news and views

CO_2 variations and the Southern Oscillation

from John Gribbin

THE so-called "quasi-biennial" oscillations of the atmospheric and oceanic system, which produce variations in weather parameters with 'periods' of anything from a year to at least half-a-dozen years, but usually averaging between two and three years, are among the best known and most intensively studied climatic phenomena—but not necessarily the best understood. One very important member of this family is the Southern Oscillation, which is most clearly identified by variations in pressure with a timescale of two to two and a half years over the Southern Hemisphere; these variations are often very highly correlated between the two key areas around Jakarta (Indonesian low) and Easter Island (South Pacific high), and to a lesser extent the variations can be correlated with features of the Northern Hemisphere circulation. The Southern Oscillation is not, then, some local or even hemispheric phenomenon, but rather a particularly obvious manifestation of the general tendency of the atmosphere/ocean system to vary on this kind of timescale, and study of just how this oscillation does interact with other parts of the atmosphere/ocean system is important in the context of understanding quasi-biennial oscillations in general—and, ultimately, producing better forecasts.

Lamb has succinctly summed up the situation (*Climate: Present, Past and Future*, **1**, Methuen, 1972): "the Southern Oscillation and its roughly 2- to 3-year periodicity can clearly be taken to involve an alternation in the pattern and rate of heat distribution affecting much of the world and its wind circulation . . . the Southern Oscillation should be seen as related to the liability of the equatorial Pacific to some of the biggest and most extensive anomalies of sea surface temperature in the world". These anomalies have one very obvious and significant effect in the phenomenon known as El Nino, which brings high rainfall to generally arid regions of the equatorial Pacific, and although the link between this phenomenon and the Southern Oscillation is not entirely clear, anomalous conditions at the Easter Island high do seem to be involved.

It is with the importance of an understanding of the Southern Oscillation to our understanding of the whole atmosphere/ocean system in mind that the contribution by Bacastow on page 116 of this issue of *Nature* should be read. Bacastow claims that after a great deal of filtering to remove both seasonal effects and the long-term increase attributed to man's activities the record of carbon dioxide variations in the atmosphere indicates a correlation with the Southern Oscillation. Critics might take Bacastow to task for making the most of somewhat limited statistical evidence which he admits involves adjustments in some cases so that "the fit appeared reasonable to the eye", and which even then end up with correlations which although high enough to be interesting are not conclusive on the basis of these limited data alone. In addition, the very small variation in carbon dioxide levels (less than one third of 1%) seems to occur before the changes in the Southern Oscillation which might be expected to drive them. Nevertheless, although it seems unreasonable to suggest that the carbon dioxide variations might drive the oscillation, there remains the important possibility that both are being driven, or at least modulated, by some outside influence which has yet to be identified.

The somewhat tentative nature of the model proposed is, however, indicative of the tentative state of our understanding of the way the atmosphere and ocean interact. It is easier to appreciate that a thorough understanding of atmospheric variations can only come hand-in-hand with a thorough understanding of oceanic variations, but much harder to see where to begin to tackle the enormous problems involved in developing such an understanding. If the views of some climatologists are to be taken at face value, there is now also an element of a race against time to determine the natural patterns of such change before they are destroyed by man's activities—the controversy about carbon dioxide levels and man being a case in point—and prediction of these anthropogenic effects can only be achieved after an understanding of the natural processes has been developed. The specific case of the interaction between the Southern Oscillation and carbon dioxide uptake of the southern ocean is of direct relevance to the controversy over carbon dioxide pollution and its effects on the atmosphere and oceans; the broader view—what drives all these quasi-biennial oscillations—is perhaps of even greater importance now that the world food production and distribution systems can be so easily shaken by "bad" weather, as we have seen in recent years. □

More speculation on human evolution

from Robin Weiss

WHILE fossil finds hit the headlines, comparative biochemistry also has its place in the discourse on the origins of our species. Two papers in this issue of *Nature* take up this discussion, one from the viewpoint of amino-acid sequences in proteins, the other of nucleotide sequences in DNA. Romero-Herrera *et al.* (page 162) discuss the amino acids residing at two positions in the highly conservative muscle protein, myoglobin, which accepts oxygen from the blood. On the basis of the amino-acid residues in positions 23 and 110 of the myoglobin chain, these authors draw up 'cladograms' or evolutionary trees that might indicate the relationship of man to the higher apes. The most economical cladogram in the sense of providing the minimum number of point mutations in the gene for myoglobin shows the orang-utan diverging from the other higher apes and man before the gibbon does. The problem with 'economy' of mutation is that it assumes that mutations are always selectively disadvantageous. This may be true for myoglobin, but resi-