

**SPECIAL ARTICLE**SURVEYS ON THE MOON

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It is most probable that in a few years' time geodetic surveys will have to be carried out on the ground of the moon or even in its deep layers, either to make selenographic\* measurements and maps, selenophysical studies, or to construct accurate foundations for nuclear plants, launching sites or the like.

It is quite feasible to make readings on theodolites, levels and microscopes through the transparent helmet of a space suit provided with some special features.

Refraction will be no problem, of course, and long sightings will be taken with great accuracy whether in levelling or angle measurement. All parts of the instruments will have to be provided with air vents in order that internal pressures do not displace lenses or prisms and no oil or grease should be applied to moving parts, since it would evaporate quickly in vacuum. Bubble phials will have to be very tightly sealed for the same reason. Long distances will be measured easily by geodimeters, or tellurometers, operating ideally in vacuum.

As for tapes, still necessary for accuracy over small distances, the reduction of gravity will not change the shape of their catenary, since it affects both tape and stretching weight in the same way, but it will considerably decrease the elastic deformation of the tape under the reduced tension. Therefore, it will be necessary either to make the necessary corrections by measuring the gravity value of the site of operations, or to bring a rigid invar standard and rig up a local calibration bench, or else to assure tensions by dynamometers that are not affected by gravity changes.

A serious problem will be the deformations of the ground, which are certainly much greater than on the earth, the solar tides being considerably larger on the moon than on earth, due to its smaller modulus of elasticity and its deeply cracked mantle, and the changes in distance from the earth are probably raising static tides reaching amplitudes up to 25 metres. Moreover, the tremendous changes of temperature occurring every fortnight will cause particularly large deformations at transition periods between day and night. Operations will probably have to be restricted to the two weeks of daylight, every month.

If deep layers have to be surveyed either for selenological and selenophysical reasons or to assure solid foundations below the superficial layers of dust, ordinary plumb-lines can be used, hanging down fair-sized wells, protected from superficial dust. Relative displacements will then be recorded from the bottom of these wells by small inductive coils or similar devices.

But for all measurements, unusually large corrections will have to be applied, such as spherical excess for selenodetic triangles, moon curvature effect on levelling, gravity deviations in geometrical levellings or astronomical closures, determination of local time and stellar co-ordinates. It would be necessary to make constant use of a gravimeter, if only to get approximate elevations, but after all it will not be difficult to carry about such otherwise heavy equipment.

\* *Selenography - the study of the surface and physical features of the moon - Webster.*