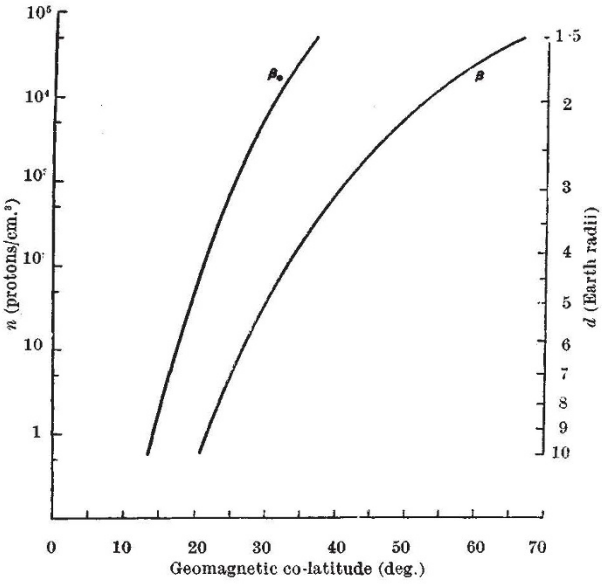

Fig. 3. Geomagnetic co-latitude of points on the Earth's surface connected magnetically to the outer edge of the Van Allen belt on the side towards the solar wind (β_0) and away from the solar wind (β). The right-hand scale shows the stationary position of the stream front and the left-hand scale gives the corresponding solar wind density, assuming the particles to be protons travelling with a velocity of 1,000 km./sec.

the increased magnetic energy density of the field. The extent of the drift can be seen to correspond roughly to the observed latitude drift of the hydrogen emission shown in Fig. 1, if moderate particle stream densities are assumed.

This correspondence leads us to suggest that the Van Allen belt contains protons which are removed by some process not yet fully understood, and which then penetrate the atmosphere and give rise to visible emissions. On this view the particles responsible for the initial stages of the aurora are not directly of solar origin, though they may be remnants of previous particle streams which have become trapped in the geomagnetic field. The Van Allen belt merely acts as a reservoir which is induced to spill over by the increase of the solar wind 'strength' on the sunward side of the Earth.

These ideas will be discussed more fully in a future publication[6] where more detailed consideration will be made of the underlying assumptions and of the processes which are operative.

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[1] Rees, M. H., Romick, G. J., and Belon, A., *Plan. and Space Sci.* (in the press).
[2] Biermann, L., *Z. Astrophys.*, **29**, 274 (1951); *Z. Naturforsch.*, **7**,*a*, 127 (1952); *Observatory*, **77**, 109 (1957).
[3] Parker, E. N., "Physics of Fluids", **1**, 171 (1958).
[4] Van Allen, J. A., and Frank, L. A., *Nature*, **183**, 430 (1959).
[5] Chapman, S., and Ferraro, V. C. A., *Terr. Mag. and Atmos. Elec.*, **36**, 77, 171 (1931); **37**, 147, 421 (1932).
[6] Reid, G. C., and Rees, M. H., *Plan. and Space Sci.* (in the press).

Colour Photography of the Aurora

Størmer[1] refers to the difficulty of photographing the aurora in colour, and states that satisfactory results have not been obtained, except for arcs and more quiet forms. However, with a colour film now available commercially, it has been found that the aurora australis can be photographed with exposure times comparable to those used in monochrome photography.

A test series of colour photographs has been taken at Scott Base, in Antarctica, during May and June of this year. Super Anscochrome daylight film (speed rating: 100 A.S.A.) has been used in an all-sky camera[2] with an $F/1{\cdot}4$ lens, and exposure times of up to 2 min. Using a standard Super Anscochrome developing kit, the speed of the film has been increased to approximately 200 A.S.A. by increasing the time of the first development 75 per cent over the recommended time. This has led to little noticeable change in the colour balance of the film.

With exposure times of 1 min., stars of the second magnitude are plainly visible on the film. A 2-min. exposure enables the Milky Way to be seen on the film. This corresponds to the visual limit of auroral observation, and is confirmed by comparisons with visual observations. An aurora just detected by a visual observer is recorded on the colour film with a 2-min. exposure. Auroræ of this intensity are below the human colour vision threshold, and thus appear colourless. (Observers frequently record these auroræ as 'faintly greenish-white'). Because of the integrating properties of the colour film, the colour 'latent' in these colourless displays is recorded on the film. Thus auroræ observed recently at Scott Base have frequently appeared white by direct observation, and red, purple, blue and white on the colour film. Spectrograms taken at the same time have shown relative spectral intensities which, it is estimated, would correspond to the colours observed with the colour film.

These observations are part of the research programme at Scott Base and are being made in conjunction with the observational programme of the Dominion Physical Laboratory Auroral Station, Invercargill, New Zealand.

The loan of the all-sky camera from the Air Force Cambridge Research Center, Bedford, Massachusetts, is gratefully acknowledged.

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[1] Størmer, C., "The Polar Aurora", 141 (Oxford, 1955).
[2] Elvey, C. T., and Stoffregen, W., "IGY Instruction Manual", Part 2, 133 (London, 1957).

Possible Reversals of the Earth's Magnetic Field in the Jurassic Period

In a recent study of the natural remanent magnetization of the Upper Lias Sands of the West of England, seventeen samples collected from two sites were found to have reverse directions of magnetization. Samples a little higher and lower in the succession were found to be normally magnetized. Numerical details of the results and reasons for considering the rocks in question to possess a stable magnetization will be given separately.