Click here for Full Issue of EIR Volume 15, Number 12, March 18, 1988

then, during helium burning, some neutrons added on to that iron makes heavy elements, and that material is usually stirred up to the surface by convection and then comes off either as a wind or in the planetary nebula stage. The Sun in particular is not doing that kind of thing.

EIR: How many of these nucleosynthetic processes are there which are postulated to produce nuclei heavier than, let's say—

Woosley: —heavier than iron. We usually say there are three: the s-process that we just talked about; the r-process that also involves neutron addition, but goes on on a very rapid timescale; "r" stands for rapid, and therefore is an explosive process; then there is the p-process which makes some very rare isotopes that are proton-rich. They only account for about 1% of the mass of the very heavy elements, so it's the rarest elements and isotopes of all. That, too, is probably an explosive process. You can read about all this in Donald Clayton's textbook, called *Principles of Stellar Evolution and Nucleosynthesis*, 1968 [University of Chicago Press, available in paperback].

Interview: Thomas Prince

Will we see more gamma-ray lines?

Thomas Prince is an experimentalist at the California Institute of Technology. The interview was conducted Feb. 22.

EIR: Where do we go from here in terms of observing gamma-ray emissions from SN 1987A?

Prince: Right now these are early observations. We made ours later in November, and there were a couple of others. Actually it was surprising that we saw the gamma-ray flux when we did. It meant that the gamma rays were coming out a bit earlier than some of the models had predicted. What is presumably happening right now is that the optical emission is fading quicker than it has been, indicating that the supernova is probably becoming transparent to gamma-ray energies.

EIR: Because of convection and turbulence, I gather.

Prince: No, it's probably just thinning out of the overlying material. If there is a lot of overlying material, the gamma rays essentially are degraded in energy and lose most of their energy inside the nebula, and then it shines in the optical. If the nebula becomes thin enough that the gamma rays can start coming out, the energy that's being put out in the optical starts going down, and the energy in gamma rays starts going up. And that looks like what's starting to happen now. Several groups are going down to Australia again this spring, in fact my crew is already down there, and is going to be making flights this spring to hopefully catch the supernova at about [gamma-emission] maximum.

EIR: How many more lines might we see in 1987A with the technologies that various experimenters are putting up?

Prince: We may see, for instance, the positron annihilation line. We may see one of the higher-energy lines of [the decay to] cobalt-56—it's a possibility, depending on how strong the line is. Beyond that there's a possibility of detecting the lines of cobalt-57 . . . but it's too early to look for them right now.

Interview: Stirling Colgate

The Nickel-56 idea

Stirling Colgate is a theoretician at Los Alamos National Laboratory in Los Alamos, New Mexico. The interview took place Feb. 22.

EIR: I am calling about the detection of the supernova gamma rays.

Colgate: The original work on the gamma rays and cobalt-60 and all of that was in a paper by Colgate and Chester McKee ["Early supernova luminosity," *Astrophys. J.* 157: 623-643 (1969)]. The paper by Clayton, Colgate and Fishman ["Gamma-ray lines from young supernova remnants," *Astrophys. J.* 155:75-82 (1969)] refers back to that paper. The whole business of the decay from nickel to cobalt to iron feeding the light curve was in that first paper. The history is that it was in trying to solve the light curve that I understood that the nickel decay was the key to the whole thing. The Colgate and McKee paper was really the earlier work—it was delayed in publication. I went to Rice University to talk about it.

[Colgate and McKee presented their ideas at the American Astronomical Society meeting in Charlottesville, Virginia, in April 1968. Clayton, Colgate, and Fishman was received by the *Astrophysical Journal* on May 20, 1968, and posed the possibility of detecting the gamma rays. Colgate and McKee—a longer paper—was slower in coming.]

© 1988 EIR News Service Inc. All Rights Reserved. Reproduction in whole or in part without permission strictly prohibited.