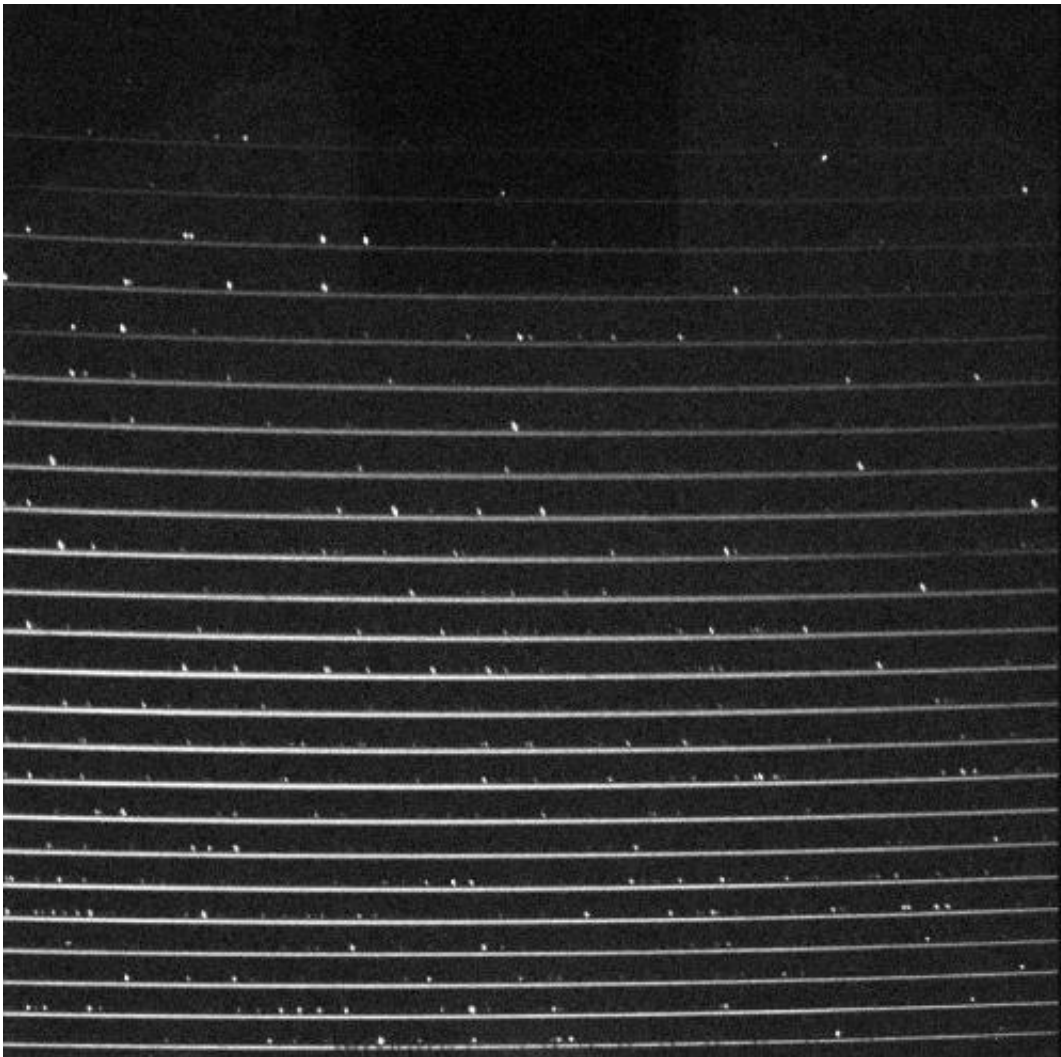


Las Cumbres Observatory achieves first light with NRES spectrograph

October 11 2012



This is a first light image of Vega from LCOGT's prototype NRES. The continuous lines across the image is the spectra of the star. The spots are from the Thorium Argon calibration light. Credit: LCOGT

Las Cumbres Observatory Global Telescope (LCOGT), a private, nonprofit scientific institution conducting time domain astrophysics and education, and a provider of global telescope resources, achieved first light with their prototype Network of Robotic Echelle Spectrograph (NRES) this week. The event took place earlier in the week at LCOGT's Byrne Observatory located at the UC Santa Barbara Sedgwick Reserve.

Primarily designed to support the study of exoplanets, the NRES prototype represents over two years of concentrated science and engineering work by Las Cumbres Observatory. Tim Brown, LCOGT Science Director, has overseen the design and funding of the project, while [mechanical engineer](#) John Hygelund and astronomy postdoc Jason Eastman have built and tested, and then installed the device.

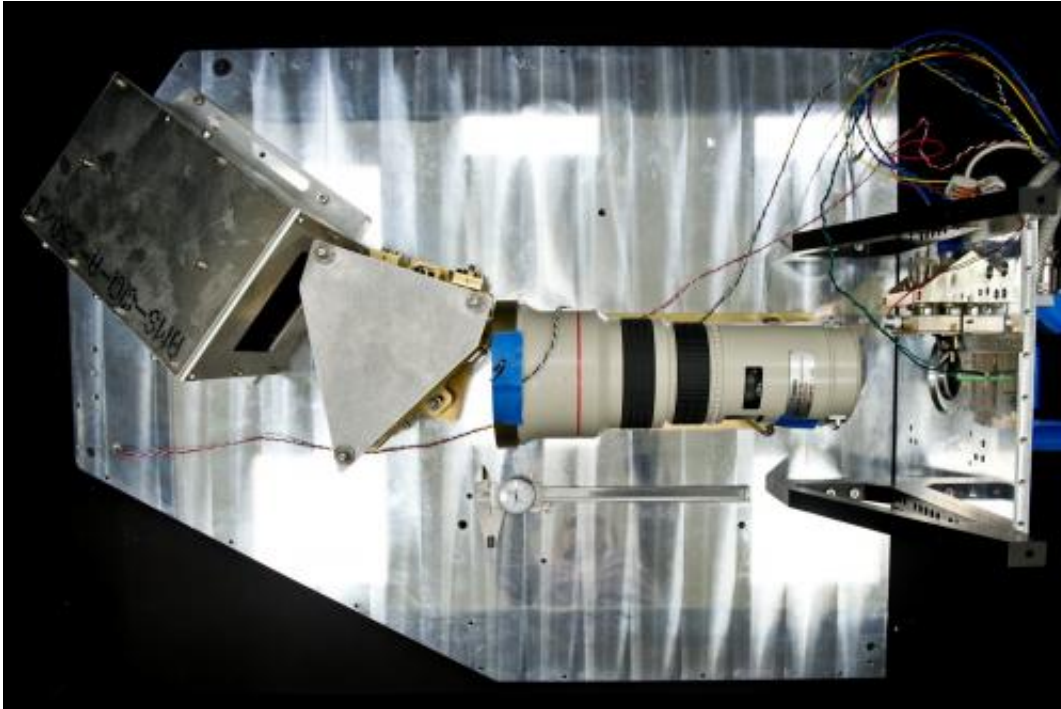
The NRES, funded through a National Science Foundation Major [Research Instrumentation](#) (MRI) grant, will extend the capabilities of the LCOGT 1-meter network with six identical high-resolution (R~53,000), precise (= 3 m/s), optical (380-860 nm) echelle spectrographs.

According to Eastman, "We adopted an [optical design](#) that is both simple and conventional in its general approach, similar in concept to spectrographs designed for the Palomar East Arm Echelle, the Lick Automated Planet Finder, and others." The in-house design enabled Las Cumbres to optimize the spectrograph for a small production run and robotic use. This, because the biggest difference with the NRES will be that there will be six of them, deployed at six geographically distributed sites around the world, and integrated through a global telescope scheduling and control system.

Doubling the Resource

Exoplanet candidates are identified through a variety of means, but most are generated through transit surveys like Kilodegree Extremely Little

Telescope (KELT), Hungarian Automated Telescope Network (HATNet), Wide Angle Search for Planets (WASP), Kepler, and CONvection ROTation and [planetary Transits](#) (CoRoT). Follow-up by targeted optical telescopes is required to confirm and characterize the exoplanets.



This is a NRES prototype out of its housing in the LCOGT lab. Credit: Jason Eastman

Separating planets from false positives is efficiently done with (and often demands) radial velocity (RV) measurements to distinguish the reflex velocities due to planets (order m/s) from the velocities due to stellar companions (order km/s). In addition, knowing the mass, radius, and temperature of an exoplanet depends on obtaining the same physical properties of its parent star. This requires spectroscopic classification of the star.

The LCOGT Network of Robotic Echelle Spectrographs (NRES) will roughly double the radial velocity observing capacity nationwide, enabling astronomers to vet the many exoplanet candidates generated from current and future surveys.



This is the installation team (from right Chester Gilmore, John Hygelund, and Jason Eastman), installing the prototype NRES into a specially designed space at the Sedgwick Reserve Byrne Observatory. Credit: David Petry

NRES spectrographs will be deployed as instruments on the LCOGT 1-meter telescope network. Each NRES spectrograph consists of two acquisition/guider units (on two separate 1m telescopes), a simultaneous Thorium Argon and flat-field calibration source, and spectrograph with precise thermal and pressure regulation. The design achieves high optical

throughput, wide wavelength coverage, and simultaneous fiber input from two telescopes.

The Spectrographic Network

The LCOGT 1-meter telescope network is currently being deployed in the southern hemisphere. Three 1-meter telescopes are currently in the installation process at the Cerro Tololo International Observatory (CTIO) in Chile. Three additional 1-meter telescopes are scheduled for deployment at the South Africa Astronomical Observatory, and two for the Siding Spring Observatory in Australia within the next six months.

Following this, deployment will begin at three northern hemisphere sites. The first two are at McDonald Observatory where one 1-meter telescope is currently conducting science observations, and at Teide Observatory in the Canary Islands. A final observatory node will be sited either in Maui, Hawai'i or in Western China.

The global telescope network, operated robotically, provides coverage of 100% of the night sky, and is responsive to events in real time. The NRES is an important extension of the planned photometric instrumentation, enabling astronomers to expand the breadth of observation data.

Future Development

Following full testing of the prototype, the NRES is scheduled to go through final design in the next months and begin production and shop testing during 2013. Deployment will occur during 2014. Brown anticipates scientific use of the instruments to begin in 2014 or 2015.

In addition to LCOGT's science programs, some data from the

spectrographs will be used to drive educational initiatives at Las Cumbres such as the successful Agent Exoplanet. This citizen science application enables anyone to analyse exoplanet observations and investigate different extra-solar planetary systems. Edward Gomez, LCOGT Director of Education sees a deep need for citizen science in astronomy. "We have an excellent opportunity to enable amateur astronomers, students, and the general public to conduct their own science investigations on astronomical data, help validate existing results with new observations, and make new discoveries."

Provided by Las Cumbres Observatory Global Telescope

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