



ARC Centre of Excellence for Gravitational Wave Discovery

# The View from Australia

As seen by David McClelland

The Australian National University



## Australian Government sources

- *Department of Industry, Innovation and Science*
  - funds major research infrastructure along with CSIRO
  - already heavily committed and occupied with engagement in SKA and ESO  
(timescale for these investments?)
  - **funding is ad hoc**: no funding stream to get a new thing like the SKA off the ground.
  - Has a representative in the GSO group.
- *Australian Research Council*
  - very supportive of GWs
  - funded OzGrav and Australian Partnership in aLIGO
  - does not have a budget for major facilities the way NSF does

# Australia in the era of global astronomy

The decadal plan for Australian astronomy  
2016–2025

	MWA -> SKA low-frequency	ATCA, Parkes -> SKA mid-frequency	ASKAP	30-metre class optical/IR facilities (ELTs)	8-metre class optical/IR facilities	High performance computing	AAT and 8-metre class wide-field multi-object spectroscopy	High energy facilities	Ground-based gravitational wave detectors	ALMA
1) How did the first stars and galaxies transform the Universe?	Orange			Orange	Orange	Orange				Orange
2) What is the nature of dark matter and dark energy?		Orange	Orange	Orange	Orange	Orange	Orange	Orange		
3) How do galaxies form and evolve across cosmic time?	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange		Orange
4) How do stars and planets form?		Orange	Orange	Orange	Orange	Orange			Orange	Orange
5) How are elements produced by stars and recycled through galaxies?				Orange	Orange	Orange	Orange			Orange
6) What is the nature of matter and gravity at extreme densities?	Orange	Orange						Orange	Orange	

*..a revolution is expected during this Decadal Plan period following the detection of gravitational waves, which, along with next-generation high-energy telescopes and Antarctic astronomy, will open new windows to astrophysics. **Mid-scale investment** in large international facilities will provide the tools for Australian discoveries in these areas.*

## Decadal Plan:

- “Continued investment for Australian capability in areas including gravitational waves, high energy, and fundamental astrophysics will leverage investment in large international projects. *These areas will open new windows of discovery and provide complementary capability to core areas of Australian observational astronomy.*”
- Australia needs a stable, predictable, system for funding major research infrastructure.
- a strategic approach to funding should be flexible enough to provide opportunities *for mid-scale investments.*
  
- Clearly we (the Oz GW community) have not enunciated an **emphatic case** for an Australian sited detector
  
- *Mid-term review of the Decadal Plan in 2020*  
need to work out our strategy

## Possibilities for Australian contribution

- Prospect for Australian 'community support' for mid-scale Australian investment in an international facility
    - could be sited in Australia
    - mid-scale meaning \$10s of millions
  - Are there conditions under which this could be pushed to +\$100M scale for an onshore 3G facility?
    - an emphatic science case
    - our astronomers getting really excited
    - drivers for Australian technology, industry, employment
    - strategic regional positioning
- major international funding contributions for both construction and operation*

## Regional Consortia:

- Could (should) an Asian consortium be put together?
  - China and Australia
  - Australia, China, India, Singapore, South Korea,,..... Site TBD
- Could a southern hemisphere consortium be put together?
  - Australia, Chile, Argentina,... Site TBD?

## • Another Approach:

- 'high frequency' 3G detector before the end of the 2020s
  - (design ideas from Martynov, Miao et al)
- Extendable to full bandwidth later
- OzGrav undertaking an initial feasibility study
- Price tag still likely to be a few hundred million dollars
- International investment still required
- *Is there a role for such an instrument in a global plan*

## Or does Australia just stay the course?

- Invest in and contribute to what extent we can in the initial 2 node global 3G array
- Let the future global consortium determine the timing for and location of the 3<sup>rd</sup> node of the 3G global array.

## Perhaps the answer depends on the Governance model we choose

- A global, united, entity builds X (not necessarily identical) detectors at locations and in a sequence that optimises the science, moderated by financial inputs.
- Separate consortia working somewhat independently strive to fund 'independent' detectors at sites whose location is driven by funding  
*=> A 3<sup>rd</sup> consortium needs to emerge to complement ET and CE*