negligible percentage of observing time has been lost through faults in it. A measure of the high regard which astronomers have for this device is the fact that it was used continuously on the 200-inch Hale telescope for a period of over 2 months last year and over 500 spectra obtained. At present it is the most powerful system of its type in the world.

The quality of the spectra displayed in the two papers in *Monthly Notices* speak for themselves. Besides the increased speed with which such spectra can be obtained, the main advantages lie in the determination of the absolute intensities of the lines and in the ease with which broad or weak features in the spectra can be recognised. For example, in the spectrum of NGC4151, over 80 narrow lines can be identified and absolute intensities are quoted for all of them. This much improved data base provides a new challenge to theorists for the construction of models of the line-emitting regions in complete nuclei. Perhaps more striking is the presence of very broad wings on the Balmer lines, the lines of He II and of Fe II. These are all permitted transitions and are much broader than the forbidden lines. The fact that no broad forbidden Fe II emission is observed indicates that the broad spectral features arise in regions where the particle density is greater than 10^7 cm^{-3}. This situation is very similar to that observed in 3C273 where the forbidden lines are either very weak or absent. In this respect 3C273 differs from most other quasars.

These papers represent the tip of the iceberg—hundreds more spectra await analysis in many different fields of astrophysics. Systems such as the IPCS will shortly be standard equipment on all the large optical telescopes; for example, Boksenberg and his colleagues are at present building a new version of the IPCS for use on the 4-m Anglo-Australian telescope. Thanks to the development of these devices, many very large scale projects which would have seemed quite impracticable 10 years ago are now within the capabilities of the new generation of telescopes. □

Madagascar issue settled

from Peter J. Smith

THE geographical position of Madagascar before the breakup of Gondwanaland has been a source of controversy for well over a decade. Before Wegenerian drift began, did this continental fragment lie to the north or south of its present location? Or has it always been at its present latitude, with only a small eastward drift to take it away from the African mainland and create the Mozambique Channel? The confusion now seems to be over, as palaeomagnetism has provided the definitive answer (Embleton and McElhinny, *Earth planet Sci. Lett.*, **27**, 329; 1975).

The first person to say anything about the ancient position of Madagascar was Wegener himself who placed the island in the large coastal embayment of Mozambique, or about 4° south of its present position. Intuitively (which is simply to say that there is some worth in the Baconian rule of "conformable instances"), this is the obvious place to put it, although there are also some respectable geological arguments for this view as Flores (*Trans. geol. soc. S. Africa*, **73**, 1; 1970) has shown. On the basis of aeromagnetic profiles across the Mozambique Channel, Green (*Nature phys. Sci.*, **236**, 19; 1972) also supported a fit against Mozambique, in which he was followed, on other grounds, by Kent (*Nature*, **238**, 147; 1972).

On the other hand, Darracott (*Earth Planet. Sci. Lett.*, **24**, 282; 1974), taking account of the thin continental-type crust in the Mozambique Channel, concluded that Madagascar has always been at its present latitude but has drifted slightly eastwards. This was a slight varient of an earlier proposal from Flower and Strong (*Earth planet Sci Lett.*, **7**, 47; 1969) that the island has remained stationary, although Wright and McCurry (*Earth planet. Sci. Lett.*, **8**, 67; 1970) felt that the evidence cited by Flower and Strong could not be taken to exclude eastward drift, arguing instead that Madagascar once lay against Mozambique.

The third and, on the face of it, more radical proposal is that Madagascar has moved about 15° southwards and slightly eastwards, in which case it would have originated against Kenya and Tanzania. This view was first put forward by Du Toit (*Our Wandering Continents*, Oliver and Boyd, Edinburgh, 1937) largely on the basis of matching lithologic units and later supported by Smith (A. G.) and Hallam (*Nature*, **225**, 139; 1970) on the basis of a computer fit of the 500-fathom contour. After carrying out a geophysical survey in the Mozambique Channel, Heirtzler and Burroughs (*Science*, **174**, 488; 1971) also concluded that Madagascar has drifted southwards.

Among the mass of conflicting geological and geophysical evidence, palaeomagnetic data is conspicuous by its absence. It is easy to be wise after the event, but an obvious way of deciding between the three hypotheses would be to obtain a palaeomagnetic direction for rocks laid down on Madagascar before Gondwanaland split and compare it with African mainland directions for the same epoch. It is true that over a decade ago Nairn (*Overseas Geol. Min. Resour.*, **9**, 302; 1964) obtained a palaeomagnetic direction from the Karroo sediments of Madagascar, but no magnetic cleaning techniques were used and at that time there was no suitable African data for comparison.

Using modern methods, Embleton and McElhinny have now obtained a good palaeomagnetic pole position from Triassic-Jurassic sediments on Madagascar and have compared it, first, with the Triassic-Jurassic African pole and, second, with the African pole for the whole of the Mesozoic (possible because Africa has apparently remained fixed in position during this period). Irrespective of how the comparison is carried out, there is no significant difference between the Madagascan and African poles only if Madagascar was north of its present position during the Triassic-Jurassic. In other words, according to palaeomagnetic evidence there is little doubt that before the onset of Wegenerian drift Madagascar lay off the east coast of Africa adjacent to Kenya and Tanzania.

Having made this central point, Embleton and McElhinny go on to cite the geological and faunal observations in its favour. This evidence is convincing too, although no doubt some puzzles still remain. The fact is, however, that the grounds of argument have now shifted. Any geological 'anomalies' must now be reconciled with Madagascar's northern origin; they can no longer be regarded as convincing evidence against it. □

Immunoglobulins: constant sequences in the variable region

from Pamela Hamlyn

ANTIBODIES—the vast number of protein molecules which react specifically with foreign substances to trigger the immune response—are complex molecules all very similar in design. Each has two heavy (H) and two light (L) chains. Both H and L chains contain a constant (C) and a variable (V) region with regard to amino acid composition. Analysis of related L chains has shown that different amino terminal regions are associated with the same C region and has led to the suggestion that, unlike all other polypeptides, two genes are needed to code for one polypeptide chain. The number of C region genes