EXPERIMENTAL IMPACTS: CONTINUED STUDY OF EJECTA VELOCITIES FROM IMPACTS INTO POWDERY REGOLITHS; William K. Hartmann, Planetary Science Institute, Tucson, AZ. 85719

Although many properties of impacts into rock and granular targets have been studied, the velocity distributions of ejecta from powdery granular targets have been relatively little studied, partly because of the experimental difficulties of photographing or otherwise measuring motions of powdery ejecta. Nonetheless, this subject is of extreme and growing importance in planetary studies, because of evidence that present-day and primeval small bodies had regolith-covered surfaces generated by impact processes. In many impact regimes, ejecta from regoliths are slower than ejecta from rock targets, and thus the regoliths play an important (perhaps critical -- see Hartmann, 1978) role in fostering early accretion. Early planetesimals may have been granular and loosely bonded throughout.

Data from 14 impacts into regolith-like powdered basalt and pumice have been collected for impact velocities ranging from 5 to 2321 m/s (Hartmann, 1981) and are still being reduced. Velocity distributions were measured for the bulk of the ejecta, using annular collectors at different distances and using high-speed films showing well-defined launch angles for the ejecta spray. The experiments were conducted at the NASA Ames Research Center.

Selected interesting phenomena are pointed out, including systematically different velocity distributions for the two target materials, and the ejection of less than one projectile mass at impact speeds of less than roughly 25 m/s. The latter result appears to guarantee accretion even in very small targets if impact speeds are low enough. The data will be applied to theoretical accretion modeling programs at the Planetary Science Institute, in attempts to study the aggregation of planetesimals in the primordial swarm of debris in the solar system (Greenberg et al., 1978).

The data emphasize the importance and difficulty of obtaining data about the highest-velocity portion of the ejecta from powdery targets. This small fraction of the total ejecta, though filmed, could not be quantitatively collected in the present experiments; but it may contain the majority of the ejecta kinetic energy. Experimental design to collect such fast-moving material would be difficult but worthwhile.

REFERENCES

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