

Economics Legislation Committee
ANSWERS TO QUESTIONS ON NOTICE
Industry, Innovation and Science Portfolio
2017 - 2018 Budget Estimates
31 May – 1 June 2017

AGENCY/DEPARTMENT: DEPARTMENT OF INDUSTRY, INNOVATION AND SCIENCE

TOPIC: Australian Astronomical Observatory - historical funding

REFERENCE: Written Question – Senator Carr

QUESTION No.: BI-98

1. What proportion of Australia's national telescope optical astronomy does the Anglo-Australian telescope (AAT) provide?
2. Are there any measures of the productivity of the AAT?
3. What funding has been allocated to the AAO under NCRIS since 2007? Please break down by financial year and distinguish between operational and infrastructure. Also outline the purpose of the various funding allocations
4. What funding has been allocated to the AAO under the Education Investment Fund since 2007?

ANSWER

1. The national optical astronomy capability provided by a given telescope can be estimated based on the annual number of observing nights available to Australian and international astronomers on the telescope in simple terms. A more meaningful measure is to multiply the number of observing nights by each telescope's collecting area, because larger area telescopes can collect astronomical data more rapidly for a given set of target objects, or observe a greater number of fainter targets during a given observing time. On this basis, for each telescope available to Australian astronomers as part of the national optical astronomy capability during 2016-17, the proportion of that capability can be attributed as follows:

| Telescope | Simple # of nights | Proportion | Weighted # of nights x area (metres ²) | Proportion |
|-----------------------------------|-----------------------|---------------|--|---------------|
| Anglo-Australian Telescope | 310* | 86.8 % | 3703 | 63.5 % |
| Magellan Telescopes | 15 | 4.2 % | 498 | 8.5 % |
| Keck Telescopes | 15 | 4.2 % | 1140 | 19.6 % |
| Gemini Telescopes | 7 | 2.0 % | 361 | 6.2 % |
| Victor M. Blanco Telescope | 10 | 2.8 % | 126 | 2.2 % |
| Total | 357 | 100 % | 5828 | 100.0% |

* This is the number of nights available in 2016-17 on the Anglo-Australian Telescope for science observations by Australian and international observers, after subtracting nights for dedicated survey projects and time allocated at the Director's discretion.

2. Scientific productivity of the Anglo-Australian Telescope can be measured in several accepted ways. Common measures for scientific productivity of a telescope are:
 - An annual count of scientific journal articles published, enabled by the use of the data collected by the telescope
 - the aggregate number of research citations, estimated over a five-year period, for the scientific journal articles published each year.

The AAT data has enabled the publication of typically 60 to 90 papers per year over the period 2009-10 to 2015-16. Estimated 5-year citation counts for the papers published each year have varied between 2000 and 3000 over the same period.

Another productivity metric is the annual number of users of the telescope. For the Anglo-Australian Telescope, the total number of users each year has risen from around 150 in 2009-10 to around 275 in 2016-17. Researchers based at Australian institutions account for about half of these users, on average.

The Anglo-Australian Telescope has focused primarily on delivering spectral observations of stars and galaxies, over the last two decades. On its own, the telescope has produced more than 20 per cent of all such measurements ever made, on all optical/infrared telescopes globally.

3. Funding allocated to the Australian Astronomical Observatory (AAO) under the National Collaborative Research Infrastructure Strategy (NCRIS) since 2007 has been as follows:

| Year | Operational activities | | Infrastructure Elements | | |
|---------|------------------------|------------|-------------------------|-------------|-----------|
| | Operations | AusGO/ITSO | Refurbish AAT | Hermes | PLATOs |
| 2007/08 | | \$150,000 | \$1,100,000 | \$1,020,000 | |
| 2008/09 | \$1,500,000 | \$253,000 | \$1,100,000 | \$400,000 | |
| 2009/10 | | \$318,000 | \$1,100,000 | \$2,500,000 | |
| 2010/11 | | \$330,500 | \$800,000 | \$2,000,000 | |
| 2011/12 | | \$116,467 | | | |
| 2012/13 | | | | | |
| 2013/14 | | \$49,000 | \$170,000 | | \$168,000 |
| 2014/15 | | \$321,000 | \$275,000 | | \$100,000 |
| 2015/16 | | \$446,000 | | \$210,000 | \$170,000 |
| 2016/17 | | \$406,000 | | \$135,000 | \$170,000 |

Purpose of the above NCRIS funding allocations to AAO:

Operations: A one-off provision to cover a gap in AAO operational funding in the year prior to its transfer into the Commonwealth, pending the winding up of the bilateral UK-Australia treaty that operated the Anglo-Australian Telescope Board.

AusGO/ITSO: (Australian Gemini Office / International Telescope Support Office) for provision of scientific support and liaison, user training, logistic support for Australian astronomers awarded merit-based observing time on overseas optical telescopes.

Refurbish AAT: Repairs to the Anglo-Australian Telescope and protective dome, to ensure ongoing operability and safety of the facility.

- Hermes:** Contributions towards the total cost of constructing the High Efficiency and Resolution Multi-Element Spectrograph (HERMES) instrument for the Anglo-Australian Telescope.
- PLATOs:** Servicing and operations of PLATeau Observatory (PLATO) autonomous robotic support platforms to enable unmanned infrared telescope observations in collaboration with China at Dome A on the high Antarctic plateau.
4. Funding allocated to the Australian Astronomical Observatory (AAO) under the Education Investment Fund (EIF) since 2007 has been \$2,380,000.