Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Nanofriction in Cold Ion Traps ANDREA VANOSSI, ANDREA BENASSI, International School for Advanced Studies (SISSA), and CNR-IOM DEMOCRITOS, ERIO TOSATTI, International School for Advanced Studies (SISSA), CNR-IOM DEMOCRITOS, and ICTP — Sliding friction between crystal lattices and the physics of cold ion traps are so far non-overlapping fields. Two sliding lattices may either stick and show static friction or slip with dynamic friction; cold ions are known to form static chains, helices, or clusters, depending on trapping conditions. Based on simulations, we show that much could be learnt about friction by sliding (e.g., via an electric field) the trapped ion chains over a periodic corrugated potential. Unlike infinite chains where, according to theory, the classic Aubry transition to free sliding may take place, static pinning always shows up in trapped chains. Nonetheless we find that a properly defined static friction still vanishes Aubry-like at a symmetric-asymmetric structural transition, ubiquitous for decreasing corrugation in both straight and zig-zag trapped chains. Dynamic friction can also be addressed by ringdown oscillations of the ion trap. Long theorized static and dynamic one dimensional friction phenomena could thus become exquisitely accessible in future cold ion tribology.

Andrea Vanossi
International School for Advanced Studies (SISSA),
and CNR-IOM DEMOCRITOS

Date submitted: 17 Nov 2010 Electronic form version 1.4