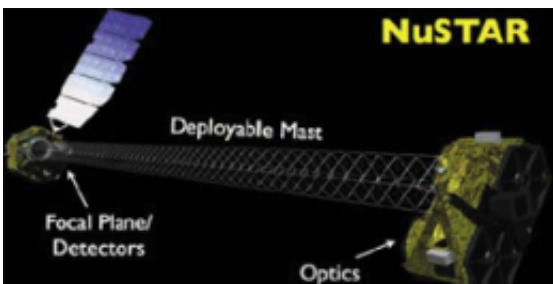


NASA NuSTAR Telescope Being Built at Nevis

December 17 2009, by Anna Kuchment



NuSTAR with primary instrument components labeled. Image credit: NASA

(PhysOrg.com) -- It's an unlikely place to build a NASA telescope: a leafy estate in Irvington, N.Y., that once belonged to the son of Alexander Hamilton. Inside a hangar-like building on the site, which is home to Columbia's Nevis Laboratories for experimental physics, Charles Hailey is assembling mirrors for NuSTAR, the most sensitive X-ray telescope ever constructed.

Its mission: to conduct a census of [black holes](#), map exploding stars known as supernovae and observe other dynamic events in space.

"NuSTAR will open up a whole new window into the universe," says Hailey, the Pupin Professor of Physics and co-director of Columbia's astrophysics lab.

X-rays, a high-energy form of light, help astrophysicists observe phenomena that are typically invisible to the naked eye. Black holes, for example, hide behind clouds of dust and gas, and their centers of gravity are so strong that optical light cannot escape. Black holes do, however, emit X-rays, which can penetrate dust and gas, making them visible to NuSTAR.

Compared with Chandra, the [NASA](#) X-ray mission that launched in 1999, NuSTAR will record a much higher energy band. The stronger the X-rays, the denser the matter they can penetrate, enabling NuSTAR to find black holes and other cosmic events that have previously escaped detection.

Building such a sensitive instrument requires patience and precision. Starting this month and working until spring, Hailey will assemble NuSTAR's "eyes" out of 4,000 sheets of glass, some as small as bookmarks, others the size of a computer screen. Each strip of glass, akin to the type used for laptop and cell phone displays, is curved according to a fast, inexpensive method that Hailey pioneered 10 years ago. Called thermal glass slumping, the technique involves placing the flat sheets into a hot oven until they melt. The glass is then shaped to curved molds beneath it. Thermal glass slumping will help bring NuSTAR's cost to about one-tenth the price of Chandra, which cost \$2 billion.

Once the pieces are slumped, they are shipped to Copenhagen, where scientists coat them with a reflective material before sending them back to Nevis. Hailey will then layer the curved glass sheets into concentric rings—12 to 24 sheets per ring, 130 rings in all. The result: two cones that will be mounted onto the finished body of the telescope in California.

NuSTAR, which stands for nuclear spectroscopic telescope array, is

scheduled for launch in August 2011 from Kwajalein Island in the Pacific Ocean, one of the Marshall islands. The project's principal investigator, Fiona Harrison of the California Institute of Technology, is responsible for building the [telescope](#)'s detectors, which will record the images collected by Hailey's optics. Components assembled by collaborators at the University of California, Berkeley and other institutions include shields to protect NuSTAR from meteors; a deployable mast; and the launch vehicle, a lightweight Pegasus XL rocket.

Hailey, who dislikes travel, will watch the launch on NASA TV from his office, but distance won't lessen the thrill of watching NuSTAR lift off into the sky.

"It's enormously exciting," he says. "I can tell you that we'll discover black holes of all masses, supernova remnants and young stars. But what really sends chills up my spine are the things we'll discover that I can't conceive of yet, that no one can envision."

Provided by The Earth Institute at Columbia University

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