

LASER ILLUMINATION OBSERVATIONS

A low intensity gas laser beam² was used as a convenient light source for illuminating small slabs or single crystals from various rock specimens. The crystals were immersed in oil and viewed under a microscope at right angles to the laser beam. The light reflected from the surfaces and the relatively few internal interfaces of ordinary undeformed crystals made them readily visible. However, highly shocked crystals, with their numerous internal interfaces, were invisible in a scintillating glow.

Furthermore, a beam impinging on a slab penetrated and illuminated an appreciable volume (approximately 1 cm³) of unshocked, coarse-grained rocks and smaller volumes of fine-grained limestones. Highly-shocked rocks, notably Cocconino sandstone from Meteor Crater, Arizona, contained and reflected the laser light within a hemisphere whose diameter was not much larger than that of the beam. These observations are consistent with the x-ray diffraction findings and may have bearing on a better understanding of the reflective properties of the lunar surface.

CONCLUSIONS

The x-ray and optical methods described, coupled with graphical representation of the data, are effective aids in revealing an impact history in any polycrystalline aggregate. These results are intimately related to internal fracturing of crystals on a submicroscopic scale, which is a dominant process in response to strong shock pressures and even to similar high pressures applied at the relatively slow rate of 5 kb/minute.

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² Bausch and Lomb instrument; He-Ne continuous beam; 1 milliwatt rated power; 6328 Å.