a "normal" star participates are, of course, supernovae, which are believed to leave behind pulsar remnants. This "radio supernova" type of event could, perhaps, be related to other violent events, such as supernovae and the processes operating in pulsars. Perhaps the most significant development in astronomy in the past five years has been the realization that there is no need to look at distant galaxies and quasars to see violent events and processes which are producing large quantities of energy; first radio astronomy, with the discovery of pulsars, then X-ray astronomy, with the discoveries made by the satellite Uhuru (now joined by another X-ray experiment on the satellite Copernicus), have shown that violently energetic outbursts are not uncommon much closer to home. Cygnus X-3 has now shown that such outbursts are even less uncommon; one hope is that a better understanding of the violence which goes on in our Galaxy will help the understanding of the violent events seen in extragalactic objects.—By our Cosmology Correspondent.

ELEMENTARY PARTICLES

New Detector Hope

from a Correspondent

THE detection of transition radiation, which is emitted when a fast charged particle crosses the boundary between two dielectric media, is a difficult but increasingly promising technique for distinguishing relativistic charged particles.

The problem of telling particles — say pions and protons—apart becomes a complicated business at very high energies. Hence the birth of the new generation of synchrotrons at Batavia (Illinois) and CERN (Geneva), capable of accelerating protons to 300 GeV or so, calls for novel techniques of particle identification. The trouble is that the higher the energy of the particle the more closely its speed approaches that of light. Thus conventional methods (at 20 GeV), which often rely on variations in velocity, become more and more difficult to apply.

Relativistic charged particles are not, however, difficult to detect; they can leave a trail of ions in their wake and may therefore be easily manifested with spark or streamer chambers. The problem is identifying particles that have the same deflexion in a magnetic field and hence the same momentum.

For some years Luke Yuan of the Brookhaven National Laboratory (husband of the formidable Mrs C. S. Wu) has been advocating transition radiation as a solution. It may be recalled that Čerenkov light is emitted if a particle passes through a dielectric medium at a speed greater than the velocity of light in the medium. In the case of transition radiation, photons can be given off when a charged particle goes from one dielectric medium into another. (It was the Russians Ghinzburg and Frank (in 1946) and Garibian (in 1960) who were responsible for the theory, and it would be appropriate therefore if this class of radiation could be named after them.)

From the point of view of particle physics, transition radiation has the advantageous property that the number of photons emitted is directly proportional to the particle energy, in fact to the Lorentz factor γ ($(1-\beta^2)^{-\frac{1}{2}}$ or E/m_0c^2). Furthermore, the emission is largely in the X-ray region. If, therefore, particles traverse a multilayered medium—a stack of foils or a piece of foam, for example — a count of the number of X-rays emitted should be a measurement of the energy of the particle.

Observing the X-rays, however, presents its own problems, partly because they are emitted essentially in the forward direction along the path of the particle. Sodium iodide or Ge(Li) detectors cannot sensibly be used in many instances because they are small and present a massive obstacle to the particle itself.

In their latest contribution, Yuan and his collaborators (*Phys. Lett.*, **40B**, 689; 1972) have considered the prospect offered by proportional counters with thin walls. This is not a simple option, for such a counter placed immediately behind the multilayered medium would produce pulses proportional not only to the ionization of photoelectrons ejected by X-rays, but also to the simultaneous ionization created by the energetic particle itself in traversing the gas in the counter. The task is to subtract the latter component.

In a fixed length of path, the total specific ionization by a charged particle is described by the Landau distribution (*Russ. J. Phys.*, **8**, 201; 1944). This differs from the Poisson distribution in that it has a tail representing occasional large deposits of ionization. It is this tail which complicates the detection of X-rays, because the aim of the exercise is to see the X-ray contribution to the pulse height distribution above that due to the particle. With a single counter it is not possible to say whether a large pulse corresponds to X-rays or indicates a tail event.

Yuan *et al.* chose to eliminate the uncertainty statistically by using a cascade of counters—in fact a cascade of Charpak multiwire chambers (see Dimčovski *et al.*, *Nucl. Inst. Meth.*, **151**, 94; 1971). If, say, thirty chambers are interspaced with multilayered transition radiators thirty pulses will be obtained every time a fast particle traverses the array. By obtaining (electronically) the geometric mean of all the signals the effect of the low probability tail can be substantially eliminated, although one still has a broad distribution to contend with.

In some tests with 10 GeV electrons crossing the chambers, the authors were able to record large mean signals indicating the X-ray contribution. These are early days, however, and it remains to be seen whether physicists will plump for this potentially valuable technique for identifying particles.

Isolation of Slime Mould Messengers

To date one of the chief limitations to investigations of the control and mechanism of protein synthesis in eukaryotes has been a lack of adequate supplies of messenger RNA. The discovery that many eukaryotic messengers possess a 3′ terminal stretch of 100 to 200 adenylic acid residues seems, however, to have provided biochemists with an opportunity to isolate messengers in large amounts. Firtel, Jacobson and Lodish, for example, in *Nature New Biology* next week (October 25) claim that it is now possible to obtain pure mRNAs in milligram amounts from the slime mould *Dictyostelium discoideum* by allowing extracts containing messengers to hybridize to immobilized poly(U); the poly(A) sequences in the messengers cause their specific retention.

The ultimate aim of Lodish and his colleagues is to programme cell-free systems with mRNAs obtained from *Dictyostelium* cells at the several well demarcated stages of the life cycle of this organism and so discover the pattern of genetic switching. So far they have established that about 75 to 95 per cent of *Dictyostelium* messengers contain a run of about 100 adenylic acid residues, that about 85 per cent of these messengers are transcribed from DNA sequences which are present in the genome as single copies and that the messengers seem to survive undegraded the isolation procedures to which they are subjected.

As Lodish *et al.* comment *Dictyostelium* is an ideal organism for studying the control of gene expression, for there is ample evidence that control is exerted at both the transcriptional and translational levels. What can be said with certainty is that whatever else may crop up to impede their goal there seems to be no shortage of messenger RNA.