SHOCK REMANENT MAGNETIZATION OF LUNAR SOIL; *J. Dunn, **R. Fisher, *M. Fuller, **S. Lally, ***F. Rose, **F. Schwerer and ****P. Wasilewski. *Dept. of Earth & Planetary Sciences, Univ. of Pittsburgh, Pittsburgh, PA, **U.S. Steel Research Laboratory, Monroeville, PA, ***U.S. Naval Weapons Laboratory, Dahlgren, VA, ****The George Washington Univ., Washington, D.C.

Preliminary shock experiments, at approximately 50 and 250kb, have been carried out with lunar soil (65901,10) and with dispersions of fine grained iron in quartz powder. The flying plate technique was used—a metal plate is explosively driven into the sample assembly. The geometry is arranged to minimize reflected shock waves and hence to present a simple plane wave shock. The shock pulse duration is of the order of microseconds with a sub-microsecond rise time. Residual heating persists on a much longer time scale. Strong and relatively stable shock associated remanent magnetization was acquired in the earth's field. Assuming a linear field dependence of this magnetization, it appears that remanence of at least $10^{-5} \text{ J gauss cm}^{-3} \text{ g}^{-1}$ could be acquired by soils exposed to 50kb shock in a $10^{-3} \text{ T}$ field.

The shock remanence acquired by the soils is approximately two orders of magnitude smaller than the saturation remanence. The 250kb remanence has a similar AF stability to that of the saturation remanence. The sample shocked to 50kb exhibits stability more like that of a partial thermoremanence acquired in the temperature range of approximately 400°C to room temperature. The direction of this remanence and that of the 250kb sample was related to the field in which the samples cooled after shocking. There is some evidence that the lower shock range also generated some magnetization in the direction of the field during shock. The magnetization acquired by the iron dispersions exhibited somewhat similar characteristics to those of the soil, except that the 50kb magnetization was entirely in the direction of the field during shock and was very stable against AF demagnetization. These results suggest that at least two magnetization processes may be effective in generating shock associated remanent magnetization. First, there may be remanence produced during the actual shock and second, there may be remanence produced during the post shock cooling.

A number of control experiments were carried out to see if the shock changed structure sensitive parameters of the magnetic phases or generated new magnetic phases. Measurements of magnetic viscosity revealed that although the 50kb shocking of the soil produced little change, the 250kb shock considerably enhanced the initial magnetic viscosity of the soil in a way which is most easily explained as due to the production of very fine grain iron (diameter 160-170 Å). The value of saturation magnetization decreases slightly after the 50kb shock, but after the 250kb shock it increases and exceeds the initial value. The samples are being recovered from the sample.
assemblies and will be examined petrographically with optical and electron microscopes.

The primary significance of this experiment is the demonstration that shock can be an efficient magnetization process. It has also confirmed earlier suggestions that shock can generate fine iron. It is now of interest to extend the experiments to lower shock ranges and to establish how much of the regolith may have been exposed to sufficient shock to give rise to important magnetic effects.