news and views

Revival of Milankovitch

from George J. Kukla

To support a century-old controversial theory that no one has yet been able to prove or disprove convincingly is an unrewarding business. Obviously though, something great must be in the making if the head of the UK Meteorological Office, certainly not one to suspect of holding irresponsible revolutionary views, ardently reapproves the Milankovitch theory of glaciations (see *Nature*, **260**, 396. 1976). According to the report, Mason was impressed by the coincidence in the length of orbital periodicities with those found by Hays, Imbrie, and Shackleton (unpublished) in the ^{18}O records of some deep-sea cores. Geologists will be pleased but hardly surprised by the convincing answers of the computerised correlation. Fifty years ago, Eberl (*Die Eiszeitenfolge im Nordlichen Alpenvorlande*, 1930) demonstrated that the number of alpine Pleistocene terraces coincides with Milankovitch minima and 10 years ago, Broeker, (*Science*, **151**, 299; 1966) summarised available isotopic chronologies of Late Pleistocene and reported a remarkable resemblance to insolation curves. As for the energy involved, Mason sees the quantities in the "right ball park" which contradicts a view held by Shaw and Donn (*Science*, **162**, 1270; 1968). Now Weertman in this issue of *Nature* (page 17) demonstrates that Milankovitch variations are large enough to set the continental ice sheets into motion. But this is possible only if precipitation in high latitudes is much greater than today.

Here is where the problem begins: to find the details of the mechanism through which insolation changes climate. Although today the astronomical part of the Ice Age theory is fairly reliable, Koppen and Wegener's original ideas on the direct impact of insolation on glaciers are, in the light of modern climatology, naive at best. Redistribution of energy in the Earth–atmosphere system, which operates through a number of delicate feedbacks makes the problem extremely complicated (Kellogg and Schneider, **186**, 1163; 1974).

The largest effect of orbital perturbations is in the changes of seasonal and geographical distribution of radiation over the globe. In order to influence the climate, sensitive areas and seasons must be affected by insolation to a greater degree than in the rest of the year (Kukla, *Nature*, **253**, 600; 1975). Finding these zones and intervals is critical for understanding climate dynamics. No valid explanation of past climates or successful seasonal forecast is possible without first solving this key problem. Subdivision of yearly insolation into only summer and winter segments or simple global circulation models incapable of handling subtle feedbacks, can hardly provide an answer.

Suarez and Held (of Princeton University's Geophysical Fluid Dynamic Laboratory) used an energy balanced model which simulates the seasonal cycle and produces a large change in the extent of permanent snow and ice when past insolation structures are applied.

Berger (*EOS*, **57**, 254; 1976) has provided us with insolation values at twelve mid-month intervals in ten degree latitudinal belts for the past million years. His calculations of August irradiation on top of the atmosphere indicate a peak (744 Ly d^{-1}) 8,000 years ago at 60°N and a minimum of 679 Ly d^{-1}, 19,000 years ago. The difference of 65 Ly d^{-1} is undoubtedly large enough to affect the surface heat balance even without the volcanic dust triggers proposed by Bray (*Nature*, **260**, 414; 1976). On the other hand, the glacial–interglacial difference of 65 Ly d^{-1} is relatively small compared with the annual amplitude of irradiation to 60°N latitude. Insolation drops and rises by that amount in less than 10 days every October and April.

Despite millions of data bits on every element of the Earth–atmosphere system we still know lamentably little on the weather system response to this 10 day insolation shift. Can we expect to find the answers from spotty geological evidence accompanying the same irradiation change occurring over ten thousand years? Can we hope to understand glaciation and deglaciation without understanding fall and spring? With the wealth of data already at hand shouldn't we start to look seriously into the mechanism of the seasonal cycle? □

Control of transcription of the ovalbumin gene

from Pamela Hamlyn

THE well-characterised eukaryotic mRNAs have all been isolated from cells in which they are the predominant mRNA. The mRNA for ovalbumin is no exception being the major mRNA species in part of the hen oviduct, however, it is of particular interest since its production can be induced in immature chicks by treatment with the hormone oestrogen. On administration of the hormone there is a concomitant proliferation of tubular gland cells in the oviduct. When the treatment ceases (withdrawal) the number of these cells drops to 10–15% and ovalbumin synthesis becomes undetectable. This system is of interest to endocrinologists and also to molecular biologists, who have used it as a model system to study the control of protein synthesis (Palmiter, *Cell*, **4**, 189; 1975).

It has been known for some time that oestrogen, after diffusing into cells, combines with a protein, and that the complex migrates to the nucleus where it remains bound to the chromatin. This is a specific reaction; it has been shown that the hormone–receptor complex will not bind to the chromatin of non-target cells. Since the oestrogen appears to bind (by way of the receptor) to the genetic material, and since one of the observed effects is the synthesis of the protein ovalbumin, the study of the mRNA was an obvious next step.

Initially ovalbumin mRNA was