change could be proved and the soils are definitely palaeosols (for example, Australia, N. Japan), a generalization seems to be justified. Therefore observations on these soils may have implications for palaeoclimatology.

Soils in which hematite (as well as goethite) is presently forming are well aerated and permeable, and slightly acid to calcareous. They occur under a warm subhumid to semiarid mediterrane or even arid climate (for example, Red Brown Earths of Australia[6], Hamra soils of Israel, Red Desert Soils of California[7,8]). This is in accord with the idea of a low ratio between supply of organic compounds and Fe release by weathering favouring hematite formation. Perhaps hematite is also forming in soils under moist tropical climatic conditions, where organic matter decomposes rapidly compared with a high rate of Fe release in acid conditions. This is, however, somewhat uncertain as many soils in these areas are probably non-recent and thus may have been influenced during their formation by other climates. Also at least some of the recent soils in these areas are brownish in colour rather than red.

U. SCHWERTMANN

Institut für Bodenkunde,
Technische Universität Munchen,
805 *Freising-Weihenstephan*

Received March 18; revised June 7, 1971.

[1] Daniels, R. B., *et al.*, *Soil Sci. Soc. Amer. Proc.*, **34**, 648 (1970).
[2] Matsui, T., *Proc. Seventh Cong. Quaternary Soils*, **9**, 222 (1967).
[3] Maud, R. R., *J. Soil. Sci.*, **16**, 60 (1965).
[4] Schwertmann, U., *Fortschr. Mineral*, **46**, 274 (1969).
[5] Fischer, W. R., thesis, Tech. Univ. Munich (1971).
[6] Radoslovich, E. W., *J. Soil. Sci.*, **9**, 242 (1958).
[7] Walker, T. R., *Geol. Soc. Amer. Bull.*, **78**, 353 (1967).
[8] Norris, R. M., *J. Sed. Petrol.*, **39**, 7 (1969).

In Support of a Physical Explanation of Ball Lightning

THE purpose of this communication is to present additional evidence in favour of the exclusion of explanations of ball lightning[1-6] in terms of, (*a*) the retinal afterimage hypothesis, (*b*) the intense point discharge hypothesis and (*c*) the burning material hypothesis. Altschuler[7] lists these in his summary of possible explanations.

During a dinner on the evening of July 6, 1971, at Orselina, near Locarno, Switzerland, I observed a flash of lightning which struck an unidentified target near the roof of a building about 200 m away. An intense point discharge immediately followed the flash and was visible clearly at the target for 1 or 2 s. I immediately told the other people at the dinner (Professor E. H. Schröter and Dr E. Wiehr from Göttingen and Mr C. Kühne from Oberkochen) of my observation because they were not looking out of the window at the time.

This occurrence was unmistakably different from another lightning event, which I observed several years ago and which I consider to have been a rare event of actual ball lightning. At that time a thunderstorm accompanied by heavy rain took place in the area of Neustadt near Coburg, Germany. I was sitting with some other people (among them Mr C. Förster from Berlin) right behind a ground floor window so that I could look at the weather; the field of view out to the street was limited by the frame of the window. Suddenly, at a height of about 16 m above the ground and at a short range of about 24 m, I saw a spherical plasma ball coloured bright yellow-white. This object appeared to have a diameter of 50 to 100 cm. It moved vertically downwards with a speed of about 4 m s^{-1}, and its path ended in the top branches of a tree, at a height of approximately 9 m. On touching the tree the ball instantly disintegrated into eight to twelve smaller spheres. These were the same colour as the large one and each had a diameter to 12 to 15 cm. They fell to the ground, guided by the outer contour of the tree, and moved vertically during the last few metres in the absence of branches. On reaching the ground (an asphalt roadway and a neighbouring footpath) the spheres instantly disappeared. There was no noise apart from that of the rain and no lightning associated with the primary plasma-like sphere. Three to five minutes afterwards, the same phenomenon occurred again in precisely the same way as before, indicating that the conditions needed to produce and guide the primary sphere were still maintained or re-established during the time that had elapsed. Immediately after the rain had stopped, I went out into the street to look for further evidence. There were circular patches of melted asphalt on the wet asphalt cover of the roadway which showed the interference colours of thin layers. Their diameters were each 12 to 15 cm and they obviously marked the impact areas of the smaller spheres. This event was described similarly by all the witnesses.

Because roadway asphalt in general contains B-80 bitumen—a thermoplast from which liquid components disintegrate at about 170° C—one may very roughly calculate the minimum amount of energy needed to produce the observed patches. Assuming that a water layer of thickness 0.5 mm at 20° C was evaporated and that an asphalt layer of thickness 1 mm was then heated to 170° C, and assuming a mean density of 1.0 g cm^{-3} and a mean specific heat $c_p = 0.46$ calorie g^{-1} for B-80, one may easily calculate the energy density of the plasma spheres to be at least 1.9×10^7 J m^{-3}.

A. WITTMANN

Solar Physics Division,
Universitäts-Sternwarte,
Göttingen

Received August 9, 1971.

[1] Argyle, E., *Nature*, **230**, 179 (1971).
[2] Charman, W. N., *Nature*, **230**, 576 (1971).
[3] Davies, P. C. W., *Nature*, **230**, 576 (1971).
[4] Gibbs-Smith, C. H., *Nature*, **232**, 187 (1971).
[5] Jennison, R. C., *Nature*, **230**, 576 (1971).
[6] Wagner, G. A., *Nature*, **232**, 187 (1971).
[7] Altschuler, M. D., *Scientific Study of Unidentified Flying Objects*, Ch. 7 (New York, 1969).

Proposal for a New High Precision Particle Detector

THE precision commonly quoted when measuring the position of a charged particle track is ± 0.3 mm for wire plane spark chambers[1], ± 0.4 mm for streamer chambers[2] and ± 0.7 mm for multiwire proportional chambers[3,4]. With the onset of the new generation of synchrotrons there is a need for detectors with better resolution. This arises from the fact that the accelerated particles will receive only small deflexions in analys-

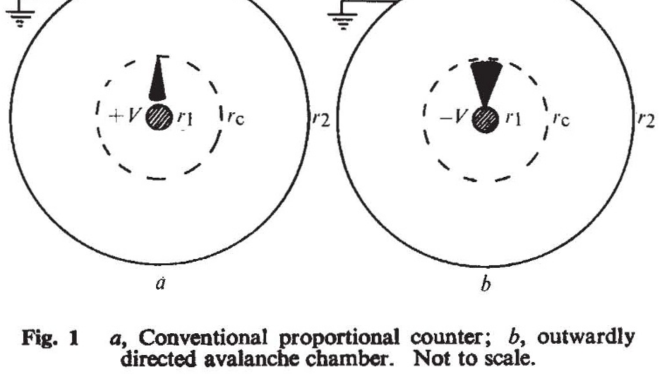

Fig. 1 *a*, Conventional proportional counter; *b*, outwardly directed avalanche chamber. Not to scale.