Third mirror casting event for the Giant Magellan Telescope

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On Saturday, August 24, 2013, the third mirror for the Giant Magellan Telescope (GMT) will be cast inside a rotating furnace at the University of Arizona's Steward Observatory Mirror Lab, the only facility in the world where mirrors of this size are being made. The Mirror Lab will host a rare media opportunity to witness this milestone in the creation of the optics for the GMT. Each of the seven mirrors weighs roughly 20 tons, yet the surface has to be smooth to within a twentieth of a wavelength of light. The GMT mirrors are considered to be the greatest astronomical optics challenge ever undertaken. Here's a short video discussing the mirror making process.

Members of the press and media are invited to participate in all events on August 24th. Events include: Tour of the Mirror Lab by senior staff—see the liquid glass as it is spun cast in the furnace at a temperature of 1170 degrees C (2140 F), and observe the mirror glass polishing procedure. There will be overview and science talks by project scientists, plus opportunities to interview leading project scientists and engineers. Evening includes VIP cocktail reception and dinner in the Resort's Grand Ballroom, followed by a special memorial program honoring GMT benefactor George P. Mitchell, who passed away on July 26, 2013.

This event is supported by the University of Arizona's Steward Observatory and College of Science and by the GMTO Corporation, a nonprofit entity with project offices based in Pasadena, California. The GMTO manages the GMT Project on behalf of its international partners:

Astronomy Australia Ltd., the Australian National University, the Carnegie Institution for Science, Harvard University, the Korea Astronomy and Space Science Institute, the Smithsonian Institution, Texas A&M University, the University of Arizona, the University of Chicago, and the University of Texas at Austin. For more information, visit www.gmto.org.

The GMT features an innovative design utilizing seven mirrors, each 8.4 meters in diameter, arranged as segments of a single mirror 24.5 meters (80 feet) in diameter, to bring starlight to a common focus via a set of adaptive secondary mirrors configured in a similar seven-fold pattern.

The GMT will allow astronomers to answer some of the most pressing questions about the cosmos including the detection, imaging, and characterization of planets orbiting other stars, the nature of dark matter and dark energy, the physics of black holes, and how stars and galaxies evolved during the earliest phases of the universe.

"Astronomical discovery has always been paced by the power of available telescopes and imaging technology. The GMT allows another major step forward in both sensitivity and image sharpness" said Peter Strittmatter, Head of Department of Astronomy, Steward Observatory. "In fact the GMT will be able to acquire images 10 times sharper than the Hubble Space Telescope and will provide a powerful complement not only to NASA's 6.5-meter James Webb Space Telescope (JWST) but also to the Atacama Large Millimeter Array (ALMA) and the Large Synoptic Survey Telescope (LSST), both located in the southern hemisphere."

Patrick McCarthy, GMT Project Director, added "This third GMT casting is going forward now because the primary optics are on the critical path for the project. The second mirror has now been successfully cast, and the first mirror is completed and polished to an

optical surface accuracy within about 25 nanometers, or about one-thousandth the thickness of a human hair."

Like other mirrors produced by the SOML, the GMT mirrors are designed to be spun cast, thereby achieving the basic front surface in the shape of a paraboloid. A paraboloid is the shape taken on by water in a bucket when the bucket is spun around its axis; the water rises up the walls of the bucket while a depression forms in the center.

Some 21 tons of borosilicate glass, made by the Ohara Corporation, flow into a pre-assembled mold to create a lightweight honeycomb glass structure that is very stiff and quickly adjusts to changes in nighttime air temperature, each resulting in sharper images. The Mirror Lab has already produced the world's five largest astronomical mirrors, each 8.4 meters in diameter. Two are in operation in the Large Binocular Telescope (LBT) – currently the largest telescope in the world, one is for the Large Synoptic Survey Telescope (LSST), and the fourth and fifth are the first two off-axis mirrors for GMT. The Mirror Lab has also produced five 6.5-meter mirrors, two of which are in the twin Magellan telescopes at Las Campanas Observatory in Chile.

"The novel technology developed at the Mirror Lab is creating a whole new generation of large telescopes with unsurpassed image sharpness and light collecting power," said Wendy Freedman, Director of the Carnegie Observatories and Chair of the GMTO Board. "The SOML mirrors in the twin Magellan Telescopes at our Las Campanas Observatory site are performing superbly and led to our adoption of this technology for the GMT."

The GMT is set to begin science operations in 2020 at the Las Campanas Observatory, exploiting the clear dark skies of the Atacama Desert in northern Chile. "With funding commitments in hand for close to half of the $700 million required to complete the project, with one mirror

finished, the second mirror being readied for polishing, and with construction scheduled to begin in 2014, the project is on track to meet this schedule goal," said Matthew Colless, Director of the Australian Astronomical Observatory.

"The giant mirrors being spun cast for the GMT at the Steward Observatory Mirror Lab are like the sails of the great ships of exploration ca. 1500, except here the discoveries are not lands across the ocean, but rather the nature of whole new worlds and island universes, spanning all of space and time," said Joaquin Ruiz, Dean of the College of Science, University of Arizona. "We at Arizona are proud to participate in such an exciting international scientific project as the GMT."

Provided by Giant Magellan Telescope