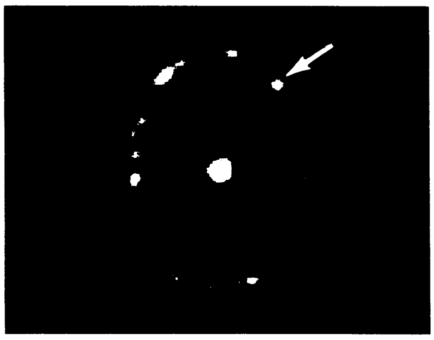
radiation from the supernova explosion heated it.

Had the winds blown gas equally in all directions, the collision would probably have formed a shell rather than the ring revealed by the Hubble Space Telescope in 1990. Some researchers then proposed that the gravitational tug of an unseen companion star could have concentrated the red giant wind along an equatorial ring, away from the parent star's polar regions. However, the variation in wind density along different directions seemed too small to require a companion.

In a more detailed analysis, John M. Blondin of North Carolina State University in Raleigh and Peter Lundqvist of the Stockholm Observatory in Sweden now come to a different conclusion. They find that in order for an asymmetry in the red giant wind to account for the ring as well as a pair of lobe-shaped emissions above and below the ring, the wind must have blown 20 times as much gas out along the equator of the parent star as at its poles. Such a scenario requires a companion, the astronomers report in the March 1 ASTROPHYSICAL JOURNAL.

F. Duccio Macchetto, Nino Panagia/ESA; Plait



Hubble image shows gas ring around supernova 1987A. In enhancing images by computer, Chevalier and Philip Plait of the University of Virginia identified a star (arrow) thought to lie in the supernova's home galaxy. That lines up with the ring as seen from Earth.

"If you follow this model, then the only explanation I can see . . . is a nearby companion," asserts Blondin. Nevertheless, he has begun work on a model in which the spin of a solitary parent star might generate a blue giant wind that preferentially blows along the equator. Roger Chevalier of the University of Virginia in Charlottesville notes that a magnetic field embedded in the blue giant wind might confine gas to a ring.

If 1987A's predecessor had a partner that survived the explosion, astronomers may spot it as the supernova continues to fade. In a Jan. 15 circular of the International Astronomical Union, Arlin P.S. Crotts of Columbia University and William E. Kunkel of the Carnegie Institution of Washington's Las Campanas Observatory in La Serena, Chile, reported that if the partner's core is still burning hydrogen, the star has less than 2.5 times the mass of the sun. *— R. Cowen*

First helium dimer: A truly supercool giant

All of the approximately 100 chemical elements in nature form pure molecules made up of one type of atom — except for the inert gas helium. Helium has the reputation of a loner, a lightweight atom that never settles down to bond with others of its own kind. Scientists have speculated that helium atoms do pair up to form diatomic molecules, but only at extremely low temperatures.

Try one-thousandth of a kelvin, a smidgen above absolute zero.

Using a new apparatus that can attain such frigidity, W. Ronald Gentry and his colleagues at the University of Minnesota in Minneapolis have detected helium dimers for the first time. Their observation proves the existence of such molecules — ending a 65-year debate — and validates recent calculations predicting that the extreme low temperature was necessary to coax the atoms to cozy up to one another.

While no longer an oddball among the elements, helium nevertheless forms an unusual molecule. The dimer is held together by the weakest chemical bond ever measured. "Helium doesn't form ordinary bonds," says Gentry. "The only thing that holds the molecule together is the long-range force caused by the electrons being unevenly distributed around the nucleus."

Oddly, the second smallest atom also forms the world's largest diatomic molecule, rivaling biological macromolecules in size, he notes. Between the dimer's two atoms lies a gulf of 55 angstroms instead of the usual two to three.

James B. Anderson of Pennsylvania State University in University Park comments that Gentry's group beautifully demonstrated that they had indeed detected the fragile molecule and not some experimental artifact. "While the theory has been solid for a few years," Anderson says, "it wasn't clear that a helium dimer would actually be seen this century."

In the Feb. 15 JOURNAL OF CHEMICAL PHYSICS, Gentry and his co-workers describe how they cooled the helium by squirting a pulsed beam of high-pressure helium gas into a vacuum chamber. There, the helium expanded as its pressure plummeted by 12 orders of magnitude. A mass spectrometer detected the dimers.

The team will now use the apparatus to further study the new helium molecule. Says Gentry, "These very-low-temperature beams are so interesting because they allow us to probe the extreme quantum mechanical behavior of matter." *— K.F. Schmidt*

Atlantic winds transport ozone eastward

Satellites have mapped the concentrations of ground-level ozone hovering over some of the most populous regions of North America, Europe, and Asia. Replenished by the photochemical conversion of polluting gases, this low-lying ozone can trigger asthma attacks, cause crop damage, and possibly contribute to global warming. However, the total amount of ground-level ozone and how much of it drifts across the Earth remain poorly understood.

A new study indicates that winds flowing across the northern Atlantic Ocean "export" North American ozone to Europe. The researchers say this may prove part of a global flow of ozone in the latitudes between 30°N and 60°N.

Using measurements of ozone and carbon monoxide taken at three sites on Canada's Atlantic coast, the scientists also offer the first estimate of how much ozone Europeans may actually receive from across the ocean, a U.S.-Canadian research team reports in the March 5 SCIENCE.

They estimate that about 16 percent of the ozone cooked up in the lower atmosphere over the eastern United States and Canada wafts across the Atlantic in the summer, far exceeding the amount of natural stratospheric ozone likely to bleed down into the lower atmosphere over the North Atlantic in the same period. The other 84 percent of the ozone produced in the United States remains behind, eventually breaking down into simpler gases or being deposited on trees and other vegetation.

Scientists aren't sure yet what environmental mischief this ozone may cause. "But it's clear that we're making a major perturbation of the [lower atmosphere's] chemistry," says David D. Parrish of the National Oceanic and Atmospheric Administration in Boulder, Colo. "Our experience in the stratosphere with fluorocarbons tells us we should at least understand these perturbations and look in some intelligent way at what the impacts could be."

Studies of ozone export fit into a larger effort to measure ground-level ozone precisely and simulate its behavior with computers, says atmospheric chemist Jennifer A. Logan of Harvard University. Such mathematical models could specify the amount of ozone that stems from human activity, detail its global circulation, and help scientists predict the possible effects of ground-level ozone on climate and agriculture, Logan notes. *— D. Pendick*