Progress report on reconstruction of the Great Melbourne Telescope

Barry Clark
bajc@alphalink.com.au

Astronomical Society of Victoria Inc

The GMT in its heyday at Melbourne Observatory
Source: Museum Victoria, MM39991

Report on GMT research at Melbourne, 1885

The Great Melbourne Telescope of 1869 was rarely used after its nebular observation results were published in 1885. It was derelict when Melbourne Observatory ceased as a professional body in 1945.

The GMT was sold for scrap value to Mt Stromlo Observatory and was modernised three times before the disastrous firestorm of 2003 brought its distinguished career there to an end.

From 1983, Museum Victoria began collecting parts no longer used on the GMT. The Astronomical Society of Victoria combined forces with Museum Victoria to have the remaining fire-damaged parts returned to Victoria in 2008. The Museum’s collection of parts became about 90% complete by mass but much less by number of items as many of the smaller parts such as the mechanical clock drive system had been scrapped at Mt Stromlo.

Modified GMT at Mt Stromlo in 1954 with lengthened polar axis, shortened lattice tube and Gregorian optics. Source: National Archives of Australia, A1200, L17382

Reconstruction of the GMT in close to its original form began in 2009 at Museum Victoria. Weekly workshop sessions since then have been attended by a team of about a dozen active volunteers from the Astronomical Society of Victoria. Initial years were largely taken up by making new engineering drawings of the several hundred parts on hand, by cleaning and conservation of these parts, and in gathering original technical information to replace that lost in two fires at Mt Stromlo. More recently, a massive steel frame was designed, built and certified with help from engineering company Beca as a temporary replacement for the original masonry piers, with possible permanent use in
which the original appearance would be reproduced by basalt cladding.

However, when the polar axle assembly was rotated an unexpected eccentricity was revealed.

Precise measurements of the central cast iron cube indicated that it must have warped by about a millimetre while under load during the firestorm. Crack testing also detected several cracks starting from bolt holes. Ways of dealing with these faults are currently under consideration. Meanwhile, progress has been made on other aspects including a new optical system design, reverse engineering of the missing clockwork drive system and design and manufacture of many other missing parts. Reversal of major engineering modifications made at Mt Stromlo is proving to be difficult and time-consuming. This is in no way a criticism of how or why these things were done.

It is 70 years since the GMT was last in this configuration. The declination clamp disk is a replacement for the broken original.

At Robinson Engineering: removal of the heavy steel flange that was shrink-fitted at Mt Stromlo to the declination axle casting

A detailed study of the original eyepieces is in progress. The intention is to manufacture replicas
and/or look-alikes with better optical performance for routine use.

MV conservation manager Helen and one of the ‘three Barrys’ unravelling mysteries of the original Huygenian eyepieces

The original cast steel flotation system for the 1.2-m primary speculum. As the new mirror will be much lighter and have a larger central perforation to allow use of a tubular stray light stop, a new flotation system will be required, allowing this one to go on permanent display supporting the surviving speculum.

Preparing a broken slow-motion bracket for repair at Museum Victoria’s Scienceworks workshop

A lathe and a mill-drill were a timely donation to the Museum for use at the GMT workshop site.

These were supplemented by a horizontal mill that was surplus to requirements at the Scienceworks engineering workshop. The three machines have facilitated manufacture of replacement parts.

Another cracked part of the polar drive mechanism being prepared for repair at Scienceworks

This time, Barry is machining a newly cast pulley axle mount using the on-site lathe.

The project clearly has several years still to run. Funds are still being sought for replacement Cassegrain optics. Meanwhile, the design of many replacement parts cannot be finalised until the thickness of the new primary is known with certainty.

Unless otherwise noted, all photographs are by Museum Victoria staff or ASV volunteer members of the GMT reconstruction project team.