It is possible that the anti-centre feature is related to that part of the local spiral arm known as the Orion Spur[8], although there is nothing to show in our meagre evidence in the direction of Orion ($l^{II} = 209°$, $b^{II} = -19°$) that there are any field reversals. The absence of the feature in the distribution of polarized galactic emission[9], which probably originates within 50 parsec of the Sun[4], implies that the field distortion is confined to the outer edge of the spiral arm, at a distance of 200–500 parsec. The other field irregularity near $l^{II} = 15°$, $b^{II} = +10°$ is not as well defined by the data but coincides with another neutral hydrogen spur, where again the gas flow is outward. By contrast, in all other directions at galactic latitudes similar to these spurs the motion is inward. In the direction of the second spur, however, contributions from the central region of the Galaxy might complicate the situation.

It is possible that additional irregularities of the type described here occur in other directions, but for these the existing longitudinal field will tend to mask small scale reversals, which will then not be distinguishable from variations in, for example, electron density.

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PLANETARY SCIENCE

Tektites and Geomagnetic Reversals

THE microscopic glassy objects which occur in sediments deposited in the Australasian area during and shortly after the last magnetic polarity reversal are apparently tektites (see succeeding communication). The last reversal occurred $0\cdot7 \times 10^6$ yr ago: potassium–argon dates[1] indicate that the Australasian tektites were formed $0\cdot7 \times 10^6$ yr ago. The tektites were formed and deposited at the same time as the geomagnetic field reversed, and so both phenomena could have a common cause.

The principal hypotheses of tektite origin involve collisions of asteroids, meteorites or comets with the Earth or the Moon. The close correspondence between the $0\cdot7 \times 10^6$ yr date of deposition of the Australasian tektites (indicated by the palaeomagnetic stratigraphy) and the $0\cdot7 \times 10^6$ yr date of their formation (given by potassium–argon and fission track ages)[1,2] shows that the tektites could not have originated in their present form outside the Earth–Moon system. The absence of aluminium-26 also shows that tektites in their present form could not have existed in space for more than 90,000 yr[3]. The aerodynamic[4] evidence that tektites were formed in a near vacuum[5] supports the theory that they were ejected from the Moon; but the discovery that impact glasses found in cryptoexplosion craters are of the same age as the associated tektites[6] suggests that the collisions were with the Earth. Soviet investigators concluded that the 1908 Tunguska meteorite fall resulted from the explosion of a small comet in the atmosphere. It spread silicate and magnetic spherules over an area 20–30 km in radius[7].

The deep-sea microtektites of the Australasian fall are dispersed through a sediment zone which represents 40,000–100,000 yr of deposition. The tektite fall was probably instantaneous, and so dispersal through a layer 30–60 cm thick suggests that bottom currents[8] and invertebrate burrowers mixed the microtektites upwards into sediment deposited during the following 40,000–100,000 yr.

It has been estimated that the total weight of tektites in the Australasian strewn field is 1,000 tons[9]. The weight of the microtektites, however, assuming average concentrations of $50/cm^2$ and an average diameter of 0·02 cm, is 150×10^6 tons. Such a mass would be equivalent to a body 0·3 km in radius. This hundred thousand-fold increase in the estimated minimum mass should be an important consideration in future discussions of tektite origin.

The Earth's main dipole field is thought to be caused by dynamo action taking place in the Earth's core[10]. Although polarity reversals are suspected to be governed by oscillations of the dynamo, there is no general theory. The discovery that the Australasian tektite fall coincided with the last reversal of the Earth's magnetic field suggests that a common cause was responsible for both phenomena. An encounter of a cosmic body with the Earth which left identifiable debris spread over 4 per cent of the Earth's surface could have had mechanical or electro-magnetic consequences on the magneto-hydrodynamic motions of the Earth's core. One might thus speculate that cosmic encounters caused at least some of the geomagnetic reversals which have occurred each $0\cdot5–1 \times 10^6$ yr throughout the late geological history of the Earth[11].

An investigation of the palaeomagnetic stratigraphy of the other known tektite deposits and a search throughout the world for tektites in sediments deposited during other reversals are necessary steps in order to rule out the possibility of an accidental coincidence.

An encounter of a cosmic body with the Earth would have obvious direct biological effects at least in the area of impact. It has already been suggested[12] that the temporary reduction in the Earth's field[13,14] attendant with the polarity reversal would effect organic evolution through the increased bombardment of the Earth by cosmic rays. Thus, the combined physical and evolutionary consequences of cosmic encounters can be recorded in geologic history.

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Microtektites in Deep-sea Sediments

AN examination of deep-sea sediments deposited south of Australia and Sumatra during and after the last polarity reversal of the Earth's magnetic field resulted in the

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