ASTROPHYSICS

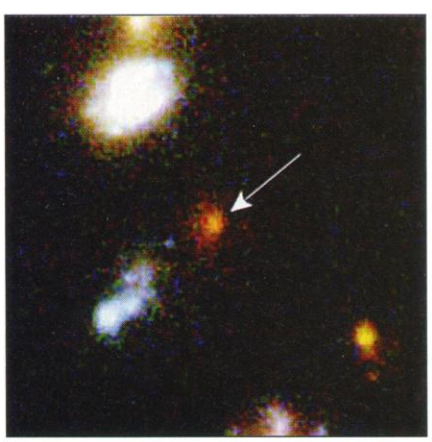
Farthest Supernova Yet Bolsters Dark Energy

If the idea that the universe is flying apart at ever-increasing speeds makes you seasick, better stock up on Dramamine. A star exploding in another galaxy has just given that theory a fresh boost.

Until recently, the queasy could hope that the evidence for the acceleration—the systematic dimming of distant supernovae—was really due to something else. Maybe intervening dust clouds were sopping up some of the light. Or maybe some quirk of cosmic evolution made ancient dying stars as different from today's supernovae as Donald Johanson is from the Lucy skeleton he found in Africa. One test could easily settle the issue: If dust or evolution were at work, more distant supernovae should become progressively fainter. If, however, unseen "dark energy" were pushing the universe apart, cosmologists predicted that the dimming with distance should eventually stop.

Now, through a combination of inspired detective work and plain old good luck, a team of astronomers led by Adam Riess of the Space Telescope Science Institute (STScI) in Baltimore has identified the most distant supernova ever. As Riess and colleagues announced on Monday at a press conference in Washington, D.C., supernova SN1997ff is so bright that it rules out both dust and evolution as explanations for the dimming, bolstering the case for dark energy.

"This is tantalizing evidence," says Robert Kennicutt, an astronomer at the University of Arizona in Tucson. "They have done a very careful job with both the measurement and the error analysis, and that is very important in this game."



Lucky star. Serendipitous images from Hubble's archives turned supernova SN1997ff into a "standard candle" that supports an accelerating universe.

CREDITS: (TOP TO BOTTOM) P. BAGLA; NASA AND A. RIESS/STSCI

The game is dissecting the light of a special class of supernova called a type Ia. A type Ia supernova erupts when enough ambient gas falls back onto the snuffed-out core of an old star to raise the star's mass to 1.4 times the mass of the sun, making the star collapse and explode. Because they start with nearly the same amount of combustible fuel, all type Ia supernovae reach nearly the same peak brightness before fading. That allows astronomers to determine exactly how far away a supernova is: The fainter the measured peak, the farther away the supernova. "They are nature's cosmic mile markers," says Riess.

The color of a type Ia supernova also reveals how much the universe has grown since the star exploded. As the universe expands, the wavelength of light traveling through space also stretches by the same amount. Astronomers call this effect a redshift, because the increase in wavelength changes blue light to red. The more the universe has grown in the time it takes light from a distant supernova to reach Earth, the larger the redshift.

In the early 1990s, while assembling the redshifts and peak brightness of hundreds of supernovae, two international teams based at the Lawrence Berkeley National Laboratory in California and Mount Stromlo Observatory in Australia made a surprising discovery. At larger redshifts, type Ia supernovae become progressively fainter than predicted by the simplest model of a steadily expanding universe. "They are dimmer than we expect for a universe that is expanding at a constant rate or slowing down," says Saul Perlmutter, a leader of the Berkeley group. To explain the dim supernovae, both teams concluded that the expansion of the nearby universe has to be accelerating. And to drive the acceleration, the universe must be filled with dark energy.

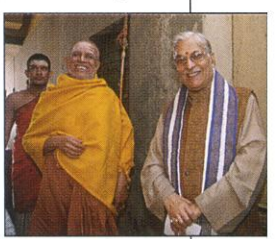
The hitch was that, on a cosmic scale, the supernovae astronomers had seen weren't very far away—merely a few billion light-years or so. As a result, the universe hadn't picked up enough speed since the stars exploded to make much difference in their brightness. "You could say, 'That's not very much,' " says cosmologist Michael Turner of the University of Chicago. " 'Maybe it's just dust blocking the light, or maybe supernovae are just dimmer in the early universe.' "

SN1997ff has dealt those ideas a potential death blow. When astronomers spotted it in a follow-up observation of the Hubble Deep Field in 1997, they knew it was far away. To tell how far, though, they needed the peak brightness—information that one image could not reveal. Digging in the Hubble Space Telescope archives, Riess and his collaborators spotted SN1997ff in the corner of a series of infrared images taken during an unrelated research project. "There were nearly 35 days of data in the archives," says

ScienceScope

Seeing Stars Indian scientists are dismayed by government plans to sanction Vedic astrology as an academic discipline. The University Grants Commission (UGC) is soliciting proposals from universities to "rejuvenate the science of Vedic astrology," which uses Hindu teachings and planetary alignments to plumb earthly events.

"Heaven knows we already have a surfeit of dross floating around our country," says Yash Pal, a retired astrophysicist and former chair of the UGC. "I hope no self-respecting university would ask to start such a department." Many believe that the directive comes at the behest of India's science and higher education minister, Murli Manohar Joshi (right, with Hindu priest). Joshi is a physicist and ardent student of ancient Indian texts.



UGC chair Hari Gautam defends the initiative, saying that it calls for "professional courses designed to produce certified professionals." He says that 70 to 80 universities have shown interest in starting the courses, which would begin in July.

Stem Cell Review Set In a move likely to fuel political tensions, the National Institutes of Health (NIH) this month will conduct its first ethical review of human pluripotent stem cell lines. The review, which will determine whether a researcher followed ethical guidelines in deriving the cell lines, is a key step toward winning government funding for research involving the cells (*Science*, 1 September 2000, p. 1442).

Many antiabortion groups, however, are pushing the Bush Administration to bar funding for such studies because the cells are derived from human embryos or fetal tissue. White House officials say they hope to decide the issue by early summer.

In the meantime, NIH is beginning to review proposals. Officials had hoped to begin in December, but no scientists submitted applications in time. At least three groups met a more recent deadline, NIH director Ruth Kirschstein told *Science* last week. NIH has not released their identities, but Martin Pera of Monash University in Melbourne, Australia, confirms that his team, which has developed several stem cell lines, is in the mix.

NIH's new Human Pluripotent Stem Cell Review Group (HPSCRG) will hold a public meeting on 25 April to review the applications. The agency plans to announce the meeting, and the names of HPSCRG members, on 10 April.

Kvamme was unavailable to comment, but science community leaders familiar with his résumé predict that he will be a strong advocate for science and technology. John Yochelson, president of the Washington, D.C.–based Council on Competitiveness, says Kvamme understands the link between government research spending and economic growth, and he is close enough to Bush to gain his ear.

But some science policy veterans were surprised that the PCAST appointment preceded the selection of a science adviser. D. Allan Bromley, former engineering dean at Yale University and science adviser to the first President Bush, called the timing "a little peculiar."

–DAVID MALAKOFF

GERMANY

A Big Boost for Postgenome Research

BERN—Germany may have been a minor player in the human genome sequencing project, but it is making a bid for the big leagues in the next wave of functional genomics research. Last week, the nation's research ministry said it will channel $175 million over the next 3 years into a National Genome Research Network involving at least 16 universities, several Max Planck institutes, and four national research centers. German research minister Edelgard Bulmahn, who announced the initiative on 30 March in Berlin, said the new program is intended to "put Germany in the forefront of public support for the systematic functional analysis of genes and the use of those research results in the fight against widespread diseases."

The new Genome Research Network—financed by government revenues from last year's licensing of communications frequencies—has three main parts (see table): a "core area" consortium of big nonuniversity research centers, a "disease-oriented genome network" that links research at 16 universities with other centers, and a separate category to fund proteomics and bioinformatics research. In addition, $10 million will be spent to study the ethical, social, and legal impacts of genomics research. Bulmahn said a high-level group of academic and industrial researchers will serve on a panel that will help set overall directions for the network and give advice on which projects to fund.

The core area consortium will get about 38% of the money for functional genomics projects. Funding will be divided among four national research centers—the German Cancer Research Center in Heidelberg, the German Research Center for Biotechnology (GBF) in Braunschweig, the Max Delbrück Center for Molecular Medicine in Berlin, and the National Research Center for Environment and Health in Munich—and the Max Planck Institute for Molecular Genetics in Berlin. Rudi Balling, a prominent mutant-mouse researcher who became the GBF's scientific director earlier this year, said the $10 million in extra funding that the center will receive from the program will help him reorient GBF's research to focus on the genetic basis of infectious diseases. He said the grants will also help the GBF play a role in the rat genome sequencing project.

A nearly equal share of the money will go to a disease-oriented genome network that will include an array of research institutes at 16 universities. The main focus will be on functional genomics related to five types of disease: cardiovascular disorders, cancer, problems of the nervous system (including Alzheimer's disease), infectious diseases, and environment-related illnesses such as asthma. Those university networks are to cooperate with the core area research institutions for specialized work, such as help with sequencing.

For example, seven research groups at the University of Bonn will share about $4.5 million in genome network funds to help identify the genes and mutations that lead to diseases of the central nervous system, including schizophrenia, epilepsy, and manic depression. At the University of Kiel, about $5 mil-

DIVIDING THE WINDFALL

Core Genomics Research Centers ($67 million)

Funds functional genomics research by the Max Planck Institute for Molecular Genetics in Berlin and four national research centers.

Disease-Oriented Genome Network ($66 million)

Funds projects at 16 universities as well as nonuniversity institutes. Focuses on functional genomics related to the circulatory system, cancer, problems of the nervous system, environment-related illnesses (such as asthma), and infectious diseases.

Proteomics and Bioinformatics ($32 million)

Funds proteomics research, bioinformatics, and "platform technologies" related to those two areas.

Another $10 million will be spent on research into the ethical, social, and legal impacts of functional genomics research.

CREDITS: (TOP TO BOTTOM) NASA; SOURCE: GERMAN RESEARCH MINISTRY

ScienceScope

Together Again Exploring Mercury will be an international affair after all. The European, Japanese, and U.S. space agencies announced last week that they will coordinate the operations of two spacecraft headed for the planet in 2004 and 2009. The deal ends European grumbling over U.S. plans to go it alone to Mercury.

Under a plan announced 30 March at a meeting of the European Geophysical Society in Nice, France, NASA's $300 million Messenger orbiter may serve as an advance scout for Bepi Colombo, a $440 million Euro-Japanese mission that includes two orbiters and a lander. Researchers say the arrangement will help them get the most out of Bepi Colombo's instruments, including sensors that will probe the planet's surface and magnetic field. Details, however, still need to be decided. Marcello Coradini, the European Space Agency's coordinator of solar system exploration, says the partners "want to establish a working group as soon as possible to enhance the science return from both missions."

Chattering Class Both the executive branch and Congress need to spend more time and money analyzing the U.S. government's $90 billion investment in R&D. That's the preliminary conclusion of a 2-year study by the National Science Board, which oversees the National Science Foundation.

The report, led by board chair Eamon Kelly, proposes such new wrinkles as a 5-year science plan, updated annually, as well as the revival of something akin to the congressional Office of Technology Assessment, which was killed in 1995. Kelly, an economist and former president of Tulane University in New Orleans, believes that the government also needs to do a better job of tracking the economic payoff from current investments, laying out possible trade-offs, and comparing U.S. results to those of the rest of the world.

The board will hold a symposium in late May to discuss the 20-page report, entitled "The Scientific Allocation of Scientific Resources." It's available at www.nsf.gov/cgi-bin/getpub?nsb0139.

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