George R. Wallace, Jr., Astrophysical Observatory

Located in Westford, Massachusetts, the George R. Wallace, Jr. Astrophysical Observatory is MIT's local astronomical observatory for both research and teaching. No personnel changes occurred during FY2010.

Facilities

The primary research instrument at Wallace Astrophysical Observatory is a 24-inch Cassegrain reflecting telescope housed in the main dome. A Perseus four-port instrument rotator was installed and commissioned this year. With this device, any one of four instruments can be put into service within a few minutes. The current instrumentation on this telescope is a Portable Occultation, Eclipse, and Transit System (POETS) camera—a high-speed charge-coupled device (CCD) camera with photon-counting capability built by professor James Elliot's group. This camera is used for occultation work and extrasolar planet transits. The telescope also has a Santa Barbara Research Group STL-1001E camera, which can be used for "strip-canning" astrometric observations. Completing the four-instrument complement are a Portable Instrument for Capturing Occultations (PICO) and a selection of eyepieces. A subsidiary dome houses a 16-inch reflecting telescope, and a four bay shed with roll-off roof houses three Celestron 14-inch reflecting telescopes, and a Celestron 11-inch telescope. Each of the four telescopes in the shed has a Santa Barbara Research Group STL-1001E camera, and the 16-inch is outfitted with an LHIRES-III spectrograph. This year, both the primary and secondary mirrors of the 16-inch were cleaned and re-aluminized and a new control computer was installed. Several additional portable telescopes are available for special use, including a classic Alvin Clark 5-inch refractor. Further infrastructure on site includes an electronics shop, machine shop, computer facilities for data analysis and storage with high-speed internet service, an office, a service area for use by observers, and two large storage sheds. A solar-powered weather station was installed this year.

A low-cost, high-speed CCD system suitable for observation of stellar occultations by Kuiper belt objects (KBOs) was developed by Matt Lockhart and Mike Person. This PICO system was tested at the observatory. Twelve systems were constructed and deployed for the 2009-10-09 stellar occultation by KBO 55636, with observations published by Elliot, J. L., et al., in *Nature* in 2010. In the four-bay shed, both Telescope 3 and 4 have Software Bisque Paramount ME robotic telescope mounts. Hence, both Telescope 3 and Telescope 4 can be controlled from campus, and observations are now routinely carried out using this capability. This year a Chronos mount was installed and commissioned for Telescope 2. Remote operation of the telescopes by students on campus facilitates the collection of a greater volume of data by students in the astronomy classes, using a mix of campus and observatory laboratory sessions.

Research and Academic Work

Professor Josh Winn '94, SM '94, PhD '01 and his team of students observed a transit of the interesting exoplanet HD 80606 with the 24-inch and the shed telescopes as part of an international collaboration. Rachel Bowens-Rubin, Katheryn French, Dora Gao '11, and Christina Jaworsky published their astrometry of the Kuiper belt object (136472)

Makemake, "KBO Astrometry Using Small Telescopes," in volume 8 of the *American Journal of Undergraduate Research*. Transit observations of extrasolar planets were carried out by Caroline Morley '10, for her senior thesis, "Measuring Transit Timing Variations of Exoplanets Using Small Telescopes," which she submitted to the Department of Earth, Atmospheric, and Planetary Sciences in June, 2010. Fakhri S. Zahedy '12, Stephanie Gibson '12, Hana Khalil '12, Matt Sooknah '12, Nargiss Mouatta '12, Kathy Tran '12, Will Wolstenholme '12, and Merritt Boyd '12 participated in our summer program of various astronomical and engineering projects at the observatory.

The observatory was used by 17 students in the fall 2009 subject 8.287J/12.410J Observational Techniques of Optical Astronomy under the supervision of professor James Elliot '65, SM '65, Amanda Zangari G, and Rebecca Sobel G. Eighteen MIT students in the spring 2010 subject 12.409 Hands-on Astronomy: Observing Stars and Planets, taught by Dr. Amanda Bosh '87, PhD '94, Professor Elliot, Caroline Morley '10, Stephanie Sallum '11, and Emily Krupczak '12, used both the portable and the shed telescopes. Dr. Bosh also taught a spectroscopy course at the observatory during the Independent Activities Period (IAP). In addition, observatory staff offered a tour during IAP that was attended by 40 members of the MIT community. Other tours were offered throughout the year for various clubs and school groups.

James L. Elliot
Director
Professor of Planetary Astronomy

More information about the George R. Wallace Jr. Astrophysical Observatory can be found at http://web.mit.edu/wallace/.