

Abstract Submitted
for the SHOCK05 Meeting of
The American Physical Society

**On the presence of the elastic precursor in re-shock experiment:
an unorthodox explanation** ANDREW RUGGIERO, NICOLA BONORA, Uni-
versity of Cassino — According to the stress wave theory, for an elastic-plastic
material reloading from the shocked state, the expected response should be entirely
plastic because the initial compression beyond the HEL should produce a material
state on the yield surface. Experiments show the presence of a step anticipating
the arrival of the plastic reloading wave, which is commonly recognized as an unex-
pected “elastic precursor.” Several explanations have been proposed assuming that
the shocked material is not on the current yield surface. Lipkin and Asay (1977) jus-
tify this assumption with the fact that neighboring grains have different slip system
orientations and they proposed a model to duplicate the key features of the shock-
re-shock experiment; Swegle and Grady (1986) believed that the phenomenon is due
to a thermal trapping localized shear deformation regions. Here, a continuum me-
chanics approach is used to justify the presence of the step and to demonstrate that
it is not an elastic precursor. According to the authors interpretation, a justification
of this should be found in the non uniform residual plastic deformation distribution
along the target thickness caused by dissipative processes during the first compres-
sive stress wave travel. The proposed interpretation of the phenomenon can explain
the reason why the initial part of the release and recompression velocity profiles
should not be completely centered as confirmed by experimental observations.

Andrew Ruggiero
University of Cassino

Date submitted: 07 Apr 2005

Electronic form version 1.4