news and views

Collaboration fixes unique QSO spectra

In these days of proliferating publications, the article which appears on page 743 of this issue of *Nature* is worthy of more than just passing attention. The paper itself is of great significance to astronomers, since it provides some of the first indications of the radio spectra of the QSOs OH471 and OQ172. These are the only radio sources yet definitely identified with optical objects which have redshifts greater than $z=3$, and as such they are, on the cosmological interpretation of those redshifts, the two most distant objects known to man.

The very high redshifts also affect the radio spectra, of course, although the absence of features comparable to the lines in optical spectra makes it impossible to measure the redshift of any QSO by radio observations alone. But in effect by shifting the radio spectra the redshift brings new regions into the band of frequencies which can be covered by radio telescopes based on Earth. Perhaps some of the features seen in these spectra are, then, typical of features which would be discovered at rather shorter wavelengths in the spectra of QSOs with smaller redshifts.

In the excitement caused by the identification of these objects, it would surely have been natural to expect everybody with access to a radiotelescope to make observations and rush them into print. The result would undoubtedly have been a scattering of reports in various journals, causing much adrenalin to be produced by other frustrated radio astronomers desperately trying to keep up with 'the literature' and to find some overall picture of the radio spectra of the two QSOs.

But in fact a different approach has been adopted. Contributions which might have formed the basis of ten separate short notes here, there and everywhere have been combined in the one article we are publishing today. The degree of international cooperation involved is notable even for astronomy; as a result this paper provides in one place just about all that needs to be said (at this stage) about the radio spectra of OH471 and OQ172. *Nature* is always happy to cooperate in ventures like this which both reduce the number of separate papers we have waiting to be published and, we hope, provide a service to the scientific community (see, for example, the Cygnus X-3 issue of *Nature Physical Science*, **239**, 113–136; 1972).

JOHN GRIBBIN

Origin of plasmocytoma cells

The DNA polymerase activity known as terminal deoxynucleotidyl transferase has been reported in murine plasmocytoma cells, with interesting implications for the study if tissue differentiation (see page 775 of this issue of *Nature*).

Terminal deoxynucleotidyl transferase differs from the other known DNA polymerase activities in mammalian cells in that it catalyses the addition of deoxyribonucleotides to the 3′-OH end of preformed polynucleotide chains in the absence of a DNA template. Although this effect has been useful as a model for the mechanism of polymerisation (*Proc. natn. Acad. Sci. U.S.A.*, **65**, 1041–1048; 1971) and for end group labelling of deoxyoligonucleotides (*Eur. J. Biochem.*, **22**, 271–276; 1971), the biological function of the enzyme is unclear, and it has been suggested that it is a degradation product of DNA polymerase. But its role as a marker for the origin and state of differentiation of certain cells is an interesting possibility.

The terminal transferase activity was first isolated in calf thymus, and has since been demonstrated in the thymus of numerous animals, but in no other tissue. Thus the activity seems to be entirely tissue specific, and also shows a development cycle which arises early in the process of embryonic development and persists in the thymus of young and adolescent animals.

McCaffrey *et al.* (*Proc. natn. Acad. Sci. U.S.A.*, **70**, 521–515; 1973) have found that cells from a patient with childhood acute lymphoblastic leukaemia (ALL) contain an enzyme with the properties of terminal transerase; this suggests that these tumour cells are thymic cells blocked very early in differentiation. Furthermore, the ALL cells lacked detectable surface immunoglobulin, a chacteristic of thymocytes. No activity was found in normal T-cells (thymus-derived lymphocytes), nor in three cultured human cell lines. This suggests that the enzyme was a marker for true thymocytes and provides hopes that an assay of this DNA polymerase might provide a diagnostic marker for whether a given leukaemia is of thymus or bone-marrow (bursal) origin.

Now Penit, Paraf and Chapeville have found that terminal transferase exists in murine plasmocytoma cells. This finding is surprising since these tissue-cultured cells have been thought of as B-cells (they express the immunological properties of cells derived from bone marrow). If the presence of terminal transferase activity in a cell is truly indicative of a thymic origin, then it would not be unreasonable to suggest that plasmocytoma cells represent an intermediate stage of differentiation between B and T cells. As Penit *et al.* point out, this has a precedent in a cloned line of thymoma (thymic tumour) cells produced by irradiation in mice. The thymoma cells possessed the T-cell characteristics of θ-antigen and anatomically thymic origin, and the B-cell characteristics of readily detectable surface immunoglobulin and immune complex receptor activity.

Unfortunately it is not yet possible to be certain that the expression of terminal transferase is evidence of an intermediate state of differentiation in plasmocytoma cells since immunological data are lacking, especially with regard to thymus antigens. A synthesis of immunological and biochemical approaches may elucidate the origin of cells containing terminal transferase activity and determine whether this will have diagnostic uses.

TONY PAWSON