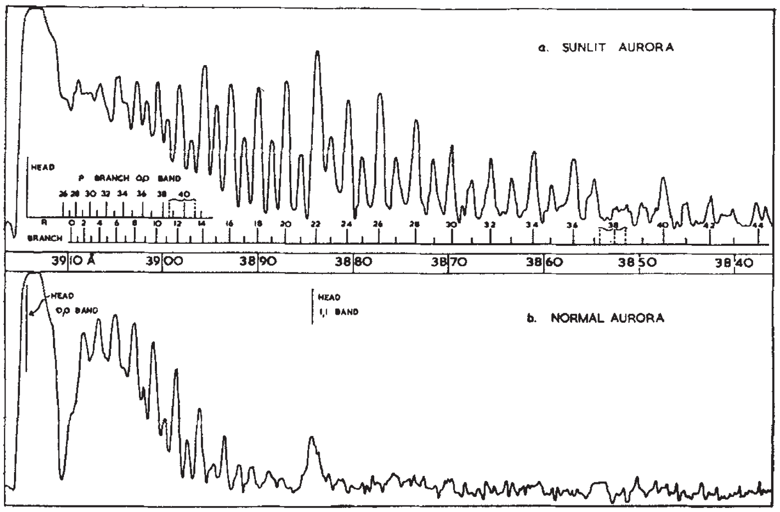

Fig. 1

could result from this mechanism, but that the distribution among the levels would be smoothed by collisions without lowering the temperature. This seems rather unlikely, especially if many of the collisions are with N_2, since charge-exchange can reduce the rotational temperature to the ambient in a single collision. It is at least possible that this observation shows a kinetic temperature of 2,100° K. at a height which is likely to be in the range 300–600 km.

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PHYSICAL SCIENCES

Wear of Graphite Surface by Punching and Planing

The wearing process has been studied in detail on graphite basal plane surfaces rubbed by metallic micro-probes while being observed with a microscope having epi-illumination. When the graphite was smooth and flat, the probe under very light force could be passed repeatedly over the graphite without damage. Under increasing normal force, however, the surface showed a few sharp shadow lines extending away from the contact region, and these were interpreted as boundaries of stress or dislocation within the crystal.

Upon sustaining the contact pressure at a site showing such lines, by stopping the motion, it was found that the basal plane surface sometimes collapsed locally, in time-dependent manner. Instantaneously with the collapse the lines disappeared, and a tiny scar was found when the probe was moved away.

The scars were very shallow and in appearance resembled a hole in a skating rink with chips lying at the borders. It was evident that a graphite fragment had been punched out of a basal plane layer, and remained tilted against it if not completely pushed aside. When the probe was slid away from a scar, a wear track almost invariably began at the first pass and continued without diminishing.

These wear tracks were characteristically uniform in width and depth so that long straight lines of ruled geometry were easily drawn. The debris in the form of thin platelets was rather cleanly swept to the borders of a track and could sometimes be fitted back into it.

This type of wear was seen to occur through a planing of the basal plane surface. It appeared that the metallic probe itself could produce the wear track by penetration of the basal plane at the scar, or that the probe could trap a graphite fragment from the scar, which fragment then served as a secondary tool for the planing. It is easily imagined that the edges of such a fragment would tend to engage the opened edges of the scar so that a continuous wearing process would inevitably follow.

Wear by planing also started when the probe passed from smooth basal plane surface across a step (in the range 10^{-4}–10^{-5} cm. height), either upward or downward. In the first instance the basal plane was penetrated directly by passage of the probe against the riser of the step. In the second instance the probe usually produced a fragment by local collapse of the edge of the step under pressure at the descent. In both instances a continuous wearing process followed.

In these instances of wear by planing, the graphite surface was continuously delaminated by the tool. A characteristically different wearing process, also in the graphite basal plane, will be called 'peeling', and will be described in a later publication.

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Metallic Conduction in the Crystal Compounds of Graphite

A marked increase of electrical conductance on forming crystal compounds of graphite with bromine, and even more with alkali metals such as potassium, has been previously attributed to electron transfer between the carbon hexagon networks, acting as amphoteric macro-aromatic molecules, and the intercalated atoms[1]. It was further suggested that the bonds between these macro-aromatic molecules and atoms such as potassium were metallic in character. Existing evidence indicated that electron transfer is less complete than when salts are formed with