effect can explain the previously perplexing patterns of accumulation of gangliosides and globosides in patients with the various forms of TSD; Hex A, but not Hex B, is strikingly activated. Finally, three TSD patients with apparently normal Hex A activity (AB variant) were found to lack the Hex A-activator protein. It is very likely that analogous activator proteins specific for sulphatides and other lipids exist. They may prove to have interesting protein structures, and a sulphatide-specific activator protein may account for known cases of metachromatic leukodystrophy (MLD) with apparently normal activity of the arylsulphatases.

These highlights illustrate the power and sensitivity of genetic approaches to studies of complex functions of the nervous system and behaviour.

As this Symposium was an integral part of the Jerusalem meeting of the ISN, it is significant to note that Professor Ekram Abdel Salam of Cairo University and Professor Yadin Dudai of the Weizmann Institute were both active participants. In the near future, we expect that such contacts will be made directly in Egypt and in Israel. □

Interstellar molecules

from B. Zuckerman

AFTER a decade of explosive growth, the study of interstellar molecules has reached a certain level of maturity. That seemed to be the picture that emerged from a recent symposium at which the organisers rather successfully blended a combination of astronomers, physicists, chemists and spectroscopists. That they were perhaps not entirely successful was suggested during the presentation of one European astronomer, when a "thank you" from the speaker directed to the slide projectionist woke up a sizable fraction of the audience who then proceeded to deliver an unexpected round of applause.

The startling new results that characterised the early 1970s were absent from this symposium. Still there are many controversies and mysteries yet to be unravelled. In spite of the very low temperatures and fairly quiescent states that characterise most interstellar molecular clouds there is evidence of surprisingly energetic phenomena hidden deep inside some clouds. S. Beckwith (Cornell University), T. Geballe (California Institute of Technology), N. Scoville (University of Massachusetts, Amherst) and D. Hollenbach (NASA Ames Research Center) discussed high velocity gas and shock waves in the cloud behind the Orion Nebula. The very large energies associated with the high velocity gas imply the existence of massive stellar winds or an explosive event (perhaps a supernova) inside this molecular cloud.

Even for the more typical molecular cloud, J. Silk (University of California, Berkeley) and C. Norman (University of Leiden) suggested that support against gravitational collapse can best be provided by energetic winds from new stars similar to the Sun that have just formed inside the clouds. That molecular clouds are somehow stabilised against free-fall gravitational collapse now seems generally, although perhaps not universally, accepted. Indeed the present controversy rages around the question of whether the giant molecular cloud complexes 'live' for at least a few times 10^8 years (P. Solomon, State University of New York, Stony Brook) or 'only' a few times 10^7 years (L. Blitz, University of California, Berkeley). In the former case the molecular clouds are well distributed throughout the inner disk of our Milky Way Galaxy, in the latter case they are confined to the spiral arms. Future observations of carbon monoxide in external galaxies should resolve the matter.

A renaissance in this field awaits development of sensitive new receivers especially for wavelengths $\lesssim 1$ mm to be used with large new mm wavelength telescopes and interferometers presently under construction or envisaged. Previews of some of the exciting results to be expected at high frequencies were given by P. Vanden Bout (University of Texas) and by T. Phillips (Bell Telephone Laboratories). Phillips reported submillimetre observations of CO (at 461 GHz) and of H_2O (at 380 GHz) obtained from NASA's Kuiper Airborn Observatory.

One of the fundamental limits in this field is the total number of different interstellar molecules that may eventually be found by radioastronomers. P. Thaddeus (Goddard Institute for Space Studies, New York) pointed out that 52 interstellar molecules have now been identified but, from considerations of the limits set by confusion due to overlapping weak lines from various molecules, he estimated that probably only about three times this number would ever be identified. Even so, the microwave spectroscopists will have their work cut out for them if we are to assign the observed transitions properly. □

*The Symposium on Interstellar Molecules was held at Mont Tremblant, Quebec on 6-10 August and sponsored by the International Astronomical Union in conjunction with the Herzberg Institute of Astrophysics and the National Research Council of Canada.

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The end of the Cretaceous

from A. Hallam

IT is widely recognised that the end of the Cretaceous witnessed one of the most significant mass extinction events in Earth's history, both on land and at sea. Whereas certain groups like the ammonites had been in decline for some time, others such as the dinosaurs and planktonic foraminifers were still flourishing until the end of the period. The many hypotheses that have been proposed to account for this striking extinction event fall into two categories, respectively invoking extra-terrestrial and terrestrial causes.

The extra-terrestrial or 'astronomical' hypotheses involve increased levels of some form of unpleasant radiation from outer space, perhaps at times of geomagnetic reversals. They have been strongly criticised and are not widely accepted today but the general notion cannot yet be decisively discounted and has been recently revived by Reid *et al.* (*Nature* **259**, 177; 1976; **275**, 489; 1978), who suggest increased ultraviolet radiation at the Earth's surface as a result of breakdown of the protective ozone belt, caused by increased solar proton flux or supernova explosions. One of the strongest arguments against such radiation events to account for various mass extinctions in the past is that terrestrial floras were comparatively unaffected. It is noteworthy therefore that Krassilov (*Palaeontology* **21**, 893; 1978) has recorded an abrupt change in terrestrial floras across the Cretaceous-Tertiary boundary.

The 'terrestrial' group of hypotheses usually postulate some form of sea level and/or climatic change. There is good stratigraphic evidence of a major eustatic regression at the end of the Cretaceous, and such regressions plausibly account for a number of mass extinction episodes of shelf faunas in the Phanerozoic, but it is not so evident why planktonic and terrestrial groups should be seriously affected. One ingenious solution to this problem was proposed some years ago by Tappan (*Palaeogeog., Palaeoclimatol., Palaeoecol.* **4**, 187; 1968). She postulated that the production of marine phytoplankton controlled the oxygen and carbon dioxide levels of the atmosphere through time, and that changes in relative and absolute abundance of these organisms had extensive effects on contemporary biota. Following the major late Cretaceous transgression which preceded the end Cretaceous regression, the influx of nutrient supply from land dropped as continents were reduced to base level. This and other associated processes led to a marked reduction in marine phytoplankton and a consequential

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