Since the waves are probably operative over a fairly wide vertical range, it is not entirely coincidence that the effects of essentially localized phenomena should appear in two random orbits. As more extended observations become available, it will be of considerable interest to observe the region of decay of the fourth harmonic in the behaviour of 1958 α and the consequent growth of the third harmonic. Such observations would offer a fairly accurate estimate of temperature in the regions of maximum amplitude. Thus we might surmise that the temperature at a height of 224 miles—the perigee level of 1958 α—is of the order of 590° K., implying that the rise in temperature associated with the *F*-layer falls off above 200 miles.

While the major effects modifying the development of satellite orbits are probably now circumscribed, it is a matter of considerable intricacy to predict, for example, the precise values of the periodic time as the orbit develops. On the other hand, the 'young' orbit offers a convenient means for investigating the density distribution of the upper atmosphere.

I am indebted to the Smithsonian Institution for the observations used ; without the extreme precision of these values, this discussion would not have been possible.

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FROM the earliest data on the periods of satellites it was not clear whether the fluctuations in period were due to anything more than the random oscillations of an irregularly shaped body. Changes in the slope of the period–time curves of *Sputniks* 2 and 3 occurred over an interval of a few days, and I remarked that motion of the perigee due to the rotation of the orbital plane seemed to account for the suddenness of the change more easily than the slow drift of the perigee towards the equator. The frequency of these changes seemed related to the crossings of the perigee between the day and night sides of the Earth at three-monthly intervals, suggesting a diurnal variation in air density. As the analysis of data continued, more changes were evident and a periodicity of just less than one month has now been established, and this Parkyn associates with an 8-hr. density variation. The Smithsonian *Sputnik* 3 data, which he presents, show the variation in the period–time curve to be a very smooth oscillation in comparison with earlier data. This is evidence in favour of the phenomenon being a tidal oscillation, and also shows that the effect of the shape of the satellite is mainly averaged out.

One of the first results to be obtained from the launching of satellites was that the air density at 200 km. is several times greater than previously reckoned, due presumably to a higher temperature. Values for the scale-height at 200 km. which I have derived from satellite period–time curves are close to 40 km., and this value is supported by certain rocket measurements. The corresponding temperature is 1,100° K. on assuming the molecular weight for air to be 25 (or 700° K. if we suppose the nitrogen to be almost completely dissociated, which is unlikely). In either case, these values disagree with the values of 470° K. and 590° K., which Parkyn derives from the condition for the third and fourth harmonic oscillations.

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Time Relationship of Metre-Wave and 3-cm. Wave Bursts

IT is known that solar bursts are observed over a very large range of wave-lengths. A single burst may extend over a large or small fraction of the range from centimetres to metres. Usually, bursts of strong intensity in the centimetre region are associated with great bursts observed on metre waves. It is generally believed that at the time of these bursts, radial ascension of ionized particles excites radio-frequency radiation at different levels in the solar atmosphere. Moreover, there are reasons for thinking that solar radio waves on the lower frequencies are emitted at a higher altitude in the solar atmosphere than those on the higher frequencies. As a result we observe a regular drift of the onset of the bursts towards the lower frequencies. The object of this communication is to discuss a relation existing between the times of commencement of the bursts observed on 3-cm. waves and on metre waves. This work is based chiefly upon measurements of the associated 3-cm. wave bursts made by means of an interferometer[1].

For this study, the data on metre-wave bursts (200 Mc./s.) provided by the observatory of Nera in Holland have been used. For those 3-cm. wave bursts which are accompanied by precursors, the time of beginning of the precursor has been taken as the time of beginning of the burst.

Fig. 1*a* shows the distribution of the times of commencement of the bursts observed on metre waves relative to those of the associated 3-cm. wave bursts. It will be seen that the metre-wave bursts often follow the associated 3-cm. wave bursts. Our results thus confirm that in the majority of cases the solar bursts are excited by the radial ascension of ionized particles in the solar atmosphere. It is also seen that the delay in time varies between zero and about 20 min. The average delay is about 3 min., corresponding to a velocity of radial movement of the order of 500 km./s.

In order to examine whether the delay in time depends on the dimensions of the bursts, the 3-cm. wave bursts associated with metre-wave bursts have been arbitrarily divided into two classes : (*a*) bursts having at the maximum intensity an apparent diameter less than 1·5 min. of arc on 3-cm. waves, and (*b*) the bursts having at the maximum intensity an apparent diameter greater than 1·5 min. of arc. Figs. 1*b* and 1*c* show the corresponding distributions of the delays of the metre-wave bursts relative to the 3-cm. wave bursts. It is seen that the delay has a tendency to be less for the bursts of smaller apparent diameter. The majority of cases in which the time-difference is small belong to class (*a*), whereas most of the cases observed where the time-difference is great belong to class (*b*). The average value of the delay for these two classes of bursts are of the order of 1 min. and 8 min. respectively. The corresponding velocities of the radial movement are of the order of 1,500 km./s. and 200 km./s. respectively.