AMERICAN MUSEUM OF NATURAL HISTORY

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ASTRONOMERS RELEASE FIRST-LIGHT IMAGES FROM GEMINI PLANET IMAGER

NEW INSTRUMENT 'SEES' EXOPLANETS BY BLOCKING OUT STARLIGHT WITH INNOVATIVE TOOL DESIGNED BY AMERICAN MUSEUM OF NATURAL HISTORY SCIENTISTS

After nearly a decade of development, construction, and testing, the Gemini Planet Imager is pointing skyward and collecting light from distant worlds with the help of a special starlight-blocking device built at the American Museum of Natural History. Installed on one of the world's biggest telescopes, the 8-meter Gemini South telescope in Chile, the Gemini Planet Imager (GPI) carried out its first observations in November 2013, which were released today at the 223rd meeting of the American Astronomical Society in Washington, DC.

"Even these early first-light images are almost a factor of 10 better than the previous generation of instruments. In one minute, we are seeing planets that used to take us an hour to detect," said Bruce Macintosh, a scientist at the Lawrence Livermore National Laboratory who is the principal investigator for the project.

Constructed by a core team of researchers from seven institutions, GPI detects infrared (heat) radiation to image faint Jupiter-like planets next to bright stars and probe their atmospheres. It also can help researchers examine dusty disks around young stars. At the American Museum of Natural History, scientists led by Curator Ben R. Oppenheimer designed and built GPI's coronagraph—a starlight suppression system—using a variety of experimental optics.

"The planets we seek to study are more than a million times fainter than the stars they orbit," Oppenheimer said. "Our work on starlight suppression over the past 15 years has led to the capability to see such planets using novel types of optics and new techniques

for controlling light."

The first observation targets for GPI were previously known planetary systems including the Beta Pictoris system, which is about 63 light years away. GPI obtained the first spectrum, or chemical fingerprint, of the very young planet Beta Pictoris b. The first-light team also used the instrument's polarization mode, which can detect starlight scattered by tiny particles, to study a faint ring of dust orbiting the very young star HR4796. With previous instruments, only the edges of this dust ring, which may be the debris remaining from planet formation, could be seen. But with GPI, astronomers can follow the entire circumference of the ring. The group also observed the system of planets orbiting HR8799, a star about 128 light years away.

Although GPI was designed to look at distant planets, it can also observe objects in our solar system. Images taken of Jupiter's moon Europa, for example, can allow scientists to map changes in the satellite's surface composition.

"Most planets that we know about to date are only known because of indirect methods that tell us a planet is there, a bit about its orbit and mass, not much else," Macintosh said. "With GPI, we directly image planets around stars. It's a bit like being able to dissect the system and really dive into the planet's atmospheric makeup and characteristics."

Another very similar instrument, Project 1640, led by the American Museum of Natural History, was deployed at Palomar Observatory's 5-meter Hale Telescope in California last year and has demonstrated the power of these techniques on a smaller telescope in the Northern Hemisphere. The two instruments are complementary, and collaboration will begin with the launch this year of GPI's large-scale survey, which will look at 600 young stars to see what giant planets orbit them.

In addition to the Museum and Lawrence Livermore National Laboratory, which is leading the international project, GPI was built by scientists from NASA's Jet Propulsion Laboatory, the University of California Los Angeles, Canada's National Research Council, the University of California Santa Cruz, and the University of Montreal.

For more information, visit http://www.planetimager.org/

The American Museum of Natural History, founded in 1869, is one of the world¹s preeminent scientific, educational, and cultural institutions. The Museum encompasses 45 permanent exhibition halls, including the Rose Center for Earth and Space and the Hayden Planetarium, as well as galleries for temporary exhibitions. It is home to the Theodore Roosevelt Memorial, New York State's official memorial to its 33rd governor and the nation's 26th president, and a tribute to Roosevelt's enduring legacy of conservation. The Museum's five active research divisions and three cross-disciplinary centers support 200 scientists, whose work draws on a world-class permanent collection of more than 32 million specimens and artifacts, as well as specialized collections for frozen tissue and genomic and astrophysical data, and one of the largest natural history libraries in the world. Through its Richard Gilder Graduate School, it is the only American museum authorized to grant the Ph.D. degree. In 2012, the Museum began offering a pilot Master of Arts in Teaching program with a specialization in Earth science. Approximately 5 million visitors from around the world came to the Museum last year, and its exhibitions and Space Shows can be seen in venues on five continents. The Museum's website and collection of apps for mobile devices extend its collections, exhibitions, and educational programs to millions more beyond its walls. Visit amnh.org for more information.

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