

## Tidal Forces and Widespread Precipitation

In recent reports in *Science* by Bradley, Woodbury, and Brier (1) and by Adderley and Bowen (2), statistical evidence was presented to show that precipitation maxima tend to occur much more frequently in the lunar intervals new moon to first quarter and full moon to third quarter than they do in the intervals first quarter to full moon and third quarter to new moon. In the former report the authors suggest that the mechanisms responsible for the effect are not known. In the latter report, Adderley and Bowen indicate that the phenomenon "is clearly not incompatible with the meteor hypothesis."

I should like to point out that widespread precipitation, including many maxima, has often been associated with hurricanes. About 9 years ago I suggested (3) that there was good reason to suspect that tidal forces play an important role in the formation of hurricanes, and I offered statistical evidence in support of the suggestion. I look upon the evidence presented in the two reports cited as supporting my thesis.

An examination of the distribution within the solar year of the dates used in the statistical work of the two reports would indicate whether or not the maxima considered there may be related, at least in part, to hurricanes. A division of the dates into two groups, those nearer a time of lunar perigee and those nearer a time of lunar apogee, might help to show that the phenomenon is tide-related, if not tide-induced. A division of the dates according to decimal fractions of the tidal period, apogee to apogee, may well show that the work of Rodés (4) is sound and significant. I regret that this paper is not available to me at present.

If tidal forces have an important effect in the formation of large storms, one would expect some lag between the time of formation of a storm and the time of maximum precipitation attributable to it. The apparent difference in phase between the graphs for the Northern and Southern Hemispheres presented in the two reports (1, 2) may result from differences in the average distance of travel of large storms between the area of formation and the various points of precipitation.

If, as Adderley and Bowen suggest, the phenomenon is related to meteoric material diverted by the moon, one would expect to find the far side of the

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moon much less pitted with craters than the near side. The argument is that if the moon tends to focus meteor streams on the earth, the earth must, to a much greater extent, focus meteor streams on the face of the moon that is toward us. This seems likely to be true; in any case, we shall have better evidence on the roughness of the far side of the moon in the near future.

One regrets that Adderley and Bowen decided not to publish their data at once. However, the reasons for their decision are clear.

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#### References and Notes

1. D. A. Bradley, M. A. Woodbury, G. W. Brier, *Science* **137**, 748 (1962).
2. E. E. Adderley and E. G. Bowen, *ibid.* **137**, 749 (1962).
3. C. H. Smiley, *Nature* **173**, 397 (1954).
4. L. Rodés, *Memorias del Observatorio del Ebro No. 7* (Tortosa, Spain, 1937).

### Effect of 1953 Fallout in Troy, New York, upon Milk and Children's Thyroids

The report of Ralph Lapp on the fallout from Nevada testing in Troy, New York, on 26 April 1953 [*Science* **137**, 756 (7 Sept. 1962)] has led to publicity in newspapers and has aroused public concern in the Troy-Albany-Schenectady area. Lapp estimated the level of iodine-131 contamination in Troy and calculated that individuals drinking milk from this area could have received a total dose up to 30 rad. He suggests a thyroid survey of children in this area who were under 2 years of age in 1953.

The records of the New York State Department of Agriculture and Markets for 1953 reveal that, on the average, cattle were first turned out to pasture on 12 May. While some farmers may put their cattle on pasture earlier than the average date, the variation tends to be small, for too early pasturing leads to damage to the turf if the ground is so soft that the hooves of the animals sink into it. Thus, the iodine-131 had 17 days, or more than two half-lives to decay to something less than 25 percent of the activity deposited on 26 April.

Moreover, the period from 26 April to 12 May was exceptionally rainy that year, even for spring. A total of 5.36 inches of rain fell during this period, in which there were four storms of more than ½ inch each. Weathering

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