**CALCULATION OF PLANETARY IMPACT CRATERING TO LATE TIMES.** Thomas J. Ahrens[1], John D. O'Keefe,[1] and Sarah T. Stewart[2], [1]Lindhurst Laboratory of Experimental Geophysics, California Institute of Technology, Pasadena, CA 91125, tja@caltech.edu, [2]Geophysical Laboratory, Carnegie Institution of Washington, Washington DC.

Simulation of impact cratering on planetary materials is crucially dependent on adequate description of shock processing of surface materials. Two recent examples of the importance of these processes is demonstrated by the simulation of impact induced flow from the impact of a ca. 10 km bolide at 20 km/sec onto the Earth. This has been inferred to have occurred along the Yucatan (Mexican) coast, 65 million years ago. This impact is inferred to have triggered global climatic change, induced by the impact devolatilization of the marine anhydrite ($CaSiO_4$) and gypsum ($CaSO_42H_2O$) deposits of the target rocks. These calculations conducted with Sandia's CTH code depend crucially upon utilizing a rock damage model which reduced crustal rock strength from 100 MPa to 1 MPa over a volume some $10^2$ times that of the bolide in about 1 minute and gives rise to a 100 km diameter central peak, flat-floored crater with overturned target flap some 8 minutes after impact. Comparison of calculated post-impact deformation compares favorably with seismic profiling and drill-core data.

A second example is the formation of ejecta blankets giving rise to rampart Martian craters by fluidization with liquid water by a new impact cratering simulation and recent shock wave data on $H_2O$ ice. We demonstrate that ground ice is melted by the impact shock within a hemisphere of radius equal to the final crater radius, resulting in excavation of a mixture of liquid water and brecciated rock into the continuous ejecta blanket. Our shock wave experiments demonstrate that ice at Mars temperature, 150 to 275 K, will begin to melt when shocked above 2.2 to 0.6 GPa, respectively, lower than previously expected. Hence, the presence of liquid water near the pre-impacted surface is not required to form fluidized ejecta. The amount of ice melted and incorporated into the ejecta blanket debris flow is within a factor of two of the subsurface ice content; therefore, debris flow modeling of fluidized ejecta morphologies may be used to quantify the amount of near-surface ground ice on Mars.