to study the compound's effects. Flumazenil is an antagonist of benzodiazepine (BZD) drugs, a group of tranquilizing agents of which the best known is valium. According to Marczynski, BZD agents, along with the signal transmitter gamma-amino butyric acid (GABA), form an inhibitory system that contributes to neuronal death over time by depriving nerve cells of needed nutrients. Flumazenil may protect neurons by preventing the body's naturally occurring BZD compounds from attaching to their receptors and exerting their damaging influence, he says.

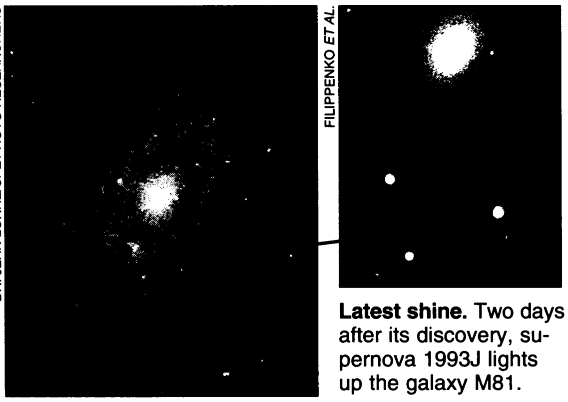
Though Marczynski's results are provocative, that's nothing new in a field that has seen many leads fail to pan out. Says Zaven Khachaturian, associate director for neuroscience and neuropsychology of aging at the National Institute on Aging, mindful of past pitfalls: "This is a very interesting single animal study, but one needs to be careful. I wouldn't jump to suggesting it's a therapy for Alzheimer's or age-related memory problems."

–**John Travis**

ASTRONOMY

A New Supernova In the Northern Sky

Even in this age of space telescopes and giant mountaintop observatories, astronomy can still reward amateurs. Francisco Garcia, a star-gazer in Lugo, Spain, proved it once more when, on the night of 28 March, he noticed an eruption of brightness from one arm of a nearby spiral galaxy called M81. At once, he alerted a fellow member of the Madrid Astronomical Association, Diego Rodriguez, who photographed the anomalous bright spot. The news spread within hours, and the following night, astronomers led by Alexei Filippenko of the University of California, Berkeley, confirmed what Garcia himself suspected: He had discovered a new supernova. Only a day or two old when it was spotted, supernova 1993J, as it has been named, is the brightest to shine in the Northern Hemisphere since 1937.



DR. JEAN LORRE/SPL/PHOTO RESEARCHERS; FILIPPENKO ET AL.

Latest shine. Two days after its discovery, supernova 1993J lights up the galaxy M81.

The discovery, says George Sonneborn of NASA's Goddard Space Flight Center, has set the astronomical community "all on fire." True, the supernova that exploded in 1987 in the Large Magellanic Cloud, a satellite galaxy of the Milky Way, was far brighter, bright enough to be seen with the naked eye; this new blast, at its peak on 31 March, was still 40 times too faint to be visible. But SN 1987A could be seen only from the Southern Hemisphere, Sonneborn points out. "A lot of Northern Hemisphere observers who felt left out by 1987A have now got their chance."

Already, supernova researchers have evidence that they're looking at a member of the same supernova class as 1987A. Supernovas can result from the explosion of a white dwarf—an ancient, burned-out star—or the collapse of a supergiant star. The second type—called type II—is the more violent kind, and it has a trademark: Spectra of the light from the explosion reveal hydrogen left over from the giant star's atmosphere. White dwarfs, in contrast, having burned up all their hydrogen, show no such emission lines. SN1987A belonged to type II, and so, it seems, does the new event.

Filippenko, who is coordinating ground-based observations of the supernova, says he and his colleagues have already seen the telltale hydrogen lines—though because the hydrogen lines are quite weak, he is quick to add, "I wouldn't bet my life" that it's a type II. Still, there's another reason to think it is, Filippenko says: Other astronomers think they may have identified the progenitor star in earlier images, and it's a supergiant.

But the suspect is a red supergiant, a larger and cooler star than the blue supergiant that exploded in 1987A. And, if so, the explosion should play out differently over the coming weeks and months. Indeed, it already shows signs of doing so. Within 2 days of the discovery, the International Ultraviolet Explorer (IUE) satellite was watching the brilliant ultraviolet emissions of the early stages of the explosion fade, giving way to visible light, as the expanding gases cooled. Sonneborn, an IUE investigator, says SN 1993J is cooling more slowly than 1987A did—just what you'd expect for a red progenitor, says Robert Kirshner of the Harvard-Smithsonian Center for Astrophysics.

Meanwhile, a gallery of astronomical instruments is lining up to observe other aspects of the supernova. Starting early this week, the Very Large Array, a giant radio telescope in New Mexico, was scheduled to observe its radio emissions. And at press time the Hubble Space Telescope was turning toward the fading supernova. In one project, starting next week, a group led by Kirshner hopes to measure the angular size of the explosion—a first step to determining its distance. If they succeed, astronomers trying to learn the size and age of the universe will have another rung in their distance scale, and this newest supernova will have brought astronomers a step closer to answering some of their oldest questions.

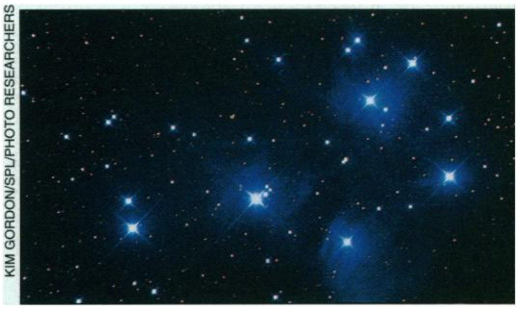
–**Ray Jayawardhana**

Ray Jayawardhana is a science writer based in New Haven, Connecticut.

ASTRONOMY

Tribe of Brown Dwarfs Discovered?

The search for brown dwarfs—objects too large to be planets but not quite massive enough to catch fire as stars—has so far turned up more embarrassing false leads than convincing results. In 1984, for instance, astronomers at the University of Arizona announced the discovery of an object the size of several dozen Jupiters emitting a faint infrared glow, only to have it dismissed as an observational artifact. The handful of suspects fingered since haven't fared much better. At the Royal Astronomical Society's national meeting in Leicester last week, however, astronomer Richard Jameson of the University of Leicester claimed that his team has captured not one, but an entire tribe of brown dwarfs—nearly two dozen—in the Pleiades (the Seven Sisters), a cluster of young stars and gas.



KIM GORDON/SPL/PHOTO RESEARCHERS

Seven sisters....and a retinue of dwarfs?

If the claim holds up, it will fulfill a longstanding prediction in astrophysics. Theorists hold that not every cloud of star-forming matter should be big enough to spawn a full-fledged star when it collapses. If the resulting object is less than 8% as massive as the sun, it won't be able to sustain the heat and pressures needed to burn hydrogen and will gradually cool, emitting infrared radiation as it does. The theory seems sound, but the fact that brown dwarfs are born faint and fade quickly makes them a tricky quarry. Even now, other astronomers are cautious about the Leicester group's claim, but many agree that some of the new candidates, at least, look like a good bet. "It's very promising," says spectroscopist Roberta Humphreys of the University of Minnesota.

If brown dwarfs were going to be found anywhere, the Pleiades—full of young stars, and relatively nearby—was a likely place. "People have been poking at the Pleiades for some time," says astronomer George Rieke of the University of Arizona, who has also been studying a small region of the cluster in the infrared. Using the UK Infrared Telescope at Mauna Kea in Hawaii, Jameson and his colleagues found that the cluster is dotted with faint, infrared-emitting objects. By measuring their brightness at a number of infrared wavelengths and using a model describing how the infrared "color" of young, low-mass stars varies with mass, the researchers found that 22 of the objects fell short of the lower mass cutoff for true stars, suggesting that they are brown dwarfs.

That wasn't conclusive, since young brown dwarfs are easy to confuse with old true stars—so the objects seen by Jameson's group might just be ancient stars outside of the Pleiades that happen to lie in the same line of sight. But by measuring the movement of the infrared sources across the night sky, the team showed that, like birds in a flock, they are moving along with stars in the Pleiades. "Their data are incredibly compelling," says Claia Bryja, a student in Humphreys' group at Minnesota who is looking for brown dwarfs in the older Hyades cluster.

Even so, the case isn't watertight, says Bryja, because the models that relate the color of a newborn star to its mass are riddled with unproven assumptions. "It's still very plausible that everybody's models are systematically off," she says. Given such uncertainties, brown dwarf hunters suspect that many of the 22 objects claimed by Jameson's group will turn out to be true stars, albeit puny ones. But even the skeptics remain excited about two of the sources, which the model puts at less than 0.04 solar masses. Given such low masses, Cambridge University astronomer Gerry Gilmore estimates that the chances that Jameson's team has discovered at least some brown dwarfs are "much better than 50:50."

Jameson hopes to improve the odds even more by analyzing complete infrared spectra for some of the sources. That should decrease the uncertainties in fitting the data to the model—and, he hopes, finally bear out astronomers' conviction that brown dwarfs do exist. Says Gilmore: "The sun exists, and the earth exists. It's ludicrous to propose that there's nothing in between."

–**Peter Aldhous**

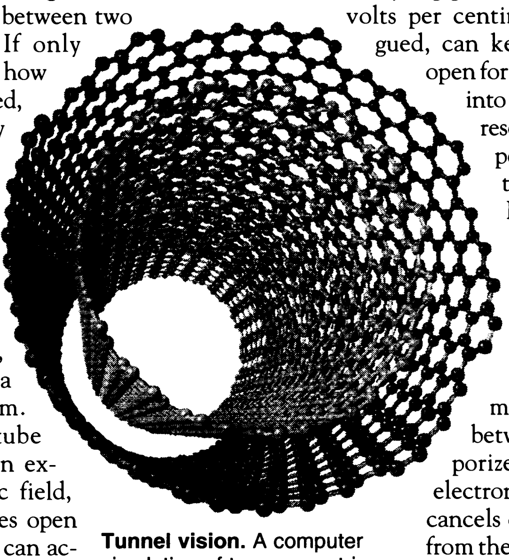
MEETING BRIEFS

Condensed Matter Physicists Shrink Their Horizons

In the world of the condensed matter physicist, a micron is a chasm and a millimeter an ocean. At the March American Physical Society meeting in Seattle, some of the 4500 physicists probed the hazards of the micro world, where weird quantum effects can scramble information. Others outlined its opportunities: Molecular engineering that is leading to new information storage materials, and minute structures that could form tethers and containers in some future nanotechnology.

How to Grow Buckytubes

Rice University physicist Richard Smalley dreams of making hollow carbon strands thin enough to mold a single file of atoms into a wire and so strong that, woven into a rope a few millimeters thick, they could hold up the Golden Gate Bridge. Why not? he asks: Last summer, without knowing just how, physicists at NEC Corp. in Japan formed just such strands—tiny, micron-long stubs of them, in any case—in the arc between two carbon electrodes. If only physicists understood how these structures formed, says Smalley, they might some day spin out "buckytubes" (so called because they are related to the soccerball-shaped carbon molecules) of any length they liked.



Tunnel vision. A computer simulation of two concentric buckytubes.

JOHN MINTMIRE, NAVAL RESEARCH LABORATORY

At the meeting, Smalley suggested a possible mechanism. The key to buckytube growth, he said, is an extremely high electric field, which holds the tubes open so that carbon atoms can accumulate on the outer edge. "It happens for the same reason that if you connect your head to a voltage source your hair stands on end," he says. Much like charged hair strands, carbon atoms at the end of the tubes get polarized by the field and feel a repulsion strong enough to counteract their tendency to bond together. Smalley suggested that the NEC workers who first created buckytubes may have done so by inadvertently creating much higher electric fields than they ever suspected. Still higher fields, Smalley thinks, might fertilize the growth of his dream buckytubes.

In speculating about buckytubes, Smalley was on familiar ground because he and other researchers discovered the prototypical material, buckyballs, in 1985. Buckyballs and buckytubes both form in an apparatus in which a carbon arc is enclosed in high-pressure helium gas. Both come from carbon atoms that vaporize from the graphite electrodes and link together into chicken-wire-like sheets that can roll up into balls or multilayered onions, or curl into tubes.

The tubes are the less stable of the two configurations, says Smalley: "Tubes fry into onions, so onions should be more stable than tubes." Only a gigantic electric field—10^{14} volts per centimeter—Smalley argued, can keep the membranes open for long enough to grow into tubes. True, the NEC researchers' voltage appeared to be a million times lower than that. But in a tiny region near one electrode, Smalley says, the electric field may have been higher than it seemed.

Across most of the millimeter-wide gap between electrodes, vaporized carbon ions and electrons move in a way that cancels out the electric field from the applied voltage, says Smalley. Only near the negative electrode does the voltage difference emerge, creating a powerful electric field over a distance of 100 nanometers. If this scenario is right, says Smalley, there might be other ways to set up a powerful electric field that would yield longer tubes.

Success could turn buckytubes from a laboratory curiosity to an exciting new material. Studies of the stubby buckytubes made so far show that they form virtually free of defects, giving them strength surpassing other known materials, says Massachusetts Institute of Technology physicist Mildred Dresselhaus: "They are strong because they are perfect." And then there's the prospect of exploiting the inner surfaces—perhaps to create tiny test tubes. NEC's Thomas Ebbesen points