Sophisticated telescope camera debuts with peek at nest of black holes

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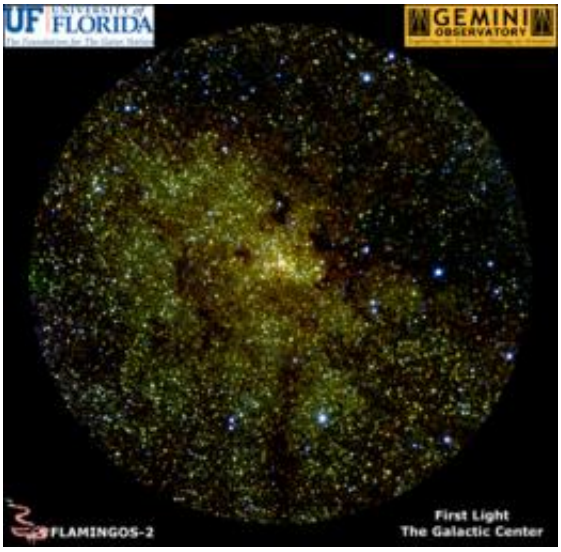

This is a near-infrared image of the galactic center of our Milky Way obtained the week of Sept. 6, 2009, by a newly installed University of Florida-built near-infrared camera and spectrometer. The instrument, called FLAMINGOS-2, captures heat-generated light just beyond the visible spectrum. In this image, a standard camera could capture the scattered blue stars in the foreground, but only a near-infrared camera could “see” the yellow and red stars because their visible light is blocked by clouds of gas and dust. This part of space also contains thousands of exotic black holes and neutron stars, objects UF astronomers plan to locate and identify using the instrument, FLAMINGOS-2. The cluster of bright stars near the center of the image surrounds a gargantuan black hole. FLAMINGOS-2 is also anticipated to become the first instrument to track the growth and evolution of this black hole over the past 4 billion years. (University of Florida/Gemini Observatory)

Less than two months after they inaugurated the world's largest telescope, University of Florida astronomers have used one of the world's most advanced telescopic instruments to gather images of the heavens.

A team led by astronomy professor Stephen Eikenberry late last week captured the first images of the cosmos ever made with a UF-designed and built camera/spectrometer affixed to the Gemini South telescope in Chile. The handful of "first light" images include a yellow and blue orb-like structure that depicts our Milky Way galaxy, home to thousands of black holes - including, at its core, a "supermassive" black hole thought to be as massive as 4 million suns put together.

"We plan to use this instrument to provide the first accurate tracking of the growth and evolution of this black hole over the last 4 billion years," Eikenberry said.

Installation of the instrument, called FLAMINGOS-2, caps a seven-year, $5 million effort involving 30 UF scientists, engineers, students and staff. Once the instrument is scientifically tested — a process expected to last around six months — it will support a range of new science. Astronomers will use FLAMINGOS-2 (FLAMINGOS is short for the Florida Array Multi-object Imaging Grism Spectrometer) to hunt the universe's first galaxies, view stars as they are being born, reveal black holes and investigate other phenomena.

"Achieving first light is a great achievement and important milestone," said Nancy Levenson, deputy director of the Gemini Observatory.

The 8-meter Gemini South telescope in the Chilean Andes is one of only about a dozen 8- to 10-meter telescopes worldwide. All require technologically sophisticated instruments to interpret the light they gather. FLAMINGOS-2 "sees" near-infrared or heat-generated light

beyond the range of human vision. It can reveal objects invisible to the eye, such as stars obscured by cosmic dust, or objects so far away they have next to no visible light

The instrument joins other near-infrared imagers installed on other large telescopes. But it is unusual in its ability to also act as a spectrometer, dividing the light into its component wavelengths. Astronomers analyze these wavelengths to figure out what distant objects are made of, how hot or cold they are, their distance from Earth, and other qualities.

Uniquely, FLAMINGOS-2 can take spectra of up to 80 different objects simultaneously, speeding astronomers' hunt for old galaxies, black holes or newly forming stars and planets.

This is a near-infrared image of the Tarantula Nebula in the Large Magellanic Cloud, the largest satellite galaxy circling the Milky Way. This image reveals a huge cluster of young stars being born from a cloud of gas. The large concentration of massive young stars in the very center of the image is illuminating the surrounding hydrogen gas with ultraviolet light, creating the glowing red nebula in the image. (University of Florida/Gemini Observatory)

"At a cost of $1 per second for operating the Gemini telescope, it will make a huge gain in the scientific productivity and efficiency of the observatory," Eikenberry said. "What would take an entire year previously can now be done in four nights. This is a real game changer."

Astronomers compete heavily for time on the world's largest telescopes, often waiting months or years for the opportunity to make observations. Eikenberry said his FLAMINGOS-2 agreement with Gemini South entitles him to at least 25 nights of observations. He will use the time to contribute to three large studies, or surveys, of the sky headed by UF astronomers.

The first is aimed at learning more about the thousands of black holes and neutron stars at the Milky Way's center. The second will probe the formation and evolution of galaxies across time, while the third will investigate the birth of new stars.

Levenson said the Gemini telescopes are well-known for their excellent image quality. With its wide large field of view and ability examine dozens of objects at once, FLAMINGOS-2 is a good match with the Gemini South telescope.

"The center of our Milky Way galaxy is a very dusty, very crowded environment, so infrared measurements and the ability to separate the fine details of the different stars and other objects are very important," she said.

FLAMINGOS-2's debut comes less than two months after UF astronomers helped inaugurate the Gran Telescopio Canarias, the world's largest telescope, in Spain's Canary Islands. UF, which owns a 5 percent share of the 10-meter telescope, is the only participating U.S. institution.

The Gemini Observatory is the lead sponsor of FLAMINGOS-2 and the

source of the $5 million for design and construction. The original FLAMINGOS, a smaller prototype that pioneered the approach used successfully in the larger version, was designed and built by the late UF astronomy professor Richard Elston. Elston was at work on the early stages of FLAMINGOS-2 when he died of cancer in 2004 at age 43.

Source: University of Florida (news : web)