LETTERS TO THE EDITOR

PHYSICAL SCIENCES

Visibility of Jupiter's Red Spot

THE existence of a relationship between the visibility (V) of Jupiter's red spot and the Zurich relative sunspot number (R_Z) was claimed in a letter by Graf, Smith and McDevitt[1]. Subsequently it was shown by Argyle[2] that the correlation coefficient between V and R_Z was too low ($r = 0{\cdot}27$) to support the hypothesis put forward by Graf *et al.* The correlation analysis was then extended to more recent data by Solberg and Chapman[3], who found an even lower value for r. In a recent letter Basu[4] has attempted to reinstate the original claim of Graf *et al.* by smoothing and partitioning the data before performing the correlation analysis. Basu states that the smoothed visibility function for Jupiter's red spot in the selected period 1894–1945 was dependent on solar activity, but that this dependence vanished or changed about 1947, and had not returned by 1965.

The visibility of the red spot changes in an erratic way and no convincing physical theory has been offered to account for these variations. It is therefore probably not worthwhile to subject the existing data to closer scrutiny and finer statistical analysis. Moreover, it can be highly misleading to do so. The widely known and used statistical tests of significance are not valid when applied to statistical parameters computed for data that have been selected and modified subsequent to an earlier computation of the same or a related parameter. This point has been dealt with by Epstein[5] in a discussion of the statistical evaluation of the results of parapsychological experiments. He shows that unusual results can be guaranteed if the method of treatment of the data is not specified until after the data have been examined.

In order to produce a special criterion of the significance of the value of r computed by Basu for his specially selected and treated data it would be necessary to know the probability distribution function of the methods contemplated, or contemplatable, by Basu. Obviously, this function is not available to the writer, and is probably not available to Basu either. It can be noted, however, that Basu smoothes the data with a five-year running mean and then partitions them into two parts, one of which (1894–1945) seems to have a length equal to nine half-cycles of the predominant eleven-year periodicity. The other portion considered has a length of four half-cycles. There are forty-five different ways of selecting a continuous subset of length between four and nine from a set of length thirteen. There are probably about eight plausible ways of smoothing such data. There are also four ways of phase-shifting one set of data with respect to the other (in steps of $\Pi/4$ radians) if this should appear advantageous. Altogether there would seem to be at least $45 \times 8 \times 4 = 1{,}440$ different data treatment processes available to anyone who wishes to resurrect the original hypothesis.

For the 1894–1945 portion of the record Basu obtained $r = 0{\cdot}57$, about four times the standard deviation for fifty-two points ($\sigma_r = 0{\cdot}14$). The probability of finding a value of r that is four standard deviations above zero is 0·000032. If this value is multiplied by 1,440 to reflect the assumption that the best of 1,440 data processing methods has been chosen, a new probability is obtained (0·0461) which corresponds to a value of σ only 1·7 standard deviations above zero. The null hypothesis is therefore again tenable and little or nothing has been added to our knowledge of the relation between the visibility of Jupiter's red spot and the Zurich relative sunspot number.

Admittedly, this criticism of Basu's methods is highly subjective. Its purpose is not to demolish the hypothesis that phenomena on Jupiter are linked to the behaviour of the Sun. Astronomers have *a priori* reasons for expecting such a connexion. But the data available at present do not specify the nature of that relationship, and no amount of re-examination of inadequate data is likely to provide cogent evidence for that which is not apparent at first sight.

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[3] Solberg, H. G., and Chapman, C. R., *Nature*, **221**, 352 (1969).
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Attempt to identify Optically *PSR* 0833-45

THE radio source, *PSR* 0833–45, a pulsar which is an obvious candidate for optical identification because of its similarity to the pulsar in the Crab Nebula[1] and because of its relatively well established coordinates[2], was observed on the nights of February 19–20 and 20–21, 1969, with the 60 inch telescope on Cerro Tololo. Slightly improved coordinates, kindly furnished in advance of publication by Dr A. E. Vaughan, isolate the field to an area roughly one photometer-aperture (15·8″) in size; the only star in this field is the one discussed in the current literature[3,4].

A pulse-counting and data-acquisition system, which will be described in a later publication, was used with a conventional, offset-guiding, single-channel photometer and a 1*P*21 photomultiplier. The recording device, a paper-tape punch, operating at its highest speed, permitted an integration time of 65000·0 μs with a 90·0 μs deadtime between integrations for loading the punch-buffer; the integration timing and repetition were controlled by a crystal oscillator. Identifiable and recoverable punch errors resulted at this high output rate, and the validity of the result presented here is conditional upon the correct recovery of a certain class of these errors.

Two runs, each of ten minutes, on the star and then on an adjacent area of sky were made with no filter. If, in