at an earlier stage. A deeper focus leads to cone-fracture patterns of greater diameter at the surface. Cauldron subsidence (of a sort) is clearly reflected in many of the larger lunar craters and this is a logical successor to the positive phase of tumescence, fracturing and explosive gas release. It indicates subsidence or actual drawing down of the surface as the subjacent body of magma contracts. The main body of magma will have congealed in depth, and will not have moved upwards once the sudden bursting-out of the volatiles deprived it of fluidity, but, as already noted, a limited late-stage oozing probably ensued. This ooze may conceivably be of basic composition, but the dark colour is a poor criterion—quartz trachytes in Kenya show deep-black on air photographs where they present absolutely fresh surfaces.

The concept expressed briefly here—that of volcano-tectonic undation—has been derived primarily from terrestrial field and laboratory studies, the results of which have been compared with lunar photographs[14]. It is, of course, not an entirely original concept, and leans heavily on other workers (in particular Jeffreys[15], Spurr[16], Firsoff[2,3], Green and Poldevaart[17]). I have never observed the Moon through a telescope and have little specialized knowledge of astronomy. It is perhaps interesting that this concept, worked out from purely geological and geophysical considerations, is entirely in accord with the deduction that the lunar surface was in an overall state of tension at the time of cratering, made by Warner and Fielder[1] from an entirely different point of view—though perhaps the process is better termed distension, if, as seems likely, it involves dominantly vertical upward pressures.

To me the obvious integration of the crater patterns with the lunar grid alone makes attribution to impact unacceptable, and complex cirques such as Ptolemeus, in which the rim is composed of ridges of short length strongly reflecting the dominant grid trend, and also the annular trace of the cirque at its rim, in which the short ridges are frequently capped by summit craters and must be some form of volcanic mound and in which the floor is so little depressed, seem only explicable in terms of dominantly gas-erupting vulcanism. The existence of cirques in which the crater floor is not depressed and the distinction between floor and surround is only established by an annular line of depression (14, *B7a*, *B8a*, Jansson) again seems otherwise inexplicable.

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In his comments on the morphological comparison between terrestrial and lunar surface features, Dr. McCall has made a number of interesting points. It should be noted, however, that Fielder and I only concluded that the lunar surface was tensionally stressed at the time when certain lunar craters were formed. These craters in question all appear to be 'young'. Full details of our work have now been published[1].

I have recently published work[2–4] relating to the morphology and origin of the lunar grid system. Therein it is maintained that the present alignment of ridges, rilles, crater walls, etc., has been caused by the action of stresses after many craters had been formed, that is, the lunar grid system as seen at present is the result of secondary activity[5]. In the hypothesis of magmatic explosions developing through fractures, as suggested by McCall, the shape of a lunar crater is a property of its origin. The question arises whether this latter theory can account for the differing shapes of lunar craters, and in particular the apparent correlation of percentage distortion with age noted by Fielder[6]. On the other hand, there are difficulties associated with the assumption that the crater walls and ridges were moved bodily after their formation[4].

Working from an observationalist's point of view, I have maintained[7] that the dark material composing the maria and certain crater floors is a superficial covering and should not feature in any theory of the origin of the maria and craters.

Finally, there is evidence indicating that the individual maria and craters were formed by slow processes rather than during catastrophic events[4,6].

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RADIOPHYSICS

Increase in Maximum Usable Frequency for Two-hop Transatlantic Propagation due to Horizontal Gradients

It has frequently been noted that in long-distance high-frequency communication the actual maximum usable frequency (MUF) may be as much as 40 per cent greater than would be predicted from vertical soundings. One explanation for this has been given by Warren and Hogg[1], who showed, by means of an oblique incidence ionogram, that single-hop propagation could occur on a transmission path of 5,300 km, whereupon the resultant MUF exceeds that predicted by a two-hop mode calculation. A calculation by Kift[2] gives good agreement with this experimental result. The possible occurrence of layer tilts and *M* and *N* reflexions has also been advanced to account for the high MUF's obtained in practice[3,4].

An examination of the records of oblique incidence recordings, taken over a 5,600-km link between Ottawa and Den Haag, has revealed that the increase in MUF is strongly correlated with the horizontal ionization gradient. This can be seen from Figs. 1*a*