IMPLOSION/EXPLOSION

Linking supernovas to quasars

A theory to explain the energy of a supernova, the sudden explosion of a star to a brilliance rivaling that of a galaxy of hundreds of millions of stars, has been devised by Dr. Stirling A. Colgate of the New Mexico Institute of Mining and Technology, Socorro (SN: 3/2, p. 205).

The theory could also explain the fantastic energy of the puzzling quasars, as well as what astronomers call Seyfert galaxies. Dr. Colgate believes that supernovas are the key to energy generation for both quasars and Seyferts. These exploding stars are considerably more energetic over a broad range of wavelengths, especially in the infrared, than observations in visible light indicate.

In our galaxy only three possible supernovas have been observed during the last 1,000 years, but in peculiar objects like Seyferts and quasars, their rate of occurrence may be much higher.

"What we see on the outside," Dr. Colgate told a seminar at the National Aeronautics and Space Administration's Goddard Space Flight Center in Greenbelt, Md., "does not actually reflect what is going on inside" an exploding star.

Before the explosion, there is an implosion, with matter falling in toward the dense core. When it hits this core, a shock wave is formed.

As this shock wave propagates outward at an extremely high velocity, it reacts with the gas present to synthesize elements, providing in the process a possible way to check the theory.

Dr. Colgate has calculated that the most likely element to be synthesized in the shock wave is nickel 56, which has a half-life of six days, decaying to cobalt 56. This has a half-life of 77 days and changes into common iron 56. Detection of the intermediate cobalt is the key to the theory, and a search for the cobalt isotope in supernovas is under way.

It is also being sought in such possibly related phenomena as the Seyferts —spiral star clusters with extraordinarily bright centers.

Dr. Jesse L. Greenstein of California Institute of Technology says cobalt 56 could be detected in Seyfert galaxies and he is now conducting a search for this element in the spectra of such galaxies. If cobalt is found, it would support Dr. Colgate's theory that violent explosions account at least in part for the radiation from Seyfert galaxies.

Quasars, Dr. Colgate believes, are denser, more energetic versions of Seyfert galaxies with much shorter lifetimes, since the supernova explosions within them occur at a more rapid rate.