

Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Apparent anomaly in electron scattering in Ag nanostructures*¹

ELLEN D. WILLIAMS, CHENGGANG TAO, WILLIAM G. CULLEN, Dept. of Physics, U. of Maryland - College Park — Electron scattering from diffusing atoms can be visualized via the effects of the corresponding force that biases atomic motion, the “electromigration force”. Using a combination of scanning tunneling microscopy and scanning electron microscopy, we investigate electron scattering via the biased motion of monatomic islands and C₆₀-decorated steps on Ag(111) surfaces in the presence of large current density ($j_{bulk} = 6.7 \times 10^9$ A/m²). For monatomic adatom islands, the biased motion is opposite to the current direction and thus parallel to the direction of momentum transfer (the “wind force” direction), while vacancy islands move oppositely. The measured drift velocity v as a function of the island radius R , $vR = 1.9 \text{ nm}^2/\text{s}$, yields an anomalously large¹ effective force per boundary atom ~ 0.06 meV/nm. An effective scattering force of similar magnitude is also observed via current-induced curvature of C₆₀ decorated line-boundaries. Possible mechanisms for this effect, including current crowding, charge transfer and local heating, will be discussed. 1. A. Bondarchuk, et al. Phys. Rev. Lett. **99**, **206801** (2007)

¹Supported by the UMD-NSF-MRSEC grant # DMR 0520471.

Ellen D. Williams
Dept. of Physics, U. of Maryland - College Park

Date submitted: 26 Nov 2008

Electronic form version 1.4