RANDOM SAMPLES

edited by CONSTANCE HOLDEN

The Oldest Supernova

The most distant supernova yet observed has been sighted by a team of 15 scientists using the 4-meter telescope at the Cerro Tololo Inter-American Observatory in Chile. The violent stellar explosion, about 6 billion light-years away from Earth, can provide astronomers with unprecedented information about a growing puzzle: the rate at which the expansion of the universe has slowed since the big bang. That in turn will yield clues about whether the universe will expand forever or eventually collapse (*Science*, 11 August, p. 756).

The new supernova's redshift—a measure of how fast an object is moving away from Earth—is 0.478. Because the speed increases with distance from Earth, the redshift also yields information about distance—about 6 billion light-years. This supernova, known as type Ia, is one of a family that is very bright and has a roughly constant peak brightness, which can be used as an independent distance measure. Robert Kirshner, a team member from the Harvard-Smithsonian Center for Astrophysics, says it thus holds promise as a "standard candle": "You can study [such supernovae] both nearby and far away. ... That's the wonderful thing about these for cosmology," he says. By comparing the two measurements—the redshifts and brightness—of nearby and distant supernovae, scientists estimate how much the expansion has decelerated in the past 6 billion years.

The team found the supernova by comparing electronic images of distant galaxy clusters taken weeks apart. After blips caused by asteroids and cosmic rays are eliminated, bright points that appear in one image but not the other are likely to be supernovae. They disappear after the fireworks are over, says team member Brian Schmidt of the Mount Stromlo and Siding Spring Observatories in Australia. The project—which also involves the University of Washington and the European Southern Observatory—is "still ramping up," says Schmidt, and should eventually find distant supernovae at the rate of about 10 a year.

Sperm Protein Gets Specific

The mystery of how closely related species that share the same habitat manage to stay separate has long dogged biologists. New insights into the structure of a protein that enables abalone sperm to penetrate eggs is starting to shed some light on this matter.

Marine biologist Victor Vacquier at the University of California, San Diego, and colleagues at the Scripps Research Institute in La Jolla report in the September *Journal of Cell Biology* that lysin, a sperm protein in the California red abalone (*Haliotis rufescens*), separates into two molecules that create a pore in the egg surface. While the lysin molecule, first described in 1993 (*Science*, 17 December 1993, p. 1864), had been thought to be a monomer, the scientists found that in its natural state it's a dimer—made up of paired polypeptide chains. Only when it gets near an egg does it separate into two monomers which then bind to the membrane and create a hole in the egg for the sperm to enter.

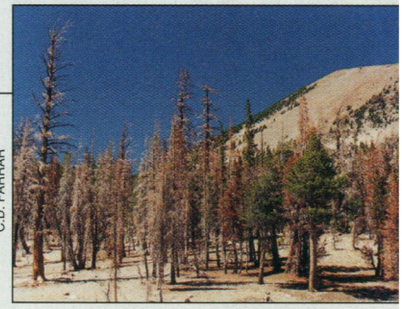
Scripps crystallographer David Stout, a co-author, says that amino acid sequences on the surface of the dimer, which vary among species, "are mutating at an incredible rate"—which may be how the abalone maintains species barriers. The initial interaction of the lysin and the egg, the scientists suggest, involves the species-specific sequences on the dimer. Like a security code that is regularly changed, they ensure the "proper fit" with sperm and egg membrane. After that, sequences common to all abalone allow the sperm to enter and fuse with the egg.

The research "shows how the study of structure contributes to understanding the species-specific interactions between sperm and egg," says Paul Wassarman, a fertilization expert at the Roche Institute. The scientists now want to find out what lysin binds to on the egg membrane. Stout points out that as the same basic processes are common to abalone and mammals, the research could provide clues to mammalian fertilization as well.

TOP 10 U.S. UNIVERSITIES IN CLINICAL MEDICINE RESEARCH, 1990–94

Paper Production			Citation Impact		
Rank	Institution	# papers	Rank	Institution	Cit. Rate
1	Harvard	9571	1	Stanford	7.58
2	Johns Hopkins	6388	2	Harvard	7.49
3	UC Los Angeles	6272	3	UC San Diego	6.82
4	UC San Francisco	5982	4	Tufts	6.61
5	U. Washington	4943	5	UC San Francisco	6.57
6	U. Michigan	4773	6	U. Washington	6.56
7	U. Minnesota	4165	7	Yale	6.48
8	U. Pittsburgh	4016	8	Johns Hopkins	6.41
9	U. Pennsylvania	3975	9	UT San Antonio	6.40
10	UT Houston	3958	10	Boston U.	6.39

Harvard holding. Harvard's the heavy among university producers of clinical medicine research in terms of papers produced and in citation impact (average number of cites per paper during a 5-year period), according to the latest count by the Institute for Scientific Information. The list ranks 50 schools that published at least 200 papers a year in 1990–94. The University of Texas, San Antonio, has made the biggest gain in citation impact, going from 3.60 to 6.40 since the early '80s.



C.D. FARRAR

Lethal mountain air. Dead trees at foot of Mammoth Mountain.

California Volcano's Slow Fizz a Warning?

Something dangerous is stirring beneath Mammoth Mountain. So far it's only killing trees, but the carbon dioxide seeping out of the flanks of the mountain, which looms over the resort town of Mammoth Lakes in California, could spread to more populated parts of the popular skiing area. It could even be a harbinger of an eruption, for the mountain is actually a volcano, says U.S. Geological Survey (USGS) researcher Michael Sorey of the Menlo Park office.

Christopher Farrar of the USGS in Carnelian Bay, California, and his colleagues report in the 24 August issue of *Nature* that 1100 metric tons of carbon dioxide are seeping out of Mammoth Mountain's flanks each day. The researchers were tipped off by patches of dying trees that first appeared in 1989, although the patches were initially attributed to natural dieback. But that same year a swarm of small earthquakes struck beneath the mountain, and the gas coming from long-established fumaroles on Mammoth began to resemble that released by magma. USGS researchers soon concluded that a finger of fresh magma had probably risen to within 5 kilometers of the surface of the volcano (*Science*, 21 December 1990, p. 1660).

Now Farrar has found that the air around the dead trees contains a deadly concentration of 60% carbon dioxide. "We are worried that there are signs of the carbon dioxide spreading toward areas where more people are," says Sorey. The U.S. Forest Service has already temporarily closed one campground in the area, near Horseshoe Lake.