

questions are favorite themes in the Japanese astronomy community.” Through Gemini, Japanese astronomers would gain access to the southern sky. And the WFMOS project would announce Japan as a major player in astronomy. “It is a good opportunity for Subaru to have a big international collaboration,” says Naoshi Sugiyama, an astronomer at Subaru’s parent body, the National Astronomical Observatory of Japan.

At this point, says Karoji, “I have not one yen [to pay for WFMOS]. We need two things, approval in the community and approval from the NAOJ headquarters for funding.” Gemini and Subaru are moving forward with design plans and seeking money. The plan is to have a conceptual design by spring 2007 and a decision on going ahead later that year.

Another project in the making for a bit further in the future would use optical fibers to link a half dozen Mauna Kea telescopes into an optical interferometer. “The classic way to have done that with multiple telescopes would be to build great big tunnels between them and have optical rays in vacuum pipes,” says Keck director Fred Chaffee. With fibers, he adds, “The technical challenge is inversely proportional to the wavelength, so with optical wavelengths a million times shorter than radio, everything becomes literally a million times more difficult. It’s a completely different ball game.” The two Keck telescopes were linked last year, demonstrating the proof of principle. The project is called OHANA (Optical Hawaii Array for Nanoradian Astronomy), the Hawaiian word for “family.”

Toni Feder

Probing Dark Energy Through Baryon Acoustic Oscillations

Dark energy makes up more than 70% of the universe, but no one knows what it is. Its existence was inferred in the 1990s to explain why the expansion of the universe is accelerating, which was determined from observations of supernovae of known luminosity, or “standard candles.” Now scientists want to learn more about how dark energy behaves by using a “standard ruler.”

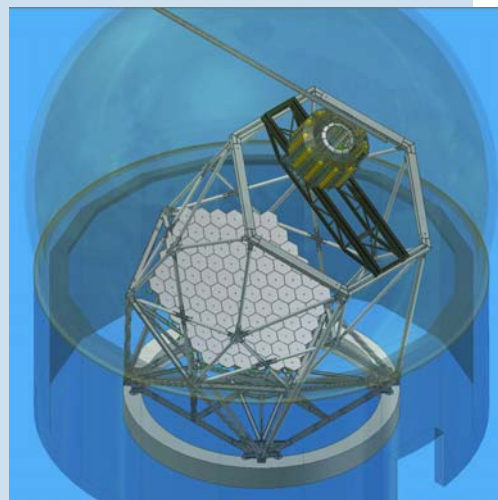
The standard-ruler approach involves measuring the traces of the primordial baryon acoustic oscillations in the large-scale structure of the universe at different times in history. The oscillations are remnants of sound waves in the first 300 000 or so years after the Big Bang, and are imprinted in the distribution of galaxies.

The Wide-Field Multi-Object Spectrograph (WFMOS), a proposed collaboration between the Gemini and Subaru telescopes (see the story on page 30), will use baryon acoustic oscillations and spectroscopic redshifts to probe dark energy. The most serious scientific competition so far probably comes from the proposed Hobby-Eberly Telescope Dark Energy Experiment (HETDEX). Both are surveys that involve “cartography of galaxies through space and time,” says the University of Texas at Austin’s Gary Hill, a principal investigator of HETDEX. “We will measure the distances between galaxies, Fourier transform that distribution, and for every galaxy, look where others are relative to it.” WFMOS will consider two time epochs, around redshifts 1 and 3, while HETDEX will look at a continuum of redshifts in the range 1.8 to 3.7.

WFMOS will use preselected galaxies, whereas HETDEX will take spectra of every point in its smaller field of view, and then use the spectra to select galaxies for analysis. “There is no a priori advantage to either approach,” says the University of Pennsylvania’s Gary Bernstein, a member of a dark-energy task force set up by NASA, NSF, and the US Department of Energy.

Neither experiment has full funding yet, but if both proceed on the time scales they’ve sketched out for themselves, HETDEX will start in 2009 and WFMOS around 2012.

Toni Feder



VIRUS (Visible Integral-field Replicable Unit Spectrograph), the instrument that would carry out a proposed dark-energy survey using the Hobby-Eberly Telescope, would consist of 145 copies of a unit spectrograph. (Artist’s rendering courtesy of the HETDEX Team, McDonald Observatory, Texas.)

Evolution Wins in Pennsylvania, Loses in Kansas

A few years ago, registered nurse Bernadette Reinking, weary after three decades of working with physicians and the medical system, retreated into her house in central Pennsylvania to, as she puts it, “raise my grandbabies”—all seven of them. Then, after two years of full-time grandmothering, she said, “I opened my door and found all of this mess.”

The mess was the Dover Area School Board, where, according to Reinking, the school board members “were not very kind to people who were offering other opinions.” Reinking, whose four children had gone through the Dover school system, decided to run for a seat on the board.

A slate of “real-world” candidates swept the intelligent design majority off the Dover, Pennsylvania, school board, while in Kansas antievolutionists not only weakened science standards, but redefined science itself.

So did Bryan Rehm, a high-school physics teacher who was angered by school board members “calling people names and spouting Bible scripture at people who disagreed with them.” Rehm said the school board also stopped funding school field trips, ended student participation in a national robotics competition, and was cutting back on other activities he thought were important.

Although many parents in the school district were concerned about

those actions, the issue that crystallized the opposition was a requirement enacted by the board that biology teachers in the school district read a statement to students saying evolution is “not a fact” and that students can learn about other theories, including intelligent design, by reading antievolution material in the school library.

The nine-member board approved the statement over objections from its own scientific standards committee. Rehm and 10 other parents sued,