

analysis of some 70 human cases in Asia in the past 2 years. As Hitoshi Oshitani, a public health specialist at Tohoku University in Sendai and consultant to WHO, described, on average, it took 2 weeks after the onset of symptoms for cases to be identified and notification sent to WHO. Lab confirmation of suspect H5N1 samples can add several days to 2 more weeks. "This is too late to contain the virus," he said. He also noted that imposing an effective quarantine would be logistically difficult and could well run into opposition on human-rights grounds. Wide-scale administration of the antiviral Tamiflu, generically known as oseltamivir, also hinges on having sufficient stockpiles readily available. And even if sup-

plies are on hand, recent studies have raised questions about proper dosing for H5N1, several meeting participants pointed out.

All these unknowns mean that an early response "is not a panacea," says Shigeru Omi, director of WHO's Regional Office for the Western Pacific. But Omi and other WHO officials emphasize that even if it fails to thwart a pandemic, early intervention might slow the spread of disease, providing precious days or weeks for other countries to put pandemic plans into action and for drug companies to start developing a vaccine.

At the meeting Oshitani pointed out that few countries, if any, currently include early response as part of national pandemic-

preparedness plans. Fukuda adds that the next step for WHO will be to launch "intensive discussions to develop plans reflecting each country's needs." Most developing countries, he said, will need to upgrade both local surveillance and lab capabilities to deal with agricultural and human health threats. But that won't come cheap, cautioned World Bank official Jacques Baudouy, who reported bank estimates that globally between \$1.2 billion and \$1.5 billion will be needed over the next 3 years. Issues of international support for building such capacities in developing countries were due to be taken up at an International Donor Conference in Beijing on 17 and 18 January.

—DENNIS NORMILE

## COSMOLOGY

# Astronomers Push and Pull Over Dark Energy's Role in Cosmos

**WASHINGTON, D.C.**—The claim was a headline writer's dream: Dark energy, a hidden force that is blowing the universe apart, had varied dramatically over time and at one point even reversed direction. But while science reporters at the astronomy meeting\* rushed to file their stories, most researchers were saying, "Not so fast."

The debate revolves around whether gamma ray bursts (GRBs), enormous explosions deep in space, can help astronomers measure distances in the universe. In the late 1990s, two research teams used the less-violent explosions of supernovae as "standard candles" of known brightness to illuminate how quickly the cosmos grew in the past. The results pointed to an accelerating universe, powered by a repulsion that seems to arise from space itself. But supernovae are too faint to shed light on cosmic expansion just a few billion years after the big bang. "Gamma ray bursts can fill in the gap," says astronomer Bradley Schaefer of Louisiana State University in Baton Rouge.

Schaefer studied a database of 52 GRBs detected by various satellites. Although GRBs differ wildly in their energy outputs, Schaefer claims that a careful accounting of up to five burst properties—such as their peak wavelengths of energy and their patterns of brightening and fading—enabled him to calibrate GRBs as rough standard candles and thus ascertain their distances. He found that nearly

all of them—including the 12 farthest—were brighter than expected if dark energy had been constant throughout cosmic history.

To explain the discrepancy, Schaefer maintains that the expansion of space after the big bang slowed down much more markedly than predicted, because dark energy exerted an *attractive* pull at that time. The force first dwindled and then, in the past 10 billion years or so, became increasingly repulsive. But Schaefer notes there's a 3% chance his conclusion is a sta-

"It's the germ of a very productive idea." And a key figure in the dark energy quest, cosmologist Michael Turner of the National Science Foundation in Arlington, Virginia, offered his guarded blessing. "The history of standard candles is extraordinarily checkered," Turner said. "But it's a very intriguing result."

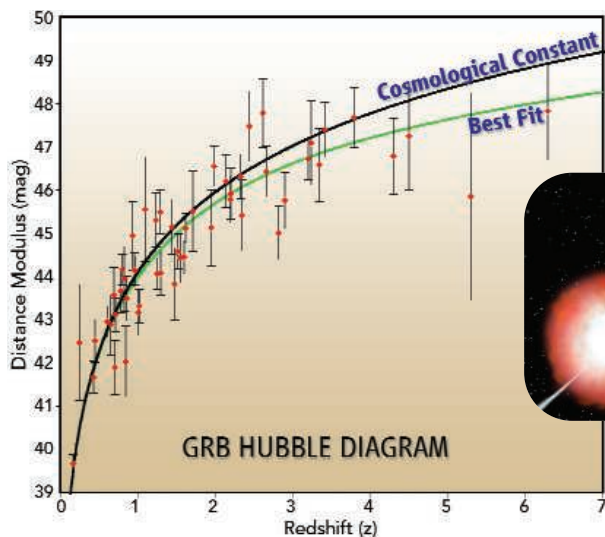
Others objected that Schaefer was overreaching. GRBs, they point out, arise from giant stars across a vast range of masses, spins, and compositions. When such stars create black holes at their cores and erupt with gamma rays and x-rays, the blasts are so different from one another that many observers doubt Schaefer's calibrations can succeed. What's more, several astronomers said, that variability makes GRBs ill suited to detect

changes in dark energy when the universe was small, because its force at that time was nearly negligible. "It's a blunt tool to do a problem that's kind of delicate," says supernova expert Robert Kirshner of Harvard University.

Cosmologist Adam Riess of the Space Telescope Science Institute in Baltimore, Maryland, has even deeper qualms. Nearly all GRBs are billions of light-years away. Without nearby points of known luminosity to anchor it, Riess says, Schaefer's distance curve is mathematically unreliable and creates the illusion of a shifting constant. "I believe it is a calculation error, and he will recognize that," Riess says.

Schaefer intends to press onward. "Supernovae have been tremendously improved in their accuracy of standard candle-ship" in the past decade, he notes. "I expect the same will happen with GRBs." At the very least, tracking dark energy will be the field's one constant for years to come.

—ROBERT IRION



**Tug of more.** Dozens of distant gamma ray bursts (artist's view, inset) suggest that the repulsive force of dark energy is not the "constant" that many believe.

tistical fluke. "This is not high enough confidence to make any claims that I have formally rejected the cosmological constant," he says. "I don't want to push the results too much."

Reaction to the presentation was decidedly mixed. "It's absolutely worth pursuing," said astronomer George Ricker of the Massachusetts Institute of Technology in Cambridge.

\* 207th meeting of the American Astronomical Society, 8–12 January.