where to stop synthesis ? If sigma factors act as capital letters, what are the full stops ? Last year Roberts reported from Harvard (*Nature*, **224**, 1168; 1969) the discovery of another factor, rho, which somehow tells an RNA polymerase molecule it has reached the end of a particular unit of genetic information and should stop making RNA. In theory, sigma and rho factors working together could provide a complete positive control mechanism to regulate sequential gene expression. Bautz and his colleagues (see page 1012), however, suggest that there may be more to the process than that. Like Travers, but less directly, they find that T4 sigma factor allows the polymerase to read genes which cannot be read if the enzyme is programmed by *E. coli* sigma. But they also find that some T4 genes are read very early in infection even though they are expressed as proteins only late in infection when all the *E. coli* sigma factor has disappeared. They suggest that this very early reading of late genes occurs because of a failure in the normal termination process. They envisage that at the outset of infection *E. coli* sigma and polymerase initiate the synthesis of the first phage RNAs to be made. These include, of course, the RNA specifying the T4 sigma factor. But instead of stopping RNA synthesis at the correct points the enzyme sometimes reads through the earliest genes and goes on to copy into RNA some of the genes expressed much later in infection when the T4 sigma is active. Such read-through must be the result of a failure in the *E. coli* termination mechanism; rho cannot be functioning properly. Bautz *et al.* suggest that one of the first phage proteins to be made together with the phage sigma is an anti-terminator which somehow stops the terminator, rho, from acting. To prove their point they must now isolate the putative anti-terminator.

GALAXIES

Ejected Clouds in Milky Way

from our Cosmology Correspondent

THERE is now increasing evidence that the centre of our own galaxy has at some time been the site of violent events comparable with those seen in Seyfert galaxies. The latest addition to this evidence comes from a survey of the high velocity component of the 21 cm profiles seen in the region $10° < l < 350°$, $-5° < b < +5°$ which has been carried out by P. C. Van der Kruit using the 25 m telescope at Dwingeloo (*Astron. Astrophys.*, **4**, 462; 1970). Van der Kruit has observed many of the well known features which lie in the galactic plane, but features which are not associated with the structure of the plane are all found to have velocities greater than would be expected from the rotation of the galaxy.

Almost all the material is expanding away from the nucleus, except for that in the nuclear disk, which is rotating very rapidly. At negative longitudes these features are seen above the galactic plane, and at positive longitudes below it, suggesting that clouds have been ejected from the nucleus in two roughly opposite directions, at an angle to the plane which may be the same as that of the secondary ridge of

continuum radiation found by Kerr and Sinclair (*Nature*, **212**, 166; 1966). Van der Kruit favours the idea that this matter has been ejected rather than that it is falling into the nucleus, and suggests that the energy in the required explosions would be as large as 10^{57} ergs, comparable with that seen in radio galaxies, and that they occurred 10^7 years ago. Many of the features of the ejected clouds can be explained satisfactorily in terms of the clouds seen emitted from Seyfert galaxies, provided that it is accepted that in our own galaxy the clouds have had time to expand to diameters about an order of magnitude larger than the clouds in Seyfert galaxies, with corresponding reduction in their outward velocities and temperatures.

Following the observations in the far infrared which support the hypothesis that the nucleus of our galaxy is similar to those of Seyfert galaxies (E. E. Becklin and G. Neugebauer (*Astrophys. J. Lett.*, **157**, L31; 1969) this evidence at radio wavelengths does much to encourage the idea that all galaxies pass through such an active stage in their evolution.

NUCLEAR MAGNETIC RESONANCE

In the Crystal Ball

from our Molecular Biology Correspondent

ANYONE wishing to lay a modest bet on scientific trends for the seventies might do well to give a thought to ^{13}C nuclear magnetic resonance of biological molecules. The first few cautious exploratory offerings in the literature may amount as yet to a cloud on the horizon no bigger than a man's hand, but the prospects are clear enough. In the first place, the chemical shifts are very much larger than for protons, and the possibilities for assignment and resolution of resonances are correspondingly greater. Second, the use of ^{13}C should make it possible to extend the method to macromolecules of much greater size than is feasible for proton resonance, and finally it has been demonstrated that there are good prospects of working on native materials, taking advantage of the natural abundance of the ^{13}C isotope.

This feature, which may in many cases eliminate the limitations and tedium of preparation of ^{13}C-labelled materials, is brought out in two articles that explore the ^{13}C-resonance spectra of natural nucleotides. Dorman and Roberts (*Proc. US Nat. Acad. Sci.*, **65**, 19; 1970) have examined a series of nucleotides in aqueous solution. Simply by means of comparisons of different sugars and pyrimidines, all the sugar and pyrimidine carbon resonances can be assigned; purine frequencies are assigned, at least in part, with the aid of procedures (heteronuclear decoupling) which make it possible to establish whether protons are attached to the nuclei from which particular resonances arise. The ^{13}C spectra of the common nucleosides have been analysed in an accompanying article by Jones *et al.* (*ibid.*, 27), which supports and completes the assignments, and emphasizes the remarkable degree of discrimination between carbon nuclei in only slightly different environments.

Another exploratory study, this time on amino-acids and some peptides, comes from Horsley, Sternlicht and Cohen (*J. Amer. Chem. Soc.*, **92**, 680; 1970). The materials were prepared from cultures of algae grown from a ^{13}C-enriched source. The chemical shifts are