PERMO-TRIASSIC

Problems left Unsolved

from a Correspondent

AN international conference, with problems of the Permian–Triassic boundary as its principal theme, was held from August 23–26 at the University of Calgary, Alberta, Canada. The keynote of the conference was set by Dr A. McGugan, speaking on behalf of Dr N. D. Newell (American Museum of Natural History, New York), who outlined some of the major problems of the late Permian and early Triassic. These included the almost universal occurrence of discontinuities or paraconformities at or near the system boundary, the general poverty of the contemporary fauna and the wide extent of essentially barren continental red beds.

The concept of a universal hiatus in marine strata at or near the system boundary was emphatically supported by Dr E. T. Tozer (Geological Survey of Canada, Ottawa), and, although there was some disagreement on exact placing, it was generally conceded that a break is present in each of the classic mid-Tethyan sequences of Armenia, Kashmir and the Salt Range of West Pakistan. The duration of the hiatus was thought on some palaeontological evidence to be of the order of one to two stages, but Dr W. G. Sweet (Ohio State University) considered that the break could not be recognized in conodont assemblages. In an unscheduled and characteristically forthright paper, Dr R. Assereto (University of Milan) asserted that the hiatus might have been shorter in some eastern parts of the southern Alps than in the classic sections farther east, and Dr H. Taraz (Geological Survey of Iran), whose view was challenged in discussion, suggested that no breaks were present in a thick late Permian and early Triassic marine sequence in central Iran. He proposed a loosely defined Abadeh stage for the time represented by post Djulfian pre-Triassic strata.

The staggered but progressive decline in late Permian floras and faunas was documented by several speakers, including Drs R. Toryama (Kyushu University) and G. L. Wilde (Humble Oil and Refining Company, Houston) who described the final stages in the evolution of the fusulinids, and Dr G. L. Batten (American Museum of Natural History, New York) who showed how a dramatic decrease in marine gastropod genera took place in the late Permian and was not fully recouped until the Ladinian. Among plants, Dr J. M. Schopf (US Geological Survey, Columbus) demonstrated a sharp unexplained change from the dominant *Glossopteris* flora of the Permian to a Triassic flora dominated by *Dicrodium*.

Several speakers speculated on the cause of the floral and faunal decline in the late Permian, without reaching agreement. Drs J. Pattison, D. B. Smith and G. Warrington (Institute of Geological Sciences, Leeds) suggested that a major cause might be the virtual elimination of shelf seas, during a prolonged phase of tectonic stability and peneplanation following rapid build-up of evaporites and progradation of coastal plain sediments. This view was supported by Dr B. Waugh (University of Hull) and, with variations, by several other speakers. There were tentative suggestions that the changes in the contemporary biota might have been related to the beginning of the break-up of Laurasia, and Dr G. F. Stehli (Case Western Reserve University) showed that seafloor spreading could be reconciled with the distribution of known Permian and Triassic biotas as well as that of evaporites and red beds.

The effects of late Permian and early Triassic plate movements along the Pacific margin of the United States were graphically interpreted by Dr N. J. Silberling (Stanford University), but Dr A. A. Meyerhoff (Tulsa), opposing the concept of continental movements, claimed that the biotic crisis could have been caused by cosmic ray and temperature maxima associated with rare galactic events of a type calculated to have prevailed near the end of the Permian. Finally, the view that late Permian floras and faunas might have declined following nutrient depletion and a progressive failure of lower members of the food chain was persuasively argued by Drs Helen Tappan and A. R. Loeblich (University of California).

In the closing sentence of his introduction, Dr N. D. Newell had expressed the wish that the conference would leave unsolved at least some of the Permian and Triassic problems: his wishes, perhaps unwittingly, were duly gratified.

How SV40 DNA Replicates

THE mechanism of replication of such covalently closed circular DNA molecules as the chromosomes of *Escherichia coli* and the coliphages lambda and ϕX 174 has long been a source of fascination to molecular biologists. And there continue to be arguments for and against the Cairns's model of replication, which predicts that none of the DNA strands in the replicating structure is longer than a parental strand and the two progeny strands are of equal length, and the rolling circle model, which predicts the occurrence of some DNA longer than parental strands and progeny strands of unequal length. The replication of the genomes of the DNA tumour viruses SV40 and polyoma virus, which are not only closed, circular, double stranded DNAs but are also supercoiled, presents, of course, the same topological problems as the replication of circular phage and bacterial DNAs. And the experiments published in *Nature New Biology* next week by Jaenisch, Mayer and Levine clearly indicate that it is by the Cairns's mechanism that these molecules duplicate.

Jaenisch and his colleagues used the Hirt procedure to extract preferentially the SV40 DNA from infected African green monkey kidney cells, which 40 h after infection had been exposed to ^{3}H-thymidine for periods ranging from 3.5 min to 120 min. They then analysed the viral DNA on sucrose, ethidium bromide–caesium chloride and alkaline gradients and examined it by electron microscopy. In summary they find that replicating SV40 molecules contain parental closed circular DNA strands as well as linear fragments of newly made DNA. Moreover, the DNA labelled during the shorter pulses is shorter than one complete SV40 strand and is not linked to parental strands; the rolling circle model, of course, predicts the opposite of these findings.

Molecules which are partially (10–70 per cent) replicated sediment faster than anticipated, but under the electron microscope the reason for this becomes obvious; these molecules have two untwisted branches of equal length attached to a third twisted or supercoiled branch and, as expected, the length of one untwisted strand plus the twisted strand is about the same as the length of a single relaxed SV40 genome. The electron microscope also reveals single stranded discontinuities at the forks and some 34 per cent of the molecules examined have these regions at both forks. If a single stranded region at a fork indicates a site of replication then at least some SV40 DNA molecules must be replicated in two directions from an origin, although this cannot be obligatory, for 41 per cent of molecules had only one fork with single stranded DNA.

By showing in reconstruction experiments that relaxed SV40 DNA molecules are not converted into covalently closed, double stranded circles during the experimental procedure, Jaenisch *et al.* have disarmed critics who might have suggested that *in vivo* the template for replication is a nicked DNA strand, which, during the experiment, is closed into a ring. And so it is hard to escape the conclusion that at least some SV40 DNA molecules replicate by the Cairns's mechanism.