Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Dynamical Effects in the Interaction of Energetic Ions and Matter[1] RYAN M. HATCHER, MATTHEW J. BECK, SOKRATES T. PANTELIDES, Vanderbilt University — A theoretical description of the microscopic processes that underlie the interaction of energetic ions traversing a solid faces unique challenges as it is intrinsically a dynamic phenomenon. Here we use time-dependent density-functional theory to explore the exchange of energy between channeled ions, which interact weakly with the solid's nuclei, and electrons in a silicon crystal. We find that the **dynamic** response of the electron gas is characterized by a drag effect where there is an average accumulation of dynamical electron charge density behind the ion. The drag effect is superposed on additional dynamical patterns. We report the "stopping powers" for a number of ion species that are in excellent agreement with experimentally observed oscillations in the stopping powers as a function of the atomic number of the ions. We analyze the result by comparing with results obtained for an ion traversing a thin layer of homogeneous electron gas of various densities.

[1]This work was supported in part by the DOE Computational materials Science Network and by the AFOSR.

Ryan M. Hatcher
Vanderbilt University

Date submitted: 21 Nov 2006 Electronic form version 1.4