ASTRONOMY

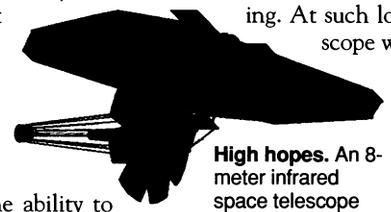
# Hubble Successor Gathers Support

NASA scientists have unfurled a blueprint for an ambitious new project: a $500 million successor to the Hubble Space Telescope (HST). The proposed instrument, dubbed the Next Generation Space Telescope (NGST), was given top billing late last month by a panel of astronomers invited by NASA to recommend space missions in the era following HST. The panel suggested that the agency build a giant infrared observatory to explore galaxies in the early universe, and this month NASA unveiled a design that would use a novel approach to peer back to the beginnings of galaxy formation.

"The ultimate goal of this is to see galaxies coming together and forming," says Alan Dressler of the Carnegie Observatories in Pasadena, California, chair of NASA's "HST and Beyond" panel. The expansion of the universe has stretched the light coming from these distant, nascent galaxies, shifting it toward the red end of the spectrum. Hence starlight that was blue when it left these galaxies appears to us to have wavelengths about three to 20 times longer than those of visible light—having been "redshifted" into the infrared.

Existing telescopes can see galaxies when the universe was as little as 1.5 billion years old. The wavelength of their light is stretched out to five times its original value and is said by astronomers to have a redshift of four. "We already have a pretty good idea that galaxy formation took place in about the first billion years after the big bang, which places it somewhere at redshift three to 20," says Dressler.

To see further into that era, explains NGST study scientist John Mather of NASA's Goddard Space Flight Center in Greenbelt, Maryland, requires a telescope larger than the HST's 2.4 meters and the ability to detect in the infrared. Dressler's panel suggested a 4-meter telescope, the largest that could be lofted by current launchers in one piece. But NGST study teams have come up with something grander: an 8-meter reflector made of eight thin segments, which unfold like petals of a flower once in space.



GSFC

**High hopes.** An 8-meter infrared space telescope would keep cool behind a sun shield.

Such a telescope, sensitive to wavelengths between 0.5 and 20 micrometers, would be able to spot detail where the HST sees a confusion of myriad specks, and the wavelength range is tuned to pick out redshifts of up to 10 and even beyond. The NGST design team's plans will push technology to the limits, however. "Nobody has ever tried to pull the string on a telescope in a bottle," says Mather. The researchers plan to make the cold, weightless environment of space work for them by constructing a lightweight mirror too thin and fragile for use on Earth, and by exiling the telescope to a distant orbit where the chill of space would cool the instrument to about 240 degrees below freezing. At such low temperatures, the telescope will not be swamped by infrared emissions from its own structure.

Technical hurdles may, however, be the least of the NGST's problems. NASA has yet to approve the project, and as Mather notes, these are tough times to be asking Congress for $500 million. That has not stopped astronomers from discussing a possible timetable, however. "There are some viewgraphs being passed around NASA that show this somewhere in the 2005 or 2010 time frame," says Dressler.

**–Andrew Watson**

*Andrew Watson is a science writer based in Norwich, U.K.*

SCIENTIFIC MISCONDUCT

# HHS Is Still Looking for a Definition

A set of sweeping proposals for changing the way the federal government handles allegations of scientific misconduct, put forward last year by the congressionally appointed Commission on Research Integrity, is getting a decidedly mixed reception in the Department of Health and Human Services (HHS). An internal working group, chaired by HHS science adviser William Raub, has declined to endorse several of the commission's key recommendations, including a new definition of misconduct that has already drawn sharp criticism from a variety of organizations.

Raub, who was asked by HHS Secretary Donna Shalala to come up with recommendations for implementing the commission's report, aired his group's findings for the first time this week at a meeting of the advisory committee to National Institutes of Health (NIH) director Harold Varmus. He said the working group is urging Shalala to accept the gist of 23 of the commission's recommendations, dealing primarily with ways to strengthen the role of institutions in investigating misconduct and to educate scientists on the issues. But it objects to several of the more controversial proposals.

The commission, chaired by Harvard University reproductive biologist Kenneth Ryan, offered 33 proposals for changing procedures for investigating scientific misconduct (*Science*, 1 December 1995, p. 1431). Its most controversial recommendation was that the government adopt a new definition of misconduct that would replace criteria based on "fabrication, falsification, and plagiarism" with the terms "misappropriation," "misrepresentation," and "interference." The proposed definition also included the statement that research misconduct is "significant misbehavior ... not limited to" these three categories.

Several scientific societies and the National Academy of Sciences have argued that the definition is overly broad and might open the door for the government to prosecute researchers who follow accepted research practices. After Raub's presentation, Varmus and his panel of advisers voted to add their names to that list of critics. Panel member Marc Kirschner, chair of cell biology at Harvard Medical School, said he was "very depressed" by the recommendations, which he called "damaging and antagonistic." Ryan still supports the commission's definition, but adds, "If we can't make the case, we can't make the case."

Speaking after this week's meeting, Raub told *Science* that his group found "very attractive" the commission's call for a clear description of such terms as plagiarism. But he said there was "no question" that the open-ended nature of the definition could be a problem. His working group is advising Shalala to seek yet more public comment on how scientific misconduct should be defined.

Raub said that the working group also objected to the commission's suggestion that the HHS Office of Research Integrity (ORI) publicize findings even when no misconduct is found. And it urged Shalala not to adopt a proposal to limit ORI's work to conducting investigations, while another body draws up findings. The working group noted that defendants already have the right to appeal an ORI decision before an HHS appeals board.

The Raub panel's stance drew praise from some of the Ryan commission's most vocal opponents. "We're pleased that the definition got put on hold," said University of California, Berkeley, molecular biologist Howard Schachman, co-author of recent attacks on the commission's proposals circulated by the Federation of American Societies for Experimental Biology. Schachman praised the ongoing efforts of a White House panel, which he says is trying to come up with "a more minimalist definition."

**–Jocelyn Kaiser**