From two such series of these observations[18,20], each taken by a single observer, twelve-month running means have been calculated and are plotted in Fig. 1. The observations by Di Legge suggest the presence of a biennial oscillation in the apparent solar diameter. It is difficult to establish whether this is a real variation or whether the periodicity was introduced through the refractive correction based on tropospheric temperatures; in fact, there is some phase correspondence between the oscillation in Fig. 1 and the biennial temperature oscillation at Uppsala reported by Landsberg *et al.*[12]. The diameter data taken by Conti also show some evidence of the fluctuation. Undoubtedly a personal element is involved in these observations and values by different observers do not agree exactly. Such features as the large minimum in 1926 in Conti's curve are shown by other observers; these may be related to atmospheric opacity and aerosol content.

If radius changes of about 0·3 sec of arc, as evident in Fig. 1, did actually occur they would change the resulting radiation at the Earth by about 5 parts in 10,000, which is well below the sensitivity limit of present radiation instrumentation. An order of magnitude estimate shows that a similar change in input radiation could be produced if sunspots with a temperature of 4,800° K covered about 1/1,000 of the solar disk. A considerable amount of effort has been spent on the possible relationships between sunspot effects and the atmospheric circulation, and if the solar diameter observations represent a real variation it would seem desirable to examine the effects of diameter changes in more detail.

It may be argued that the Sun is not a cool star of the type normally associated with long-period variables. May not this be simply a reflexion of the fact that variables with such small amplitude cannot normally be detected? One purpose of this communication is to raise again the question of Armellini[21]: "Il sole è uua stella pulsante?", and to suggest that a further investigation with modern instrumentation might be appropriate. I shall be grateful for any daily or monthly values of diameter that might be available from regions outside Europe since it seems that data from a series of locations would allow one to unravel the effect of atmospheric refraction and temperature changes in the results.

This communication comments on one possible source of the oscillation which seems to warrant further examination. It is intended to discuss others in a separate communication.

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GEOLOGY

Pleochroism of Orthopyroxenes

DR. M. S. MURTY has recently concluded[1] on the basis of two analysed minerals that the strength of the pleochroism of orthopyroxenes of the charnockite series can be correlated with their titanium content, it having been noted earlier[2] that the pleochroism is independent of the iron content of these minerals. More recently, however, it was suggested[3] that the pleochroism of orthopyroxenes can be correlated with their alumina content and with the resultant contraction of their cell parameters, that is, it may be largely a physical effect.

Inspection of a semi-quantitative record of the intensity of pleochroism in 12 analysed orthopyroxenes of the charnockite series[2] does not support Murty's conclusion that the intensity of pleochroism can be correlated with the titanium content: indeed, the most pleochroic minerals have the lowest titanium contents but do contain more than 4 per cent alumina. Further examples can be taken from a compilation of 47 orthopyroxene analyses[3]; for example, specimens 186*b*/54 and 177/54, both from British Guiana, have roughly equal amounts of titania at 0·17 and 0·19 per cent respectively; their alumina contents, however, are 1·37 and 9·48 per cent and the latter mineral is very much more pleochroic.

In an examination of Scottish orthopyroxenes[4], two bronzites are shown to have roughly equal amounts of alumina, with 4·53 and 4·45 per cent, and are equally strongly pleochroic, but the first has twice the titania content, with 0·19 and 0·09 per cent respectively. Thus, on further inspection, Murty's data for two pyroxenes with titania 0·45 and 1·05 per cent, and alumina 2·83 and 4·06 per cent, the second pyroxene being more strongly pleochroic, could be taken to support my contention that the strength of pleochroism of orthopyroxenes can be correlated with their alumina content.

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IT has been noted by several investigators that the magnesium-rich orthopyroxenes are more strongly pleochrotic than the iron-rich members, indicating that the strength of the pleochroism is not dependent on the iron content. Kuno[1] observed no relationship between the strength of the pleochroism and the manganese content of the mineral, he having noted no pleochroism in the manganiferous pyroxene, but suggested a possible relationship with the titanium content. In a recent investigation[2], it was suggested that the strong pleochroism may be due to the high titanium content. But Howie (preceding communication) considers that the strength of the pleochroism is independent of the titanium and correlates with the alumina content.

Kuno[1] related the pleochroism in the pyroxenes of the Bushveld type to the exsolution of titanium together with calcium and iron. Howie[3] suggested that it is related to the presence of oriented schiller inclusions. Parras, as quoted by Deer *et al.*[4], considered that the intensity of the pleochroism is dependent on the amount of exsolution of diopsidic pyroxene and ferric iron.

Though oriented schiller inclusions and lamellæ were noted in the orthopyroxenes of the charnockite series, they apparently seem to have no relationship with the strength of the pleochroism as the inclusion free grains are also found to be pleochroic. In the light of the foregoing observations, I am inclined to believe that the strength of

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