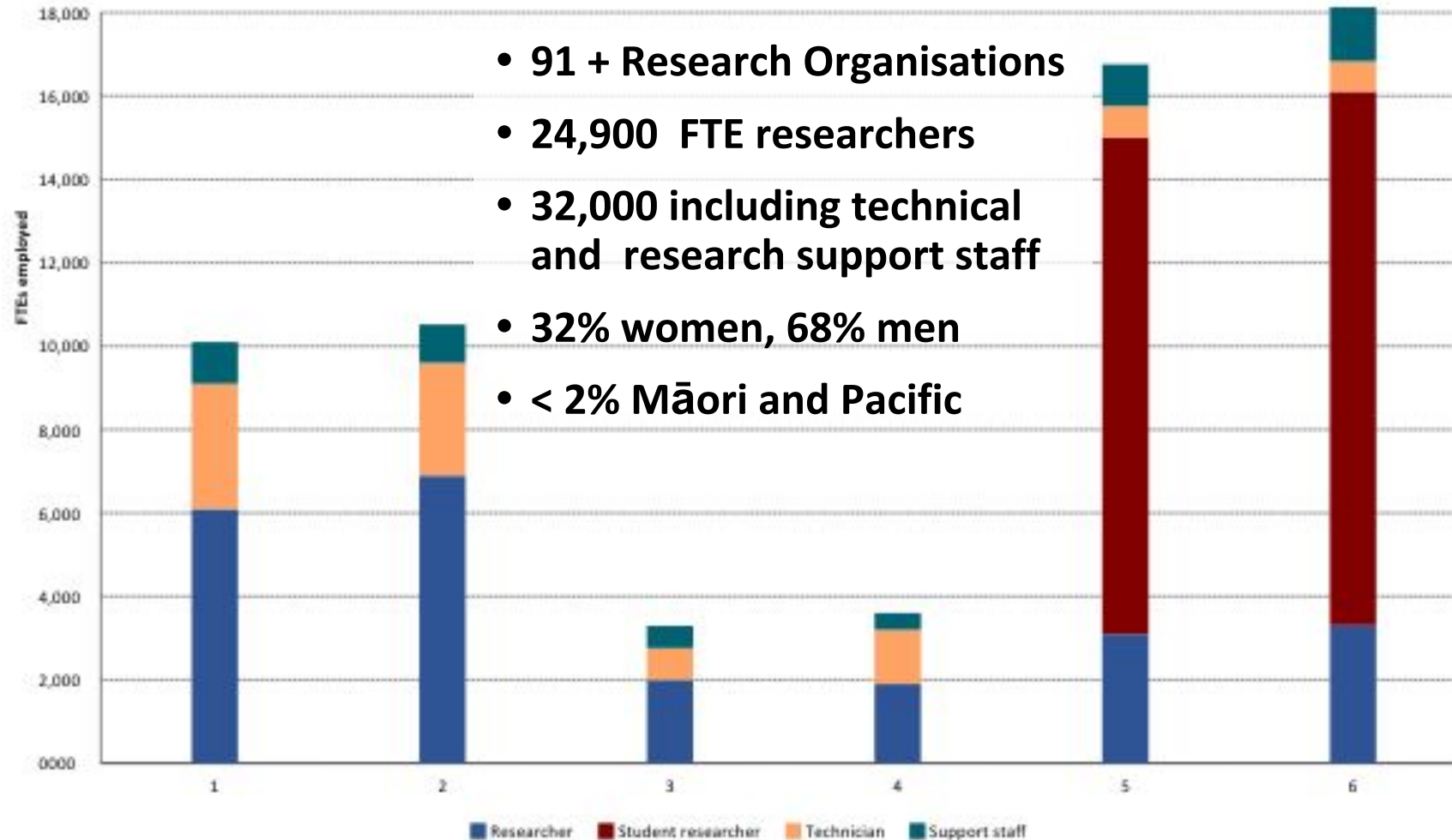


Government Investment in R&D

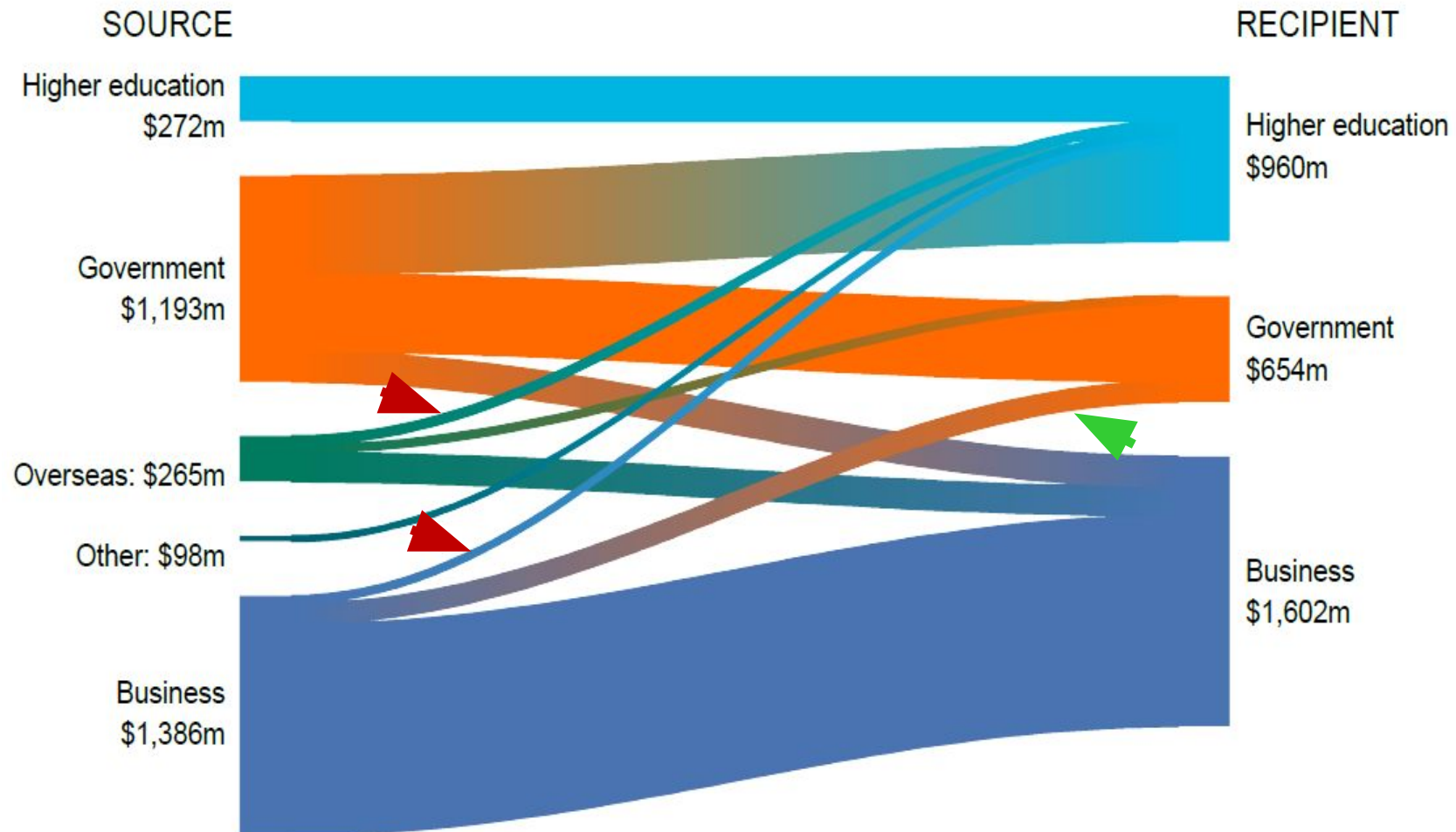
Figure 16 Share of R&D expenditure by Industry



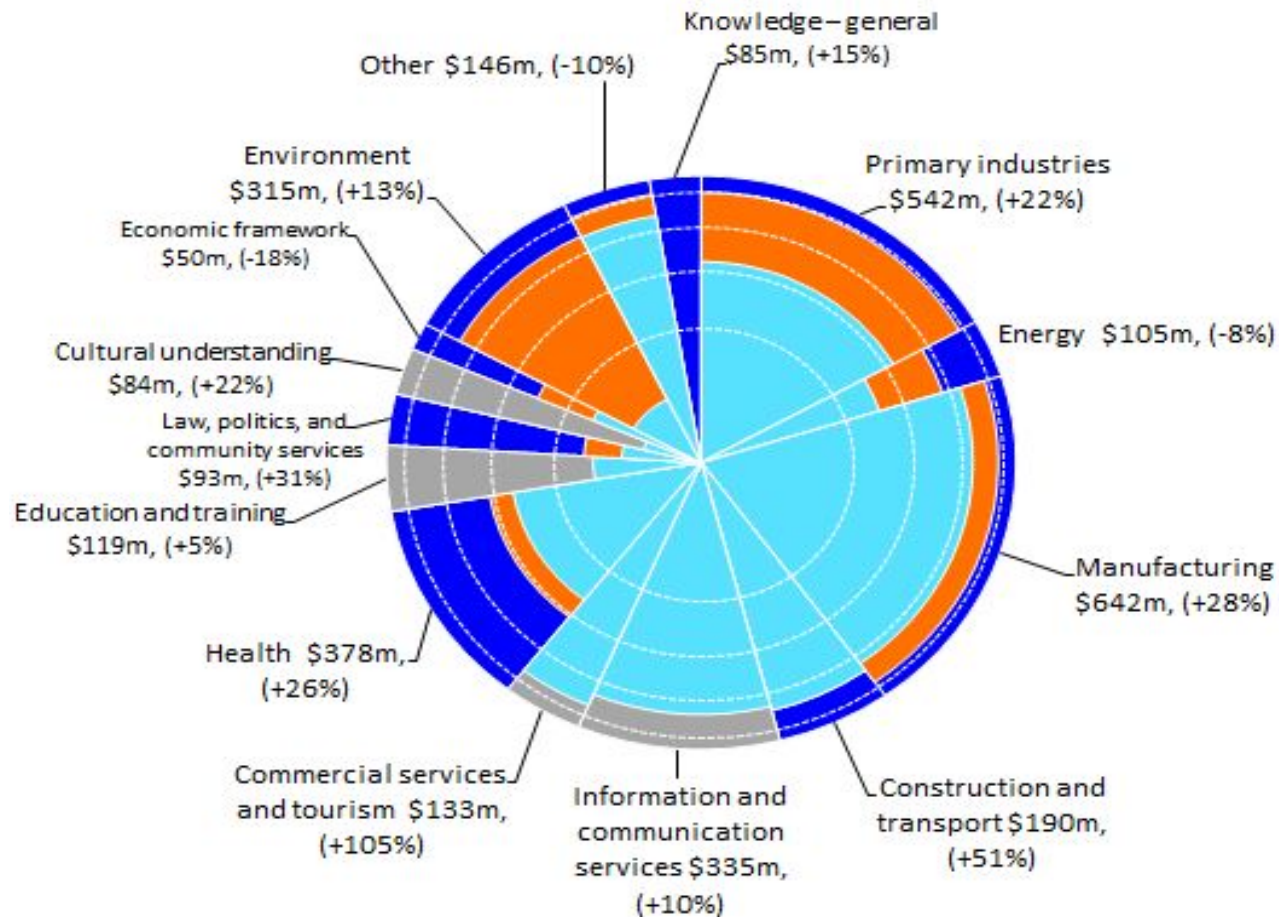
Research Workforce



R&D funding by source and destination 2016



Sector snapshot



Business

Government

Higher Education

Data
anonymised or
not available



Vision Mātauranga



waatea
news.com

Monday February 12, 2018 Last updated 00:06AM

Tuaropaki punts on hydrogen power

09 Feb 2018 14:36 PM



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Delivering benefit for NZ?

Mobilisation of knowledge
through connections with
those who are going to use it

Greater engagement with
research in businesses

Research quality bias
between basic and applied



eResearch



- Modelling of ecosystems or economies
- Exploration of human genome structures
- Studies of large linguistic corpora
- Integrated social policy analyses
- Principle features of e-Research include
- Use of grid-computing technologies
- Data-intensive activity



The Strategic Science Investment Fund

NAME	DESCRIPTION	AMOUNT	
		2016/17 ACTUAL	2017/18
Advanced Genomics Research Platform	New research centre for the whole science sector that also grows excellent genomics research capability in New Zealand	-	\$5m
Australian Synchrotron	A particle accelerator that generates high-energy light, used for imaging and experimentation across many research disciplines. Located in Melbourne, Australia.	\$0.9m	\$0.9m + capital development
Enhanced Natural Hazards Monitoring	Geonet's hazard monitoring and warning capability.	\$3m	\$3m
Nationally-Significant Collections and Databases	26 long-term research resources including longitudinal climate data, herbaria, geological samples, land information and biobanks.	\$19.1m	\$19.1m
New Zealand eScience Infrastructure (NESI)	Supercomputing and support services for New Zealand research projects and programmes.	\$7.2m	\$7.2m
New Zealand Genomics Ltd (NZGL)	Genomics, bioinformatics and bioIT services for New Zealand research projects and programmes.	\$2.2m	-
Research and Education Advanced Network for New Zealand (REANNZ)	A high-performance broadband network designed to send large amounts of research data between researchers, without loss and at very high speed (1-100 Gb/s).	\$4m	\$3m
Research Vessel Tangaroa	A deep-water research vessel capable of operating in the EEZ and Antarctic ocean; enables New Zealand's offshore marine research.	\$4.6m	\$11.1m
Square Kilometre Array (SKA)	A proposed radio-telescope array (to be constructed in the Southern Hemisphere over the next decade).	\$1.1m	\$1m



Data Science

1. **Deliver excellence:** Produce excellent, cutting edge, dynamic and paradigm-shifting data science research.
2. **Grow capability:** Grow the scale, depth, excellence and impact of New Zealand's data science research community, with world-class academic leadership driving deep excellence in defined areas of data science. The Platform should build on existing expertise and attract top researchers, both senior and emerging.
3. **Leverage collaboration:** Foster and grow international and national connections between researchers and across institutions.
4. **Enable New Zealand researchers** to access innovative and advanced data science methods to tackle research questions and real world problems. The Platform will develop data science approaches, methods, tools and technologies that can be accessed by New Zealand researchers.
5. **Deliver additionality:** Provide fresh thinking, new people, new and expanded research, new collaborations and impacts that would not have happened without this investment.
6. Give effect to the Vision Mātauranga policy.



Contestable Funding – The Endeavour Fund

- Endeavour is open to any topic except health benefit research (which is overseen by the Health Research Council)
- eResearch applications are welcome
- In terms of government signals eResearch could contribute to many of these
- eResearch expertise is already contributing to many areas of existing funding eg;
 - Genetics
 - Artificial Intelligence
 - Location based mapping



Contestable Funding – The Endeavour Fund

- The government, in the Endeavour investment plan signals the following areas as important:
 - Creating and growing knowledge intensive industries
 - Supporting the transition to a low emissions economy
 - Take account of broader government policy and strategy documents
 - Give effect to Vision Mātauranga
 - Leverage wider investment and knowledge, in NZ and overseas
 - Excellent research, with high potential impact in areas of future value, growth or critical need for NZ



Thank you

