(Zalkin, Yanofsky and Squires, *J. biol. Chem.*; Franklin, *J. molec. Biol.*).

The ability of a juggernaut polymerase to suppress polar nonsense mutants implies that all polar effects may be mediated at the level of transcription. This resolves a conflict of some years standing as to how premature termination of protein synthesis may affect the availability of messenger for subsequent genes. One view has been that dissociation of ribosomes within (but not at the end of) a gene makes the subsequent messenger regions susceptible to degradation; an alternative was to suppose that termination of transcription within a gene causes transcription to halt, although it has always been difficult to visualise molecular models for this relationship (see Lewin, *Nature new Biol.*, **232,** 161–162; 1971). In view of the action of N as an anti-terminator, these new results support the idea that premature translational termination may provoke a rho-dependent transcriptional termination that can be antagonised by the anti-terminator action of N.

Adhya *et al.* propose that termination of translation in a gene allows rho-dependent termination of transcription to take place at the end of the gene by a normal polymerase, although a juggernaut polymerase may of course read straight through, suppressing the polarity of the mutation. This implies that a rho-dependent termination site is present at the end of each gene in which polar mutations may occur but is rarely recognised in the usual course of events. The termination signal at the end of an operon presumably differs from any internal signals and is recognised by all polymerases.

BENJAMIN LEWIN

# Do pulsars make supernovae?

*from James Pringle*

THE brilliant explosion of a supernova heralds the demise of a highly-evolved, massive star. When stars in the mass range 3–8 solar masses ($M_\odot$) have exhausted the hydrogen and helium in their central regions, they all evolve to red-giant configurations of very similar structure. They have a dense core of about $1 M_\odot$, surrounded by a zone containing shells of burning helium and hydrogen, the whole of which is engulfed in a highly extended low-density envelope about a thousand times larger than the Sun.

The details of what happens next are still uncertain. It is known that some kind of explosion is triggered off, releasing in all about $10^{50}$ erg. The outer layers of the star are blown off at speeds of some 8,000 km $s^{-1}$, gathering up the interstellar gas in their path and later becoming the wisps of gas which are known as 'supernova remnants' and of which the Crab Nebula is the most oft quoted example. Eventually, the 'remnant' itself disperses to become part of the ambient interstellar medium which, in its turn, condenses to form stars. It is precisely because a supernova explosion spews heavy elements from the heart of the dead star into the interstellar medium, that planets too can form and life as it is known can exist.

Several specific mechanisms for triggering the initial explosion have been advanced—for example, the suggestions by Fowler and Hoyle that the core collapses caused by the photodisintegration of iron or that the explosive onset of carbon burning disintegrates the whole star. Recent evolutionary calculations strongly indicate that collapse of the core in a highly evolved star, rather than its total disruption, is possible, at least for stars of 3–8 $M_\odot$. The collapsed core forms a 'neutron star'—a highly compact object with a typical density of $10^{16}$ g $cm^{-3}$. This density is so great that the star's original magnetic field is compressed to a value around $10^{12}$ G and any rotation the core had before collapse is amplified until the newborn neutron star has a rotation period of a few milliseconds. Thus a sizeable fraction of the gravitational energy released by the collapse of the core is converted into and stored as the rotational energy of the compact object. The combination of rapid rotation and strong magnetic field causes most of the kinetic energy thus stored to be radiated away within a few thousand years, although the slow radiation of the residual rotational energy can be observed for much longer in the radio band as the regular bleeps from a pulsar. These ideas are confirmed by the presence of two very short period, and presumably very young, pulsars in supernova remnants—the nebular remnants around the older pulsars would presumably have dissipated by now.

Thus, the implosion of the stellar core is required, first, to release enough momentum to disperse the outer layers of the star at high velocity and, second, to release enough energy to account for the visual light curve. Light curves have been caculated according to several different theories, but, in general, the first requirement is a problem if the energy is released on too short a timescale. Two recent articles, one by Ostriker and Gunn (*Astrophys. J. Lett.*, **164,** L95; 1971) and the other by Bodenheimer and Ostriker (*Astrophys. J.*, **191,** 465; 1974) suggest that the pulsar at the centre of the supernova can make a substantial contribution to the energy of the outburst. Rather than having to release all the energy in one initial explosion, the authors argue that the power continuously radiated by the newborn pulsar is sufficient to assist in propelling the outer stellar layers up to high velocities. They perform detailed calulations, assuming that the main energy source in a supernova is the dipole radiation from the central pulsar. If it is intense enough, the radiation hollows out a cavity in the centre of the star and then expels the outer envelope at high speed. As this shell of material moves outward, its density decreases rapidly and its transparency increases accordingly. The peak of the light curve occurs when the timescale for the expansion of the envelope is approximately equal to the timescale on which photons can diffuse outwards through it. The authors obtain good agreement with the observations of 'Type II' supernova light curves. They comment on other effects—such as the possible presence of a dust shell around the pre-supernova star—which add complications and could improve agreement. They predict that about 3–4 months after the light curve maximum ultraviolet and X radiation from the central cavity should become visible.

# Many a marmot

*from our Animal Ecology Correspondent*

ALL populations have a tendency to overproduce and, if they are not held in check, to damage the environment upon which they depend for existence. Some ecologists believe that control is enforced only by the actions of extra-population forces, such as the climate. Others hold that mechanisms which are dependent on the density of the population and which modify their effect according to the state of the population are at work. In proposing this system of control, Nicholson stated that the only perfect density-dependent regulatory factor is intraspecific competition; all other factors play less direct, though strongly influential parts (*J. Anim. Ecol.*, **2,** 132; 1933). Wynne-Edwards endorsed Nicholson's views and drew attention to the part played by social behaviour in the dispersion, and hence regulation, of animal populations (*Animal Dispersion in Relation to Social Behaviour*, Oliver and Boyd, Edinburgh, 1962). He stressed that intraspecific competition, be it for a territory, individual range, rank position in a hierarchy or the like, is never directed at the environmental resource in short supply but at a substitute. The winner of a substitute goal gains exclusive rights to some primary environmental resource.

If social behaviour really does play such an important part in the prevention of overpopulation (by allowing only a fixed number of goals to be open to competition) one might expect to