cessing of messenger RNA. This information has come from the application of a few simple techniques, in particular that of identifying RNA molecules containing poly (A) sequences by their binding to poly (U) sepharose.

About 90% of the cytoplasmic poly (A)-containing RNA, which has a sedimentation coefficient of 8–30S, is found in polysomes and is therefore almost certainly messenger RNA. Each mRNA molecule has a stretch of 100–200 adenylic acid residues at the 3′ end, and about 90% of each molecule hybridizes to unique sequences in the DNA, leaving only 10% to anneal to repetitive DNA. Poly (A)-containing RNA molecules in the nucleus, on the other hand, are larger than those in the cytoplasm, though only by about 20%, and a greater proportion of each molecule hybridizes to reiterated DNA. The nuclear RNA sequences hybridizing to repetitive DNA are at the 5′ end of the molecule and are about 300 nucleotides long.

From these and other observations using pulse-chase techniques, Firtel and Lodish propose the following model for mRNA metabolism in the slime mould: RNA is transcribed from DNA, beginning at a repeated sequence, running through a unique sequence and ending in a second short repeated sequence. Poly (A) is then added post-transcriptionally and most of the 300 nucleotides at the 5′ end are removed before the molecule enters the cytoplasm, where it rapidly attaches to polysomes. This model has obvious implications for the arrangement of repetitive and single copy sequences in the DNA, and must certainly be elaborated upon in higher organisms where much larger mRNA precursors are present and more of the heterogeneous nuclear RNA never reaches the cytoplasm.

In the course of this work Firtel, Baxter and Lodish made some important observations which have subsequently upset long-held ideas about the regulation of gene expression during the development of *Dictyostelium*. After the vegetative amoebae have aggregated to form the motile pseudoplasmodium there is a sequential increase in the activity of a number of enzymes, such as those concerned with the synthesis of the "slime" sheath. Earlier studies, in which actinomycin D was used to inhibit total RNA synthesis by about 90%, had suggested that the messenger RNA for certain of these enzymes—for example, UDP-glucose pyrophosphorylase — is synthesized several hours before it is translated and until then is stored in a "masked" or inactive state. Firtel *et al.*, using their technique of selecting poly (A)-containing RNA molecules, show that very high doses of actinomycin D do not in fact completely inhibit the synthesis of mRNA and that this can only be achieved with high doses of actinomycin D and daunomycin (another DNA intercalating drug) together. Their results using these two drugs suggest that mRNA is translated soon after it is synthesized and that there is no intervening translational control mechanism.

The reason for *Dictyostelium*'s resistance to actinomycin D is not clear; the unique sequence DNA has a very low G+C content compared with other eukaryotes and the "slime" sheath may restrict entry of the drug. These findings, however, will undoubtedly serve as a cautionary tale against overinterpretation of other results using actinomycin D in developing systems.

EARTH'S MAGNETIC FIELD

Pacific Window in Doubt

from our Geomagnetism Correspondent

ALTHOUGH the Earth's magnetic field is largely dipolar, it also possesses non-dipole components which fluctuate much more rapidly with time. Almost all of the secular variation which has been observed during the past few hundred years may be attributed to changes in the non-dipole part of the field having periods in the range 10^2–10^3 yr, but over longer time scales there is an additional component in the secular variation due to wobble of the dipole with a periodicity of 10^4–10^5 yr. Of course, because the geomagnetic field has only been observed in detail for about 150 yr, the full ranges of non-dipole changes and dipole wobble have not been measured directly. But both types of variation contribute to the scatter of palaeomagnetic directions and, conversely, such scatter may be analysed to give estimates of secular variation in the past (palaeosecular variation).

Numerous analyses of this type have been made using rocks from various parts of the world; but perhaps the most important are those which purport to show that for at least several million years the secular variation (and thus, by implication, the non-dipole field) in the central Pacific region has been anomalously low. Certainly the non-dipole field there is demonstrably low at present; and studies of lava sequences in Hawaii (see, for example, Doell and Cox, *J. geophys. Res.*, **74**, 4857; 1969) suggest that the state of affairs is far from temporary. Why this should be so is far from clear; but one interpretation is that there is some inhomogeneity in the lower mantle beneath the central Pacific which either shields the region above from the field variations seen elsewhere or reacts in some way with the fluid core to suppress the corresponding part of the non-dipole field altogether. In short, the low figure for the central Pacific field, if real, has important geophysical implications.

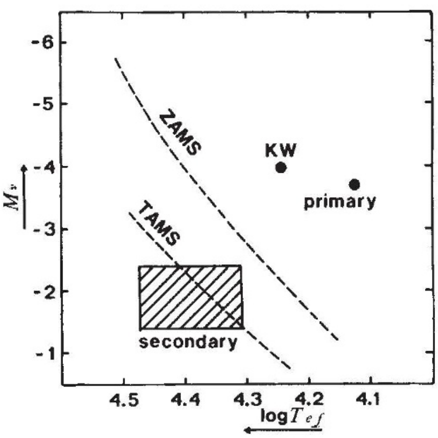
But is it real? Up to now the existence of the so-called Pacific window has been widely accepted even though its physical cause is uncertain. Aziz-Ur-Rahman and McDougall (*Geophys. J.*, **33**, 141; 1973) now suggest, however, that the phenomenon may be more apparent than real because of the pos-

Nature of Beta Lyrae

IF nothing else, the suggestion that black holes have been discovered in binary systems has certainly stirred the theorists into proposing alternative models. The latest contribution to the discussion comes from Kříž, who presents in next Monday's *Nature Physical Science* (September 17) a persuasive argument that β Lyr does not contain a black hole, but rather represents an example of Case B mass exchange in a close binary.

Although the secondary is certainly underluminous, Kříž argues that this underluminosity was exaggerated by previous workers. From OAO observations and other data, he concludes that the secondary is of type B0–B2, which corresponds to a main sequence star with the mass estimated for the secondary of β Lyr. Combining the evidence in a Hertzsprung–Russell diagram (see figure), Kříž's estimates of the properties of the secondary fall plausibly about the terminal age main sequence (TAMS) which Stothers has determined for the stage at the end of core burning when core temperature reaches a minimum (*Astrophys. J.*, **175**, 431; 1972).

The real problem, says Kříž, is not "why is the secondary underluminous?" but rather "why is the primary overluminous?". Even so, one model of Case B mass exchange in a 9 $M_\odot$+3.1 $M_\odot$ binary leads to a primary comparably overluminous (KW in the figure),



falling rather above Stothers's zero age main sequence (ZAMS). The black hole hypothesis cannot explain this overluminosity, and that seems to be powerful evidence against it.