New Science Instruments for Hubble

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Engineers check NASA's Wide Field Camera 3 instrument to ensure it will fit properly in the protective enclosure that will carry it to orbit aboard the space shuttle next summer for Servicing Mission 4 to the Hubble Space Telescope. Credit: NASA

To enhance the Hubble Space Telescope's science capabilities, two new instruments – the Wide Field Camera 3 and Cosmic Origins Spectrograph - will be installed during the fifth and final shuttle servicing mission to the observatory in August 2008.

Wide Field Camera 3

Wide Field Camera 3 will replace the existing Wide Field Planetary Camera 2 that astronauts installed on Servicing Mission 1 in 1993. By capturing high- resolution images over a wide range of wavelengths, the new camera's capabilities will far surpass those of the previous cameras on Hubble.

What makes Wide Field Camera 3 superior is its ability to cover a range from the ultraviolet, through visible light, all the way into near infrared, and everything in between. The new camera has a more panchromatic range, meaning that it is able to cover a broader range of colors all at the same time, which distinguishes it as truly remarkable. The outstanding images that Wide Field Camera 3 is designed to produce will greatly contribute to the success of Hubble's scientific voyage.

In order to determine the overall quality of the images that this new camera will produce, several factors were considered. The evaluation is similar to the one consumers generally use when shopping for a new digital camera. Most people want a camera that will produce high quality pictures, in the most efficient manner, and within their particular budget.

"Picture the standard camera you use for home photography - is it a one megapixel camera, a four megapixel camera?" asked Hubble project scientist Randy Kimble at NASA's Goddard Space Flight Center. "Naturally, the bigger the format the more detail you can get on things or the more field you can cover. The new Wide Field Camera 3 has a larger field of view as well as higher sensitivity to fainter objects."

As a result of these improvements, astronomers will get a better advantage in surveying the sky faster and seeing faint objects more quickly. Although the same wavelengths have been covered before by instruments on the telescope, they have never been covered with the same combination of sensitivity and faintness.

The Cosmic Origins Spectrograph

Spectroscopy is the science of breaking up light into different components and, thus, determining an object's temperature, density, chemical composition, and velocity. Using this approach, the Cosmic Origins Spectrograph will provide the means for characterizing distant objects in space. This new spectrograph is well equipped to observe faint point objects to detect their structure and composition, providing valuable information that has never been obtained.

"Our goal with the Cosmic Origins Spectrograph is to produce the most efficient spectrograph ever flown in space," Leckrone explains. "It will do this by spreading out the light into its component colors and measuring the brightness of the light and how it changes the color. All kinds of interesting physical information come from these kinds of observations."

Although the new spectrograph will not the produce the pretty pictures that Hubble is so well known for, the kind that make it to the newspapers in terms of their beautiful imagery, it will be a very fundamental tool for astrophysicists.

"The spectrograph's design is very clever in that it does everything it needs to do with light with one bounce, with one mirror," said Leckrone. "A single bounce collects the light, spreads the light out into its component colors and spectrums and brings it to a focus on an electronic spectrum."

Should astronauts successfully repair the Space Telescope Imaging Spectrograph aboard Hubble, it will complement observations made by the new Cosmic Origins Spectrograph.

COS will take the in place of COSTAR, the Corrective Optics Space

Telescope Axial Replacement, astronauts installed during Servicing Mission 1, to correct a flaw in Hubble's primary mirror.

Source: by Dana Martinez, Goddard Space Flight Center