

NASA Decision Could Break Mauna Kea Outrigger Impasse

Astronomers in Hawaii and beyond hope that NASA's environmental impact statement will be a first step toward improving relations with opponents of new telescopes on Mauna Kea—and will bode well for astronomy's future in Hawaii.

NASA announced in November that it will undertake an environmental impact statement (EIS) for its \$50 million outrigger project, which would add several 1.8-meter telescopes to the twin 10-meter telescopes at the W. M. Keck Observatory on Mauna Kea, Hawaii. The move goes beyond what a federal judge had ordered last July and raises hopes that antagonism will begin to thaw between the astronomy community and Native Hawaiians and environmentalists who oppose further developments on the island mountain.

The announcement was made at a joint press conference with the Office of Hawaiian Affairs (OHA), the organization whose lawsuit won a July ruling that NASA's earlier environmental assessment was inadequate. Noting that only 3 out of 125 pages in the assessment were devoted to the cumulative impact of building more telescopes, the judge required a more thorough evaluation, but she stopped short of requiring a full EIS. NASA decided to do the EIS, says Carl Pilcher, the agency's program scientist for the Keck Observatory, "because if we'd just expanded on the assessment, a lot of uncertainties would have remained, and because we wanted to show that we had heard the message that the Native Hawaiian community was sending. They want us to do an EIS."

For its part, OHA welcomed NASA's decision as "a positive step." At the press conference, OHA chair Haunani Apoliona said, "[We] see this as a demonstration of good faith by NASA in building trust and in fulfilling its obligations as stewards of this sacred site." She said "it is not OHA's intent to stand in the way of responsible, well planned, culturally sensitive science," but that "we will continue to *maka'ala* [be watchful] to ensure NASA complies with its responsibilities under the law."

At stake is far more than the outriggers: The legal wrangling has made planners of other future tele-

scopes wary about setting their sights on Mauna Kea, generally considered the premier location for ground-based optical and infrared astronomy in the Northern Hemisphere. "I feel this is the best opportunity we have had in many years to resolve the concerns that have been festering," says Keck Director Frederic Chaffee.

Outrigger interferometry

NASA's plan is to link the outriggers to the two main Keck telescopes to form the world's largest optical/infrared interferometer. The outriggers would be housed in domes about 11 meters high and 9 meters in diameter; the main Keck domes are nearly four times as big. NASA has funding for four outriggers, but may eventually install six.

With the Keck interferometer, NASA would survey hundreds of stars to search for extrasolar planets; in particular, it could use astrometry to spot Uranus- and Neptune-like planets that are too far from their parent stars to detect with current radial velocity methods. "The outriggers will be able to measure the positions of stars with an accuracy equivalent to measuring the width of a candy bar on the Moon. It's pretty amazing," says Pilcher. Other projects will be to probe planet formation by imaging objects such as disks around stars and to hone the relatively new field of optical interferometry in support of space missions.

Sacred site

The litigation has been a major factor in delaying the outriggers by several years. But it could have happened to any new project: Opposition to development on Mauna Kea goes back three decades to the first telescopes, and distrust of development can be traced back more than a century to the overthrow of the Kingdom of Hawaii. Against that backdrop, the outriggers were the first project to come along after the University of Hawaii adopted its master plan for 2000–20 (see PHYSICS TODAY, October

2000, page 72), and they came at a time when Native Hawaiian activism was growing.

The nearly 4200-meter-high mountain is "the pinnacle of Hawaiian spiritual existence," says Bill Stormont, director of the University of Hawaii's office of Mauna Kea management, which is charged with protecting the mountain. "It is where Earth Mother meets Sky Father." Native Hawaiians practice religious rituals on the mountain and use its water for medicinal purposes. In their concerns for flora and fauna, they are joined by environmental groups, whose objections center on the *weki*, a bug that lives on the summit cinder cones and is a candidate for endangered-species status. Other insects and native wolf spiders are also a concern.

Money complicates matters further. The presence of the telescopes pumps about \$150 million a year into the state's economy and provides some 600 jobs for nonastronomers, says Rolf Kudritzki, director of the University of Hawaii's Institute for Astronomy (IfA), which oversees the Mauna Kea observatories and has itself been the subject of protest by opposition groups.

Native Hawaiians' views run the gamut from seeing any development on the mountain as a desecration, to being satisfied with no further bulldozing, to accepting further growth. OHA, says a spokesman, "wrestles with trying to balance both factors. We recognize the desirability of the site for observatories. And we recognize that in Hawaiian culture, Mauna Kea plays a significant role. The only way to balance these factors is to make sure that all procedures are adhered to." Adds Stormont, who is part Native Hawaiian, "It's my hope that those who propose new projects will do everything they can to show they are minimizing the impact on the mountain." The opposition faced by the outriggers, he adds, "tells everybody, Go through the hoops."

Environmental impact statement

The hoops are still being defined for the NASA EIS. But whereas an environmental assessment seeks only to determine whether a project will have

The proposed Keck outriggers (small domes) are the first planned Mauna Kea project to face litigation. If built, they will, with the main Keck telescopes, make up the world's largest optical/infrared interferometer. (Photograph with simulation of outriggers courtesy of the W. M. Keck Observatory.)

a significant impact—NASA originally concluded that the outriggers would not—an EIS assumes there would be, is more detailed, and involves more public input. “To look at the cumulative impact, we are going to look back at what has occurred, at our project, and at other future projects,” says Kenneth Kumor, NASA’s national Environmental Policy Act coordinator and federal preservation officer.

Consideration of cultural resources will be a fundamental focus of the EIS, Kumor says. “We are looking for environmental and cultural impact. For example, what are the noise impacts for areas considered sacred by Native Hawaiians? How have terrain alterations to site telescopes changed the silhouette of the mountain?” The list also includes studying the impact of traffic; sewage; and increased use of the summit area by astronomers, recreational visitors, and tourists; and the impact on the wekiu bug. The EIS will include a comprehensive look at alternative sites for the outriggers.

NASA is holding its first public meeting for the EIS early this month, and hopes to have a draft ready by summer and a final version in September, Kumor says. “But our first priority is to get the analysis done

right. If it takes longer, we will take that time.” He estimates the EIS will cost \$1–2 million.

In addition to a thumbs-up from the EIS, the outriggers need a land-use permit, on which the state is expected to decide in the next month or so. If all goes smoothly, construction could begin next year and the outriggers could be up and running by early 2007.

The future of astronomy

Whatever happens with the outriggers, everyone involved expects the NASA experience to set the tone for future projects on the mountain. Broadly, astronomers accept the need to show more respect for cultural and environmental issues, but they say compromise should go both ways. As the IfA’s David Jewitt puts it, “Seen in the proper perspective, the delay for the

EIS is a small price to pay. As far as the outcome is concerned, the bottom line is that we are not smelting steel up there, we’re collecting photons. It doesn’t get much cleaner than that.”

“My plan is to do every new project differently than in the recent past. I want to have full community involvement,” says Kudritzki. “Since the difficulties with the outriggers started, people have looked more intensively for other sites,” he adds. A key example is the Thirty Meter Telescope, for which site testing is planned on Mauna Kea, on Mexico’s San Pedro Mártir, and in Chile (see *PHYSICS TODAY*, August 2003, page 22, and December 2003, page 35). Says Kudritzki, “It’s important to get the TMT because it’s the future of astronomy. Without it, the importance of Hawaii for astronomy will decrease.”

Toni Feder



DOE Unveils 20-Year Priority List for Developing 28 Research Facilities

With a level of fanfare that signaled a significant commitment by the Bush administration to basic science research, Secretary of Energy Spencer Abraham used a packed National Press Club luncheon on 10 November to unveil the Department of Energy’s priority list for developing 28 major science facilities over the next two decades. The list, based on recommendations from six advisory panels, was finalized by Office of Science Director Raymond Orbach.

The high visibility of the secretary’s announcement was, in itself, considered important because such speeches are typically cleared by the White House and the Office of Management and Budget before being de-

The US Department of Energy’s Office of Science required that each proposed facility have a projected cost of at least \$50 million, and then assessed each based on the importance of the science it addresses and its readiness to move forward.

livered. Abraham emphasized that the facilities list is not a funding document, but said, “Clearly, this document has implications for the budget.”

Later, in a background briefing, a senior DOE official said that the budget assumptions used in selecting the 28 facilities were based on a 60% increase in Office of Science funding over the next five years and then a 4% increase every year through 2023. That would be a dramatic change in fortune for the office, which has had an essentially flat budget for several years.

Congress recently approved a \$3.2 billion Office of Science budget for fiscal year 2004, a 4.3% increase that is regarded as respectable but is not the dramatic increase that will be needed to realize the five-year, 60% increase envisioned in the facilities plan. Much of the 4.3% increase is for high-performance computing research, domestic fusion research, and 90 congressionally designated earmarks for programs in the Office of Science’s biological and environmental research division.