by as much as Maharajh and Walkley claim. It appears that if anything, the solubility of oxygen in water is enhanced to a small extent by the presence of nitrogen rather than lowered by it.

We have had considerable experience in determining gas solubilities by gas chromatography (the technique Maharajh and Walkley used). It is extremely difficult to attain precisions better than 3% by this method. Indeed, in our judgment, the precision of other workers may actually be as poor as ±10%. We suggest that the results reported by Maharajh and Walkley are due to inherent difficulties in the gas chromatographic approach.

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Redshift during Pioneer-6 solar occultation—unexplained or predicted

THE recent detailed analysis[1,2] of Pioneer-6 data[3] demonstrated, under controlled conditions, the existence of the redshift effect which we predicted[4–6]. The explanations proposed by us for certain anomalous redshifts were based on the simple fact, that a moving inhomogeneous medium results in frequency shift and line broadening[4,5]. (But there is no close correlation between line broadening and frequency shift.) Therefore the search for highly specific or hypothetical explanations for redshift effects, observed on or around the Sun, seems to be unjustified.

The Pioneer-6 frequency residuals could be reproduced well (Fig. 1), without any effort to reach a better agreement between measured points and theoretical curve. In computing the theoretical curve, the method described in refs 4–6 was used. In the given range of heliocentric distances the particle density was taken proportional to r^{-3} and the velocity of the medium was decreased in the vicinity of the Sun. Unfortunately the original data of Pioneer-6 were not available to us, so we were compelled to use the data

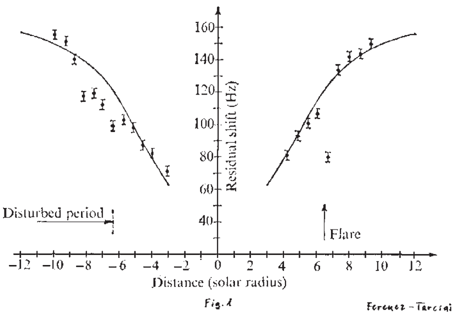

Fig. 1 Residual frequency shift[1] and computed curve, corresponding to the moving medium around the Sun, as a function of the minimum distance of Pioneer-6 2,292 MHz radio signal to the centre of the Sun.

published in refs 1–3. From these, however, one cannot establish exactly the zero-line of frequency residuals. Therefore the measured points and the theoretical curve were tied together on the basis of the measured data, referring to $r = 5\,R_{\odot}$, known satisfactorily from the Taurus A experiments[4].

Furthermore, the overall picture of solar activity exhibits a correlation with deviations from the theoretical curve, and the effect of enhanced solar activity appears also in the asymmetric bandwidth pattern (ref. 2, Fig. 1*b*).

With special respect to the opportunities afforded by the space shuttle, it would be expedient in the future to measure accurately the solar disk and corona (the latter by occultational methods) for frequency shift and line broadening in different regions of the electromagnetic spectrum.

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Spatial distribution of cometary outbursts

PATASHNICK *et al.*[1], in reproducing figures of the position of comets at the times of cometary outbursts from the papers of Pittich[2,3], have omitted the outbursts of comet P/Schwassmann-Wachmann (1) (1925 II) which have been observed regularly since 1927 (ref. 2). Richter[4,5] concluded that the outbursts of the latter were essentially similar to those of 12 other comets. The omission of these data is therefore unjustified.

Figure 1 is a histogram of the number of observed cometary outbursts N_0 in the interval R to $R+0.25$ AU as a function of R, the distance between the comet and the Sun at the time of outburst. Three regions are apparent:

(a) $R<1$ AU. The increase of N_0 with R is simply a reflection of the distribution of cometary perihelion distances[6].

(b) $1<R<5.5$ AU. A minimum deviation fit gives

$$N_0 = (24\pm4)\ R^{-(2.2+0.1)}$$

Contrary to ref. 1, it is thought that here $N_0(R)$ is determined chiefly by observational selection, the ratio between detected and undetected outbursts decreasing as the Earth–comet distance increases.

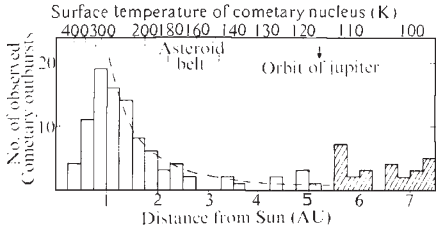

Fig. 1 Number of observed cometary outbursts as a function of distance from the Sun R. Hatched regions, Comet P/Schwassmann-Wachmann (1); White regions, other comets; dashed curve, minimum deviation fit to the data in $1<R<5.5$ AU region.

(c) $R>5.5$ AU. These data originate *in toto* from comet P/Schwassmann-Wachmann (1) containing outbursts from two complete orbits. There is no clear variation of N_0 with R. It is therefore concluded that the probability of outburst occurrence for the other comets is also independent of R, at least for $R<7.5$ AU, and similarly independent of temperature for $T>115$ K (the surface temperature of the cometary nucleus is shown as the upper abscissa in Fig. 1, this being calculated assuming that the cometary nucleus has an albedo of 0.6 and is a rapidly rotating sphere). This rules out the three temperature-dependent theories of outburst production—Whitney[7] requiring $T>130$ K to produce pockets of vaporised methane, Donn and Urey[8] requiring $T>148$ K to produce the explosive NH_4N_3 and Patashnick *et al.*[1]