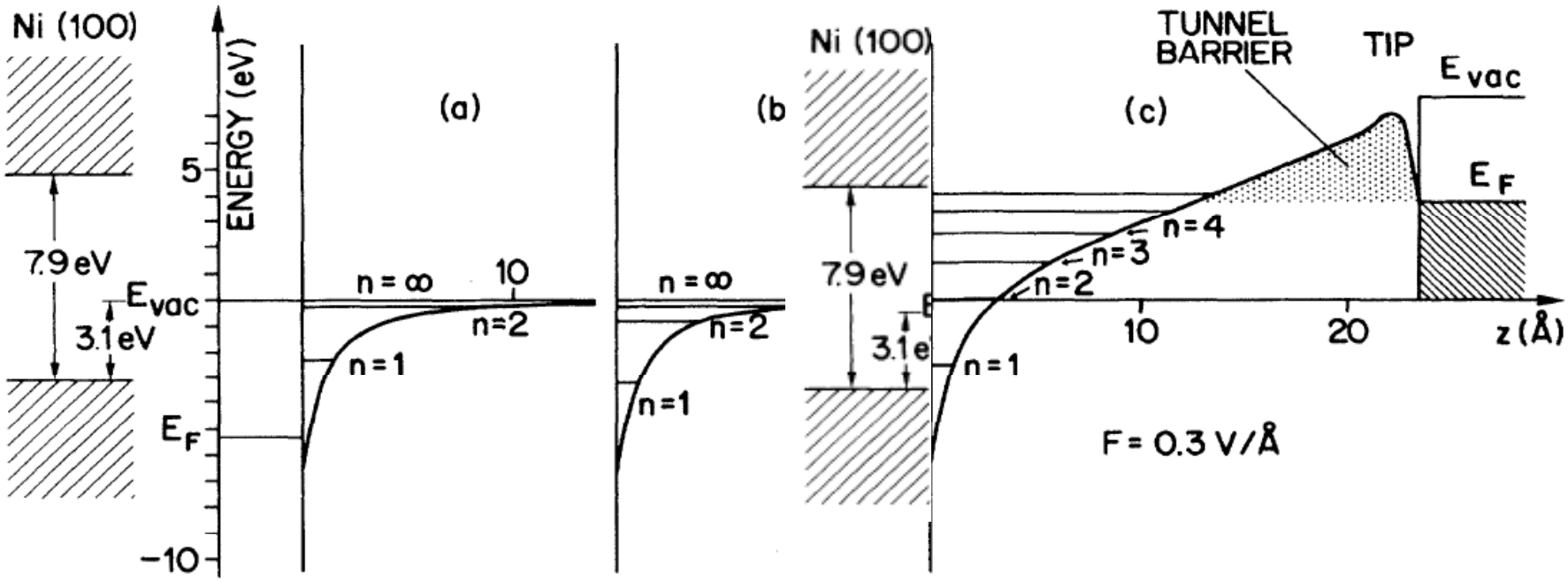
Measuring Image Potential States by Scanning Tunneling Spectroscopy



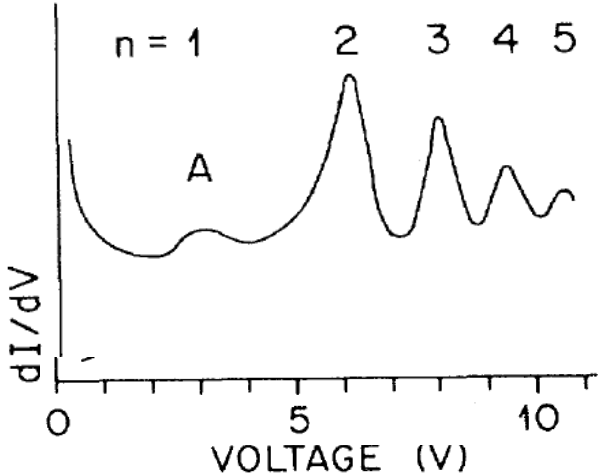


Fig. 3.25

G. Binnig et al., Phys. Rev. Lett. 55 (1985) 991

Surface States due to Complex Wave Vectors

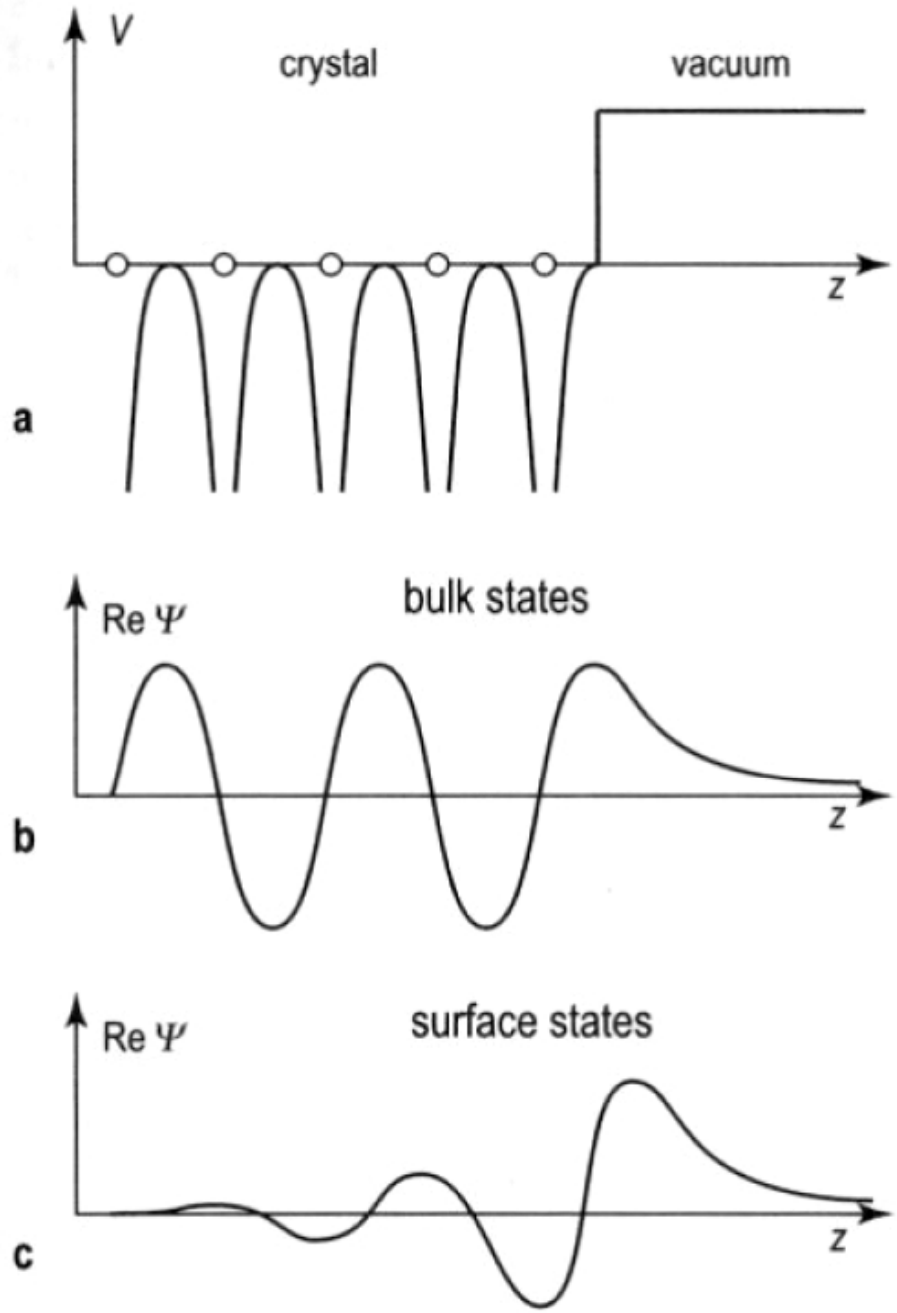


Fig. 3.26

The Surface Projected Bulk Band Strcuture

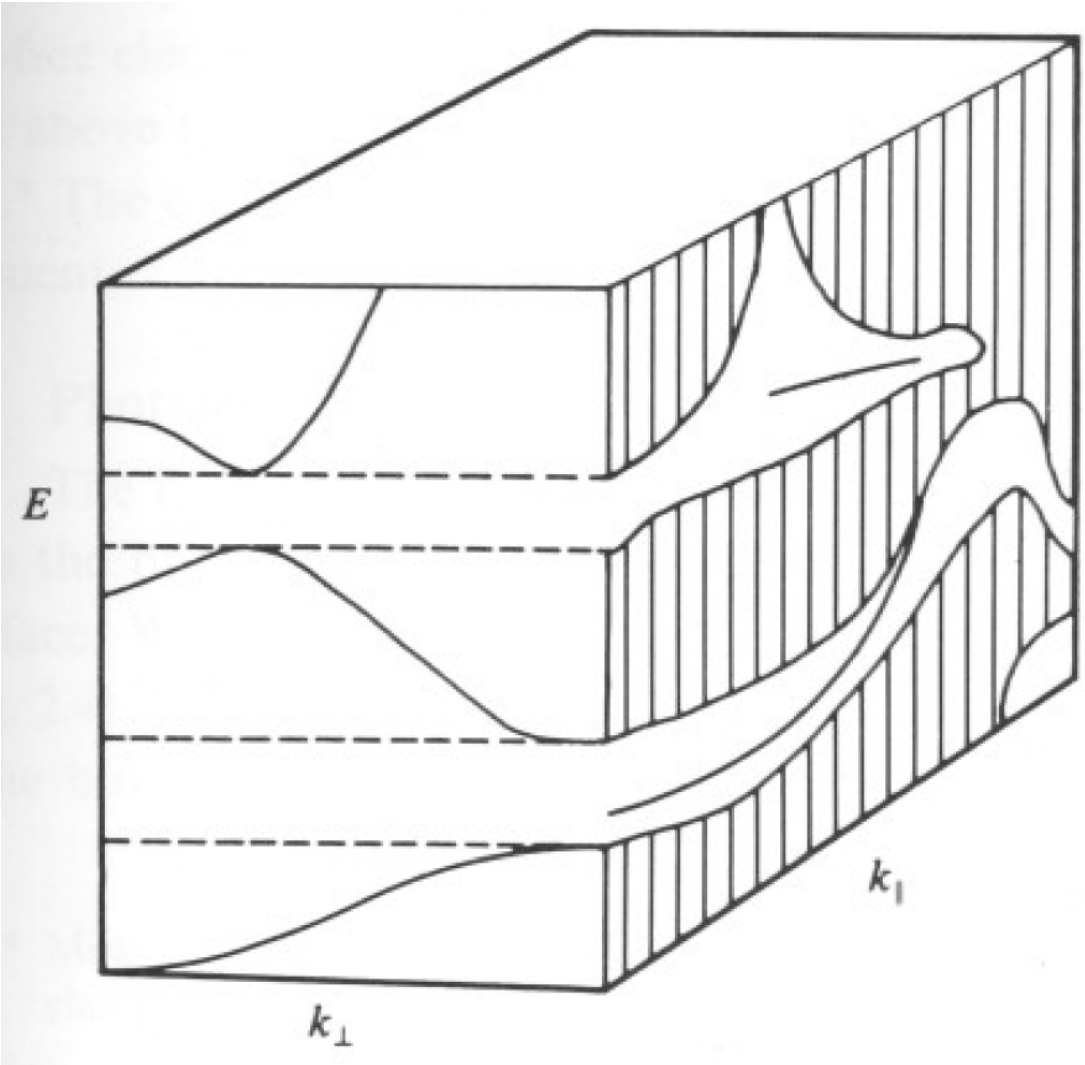


Fig. 3.27

Surface States and Surface Resonances; Projected Bulk Band Structure

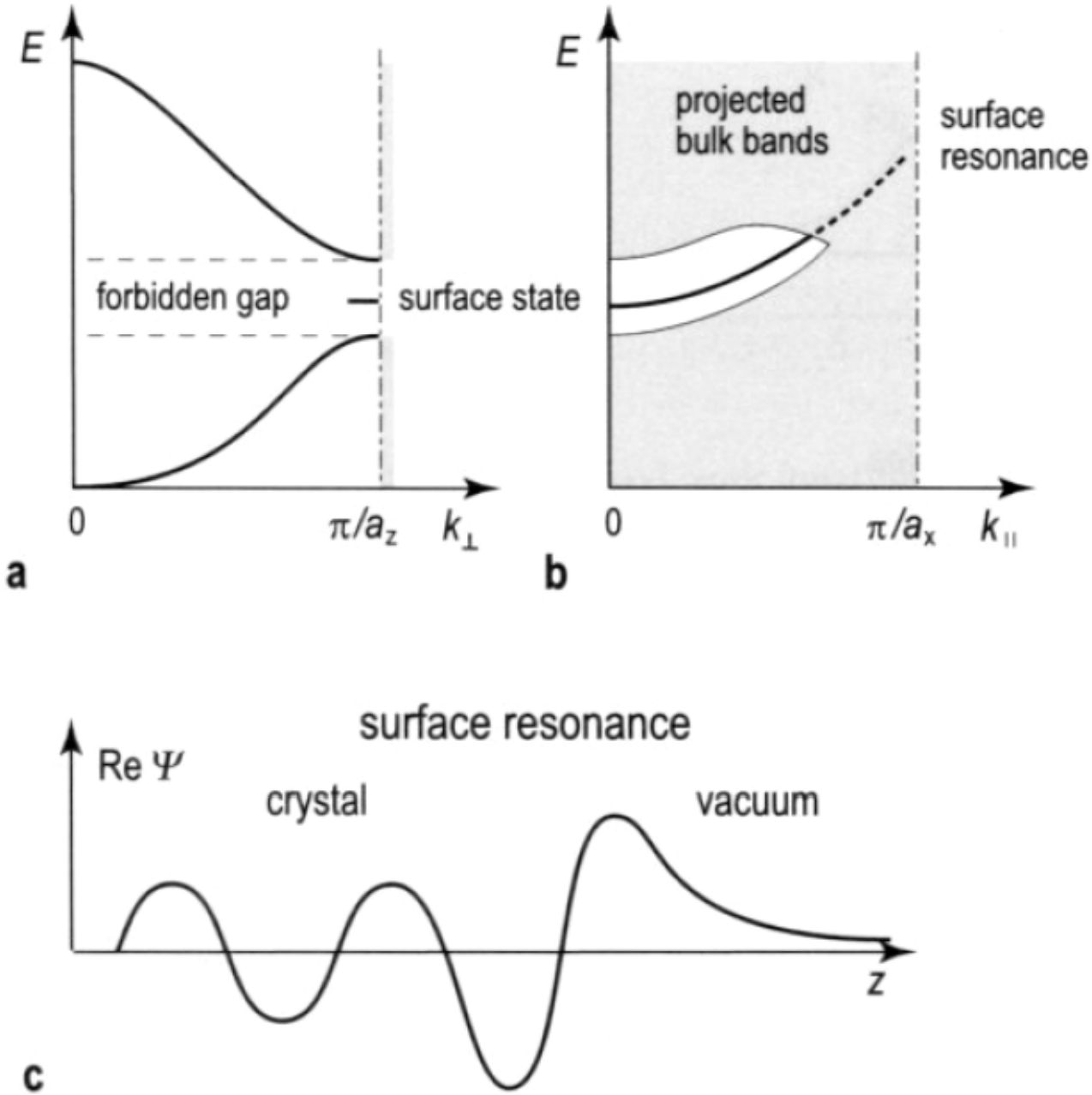


Fig. 3.28

Surface State of Cu(111); Measured Data vs. Theory

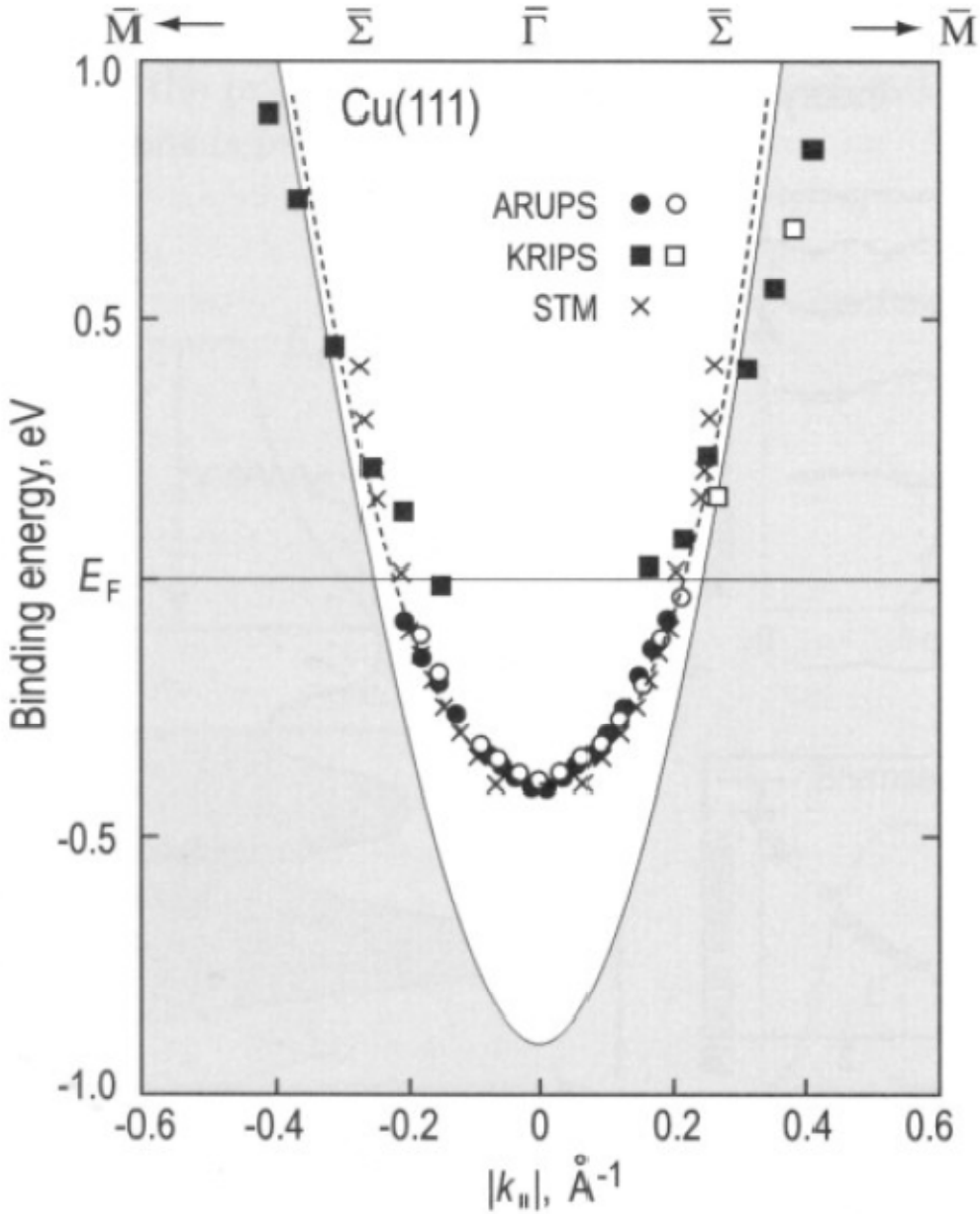
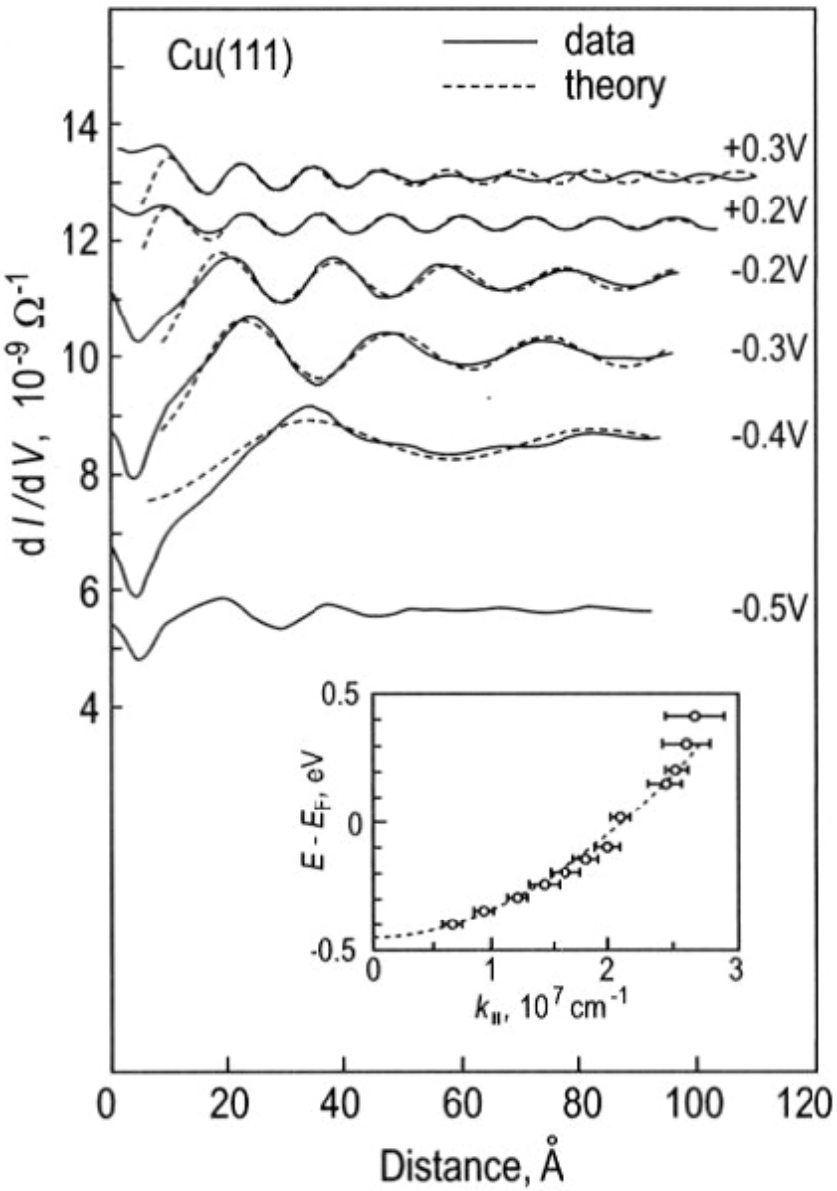


Fig. 3.29

Surface State Dispersion on Cu(111) by STS



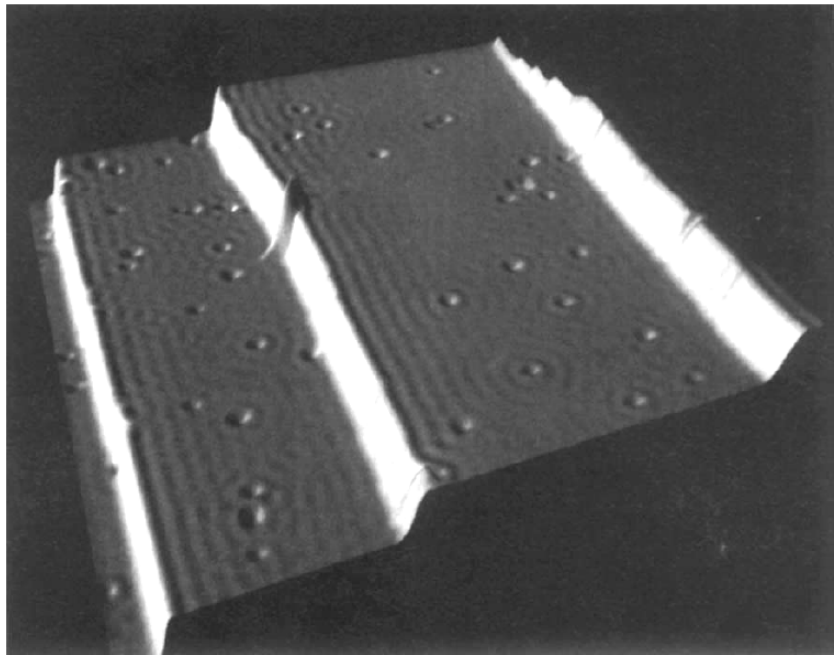
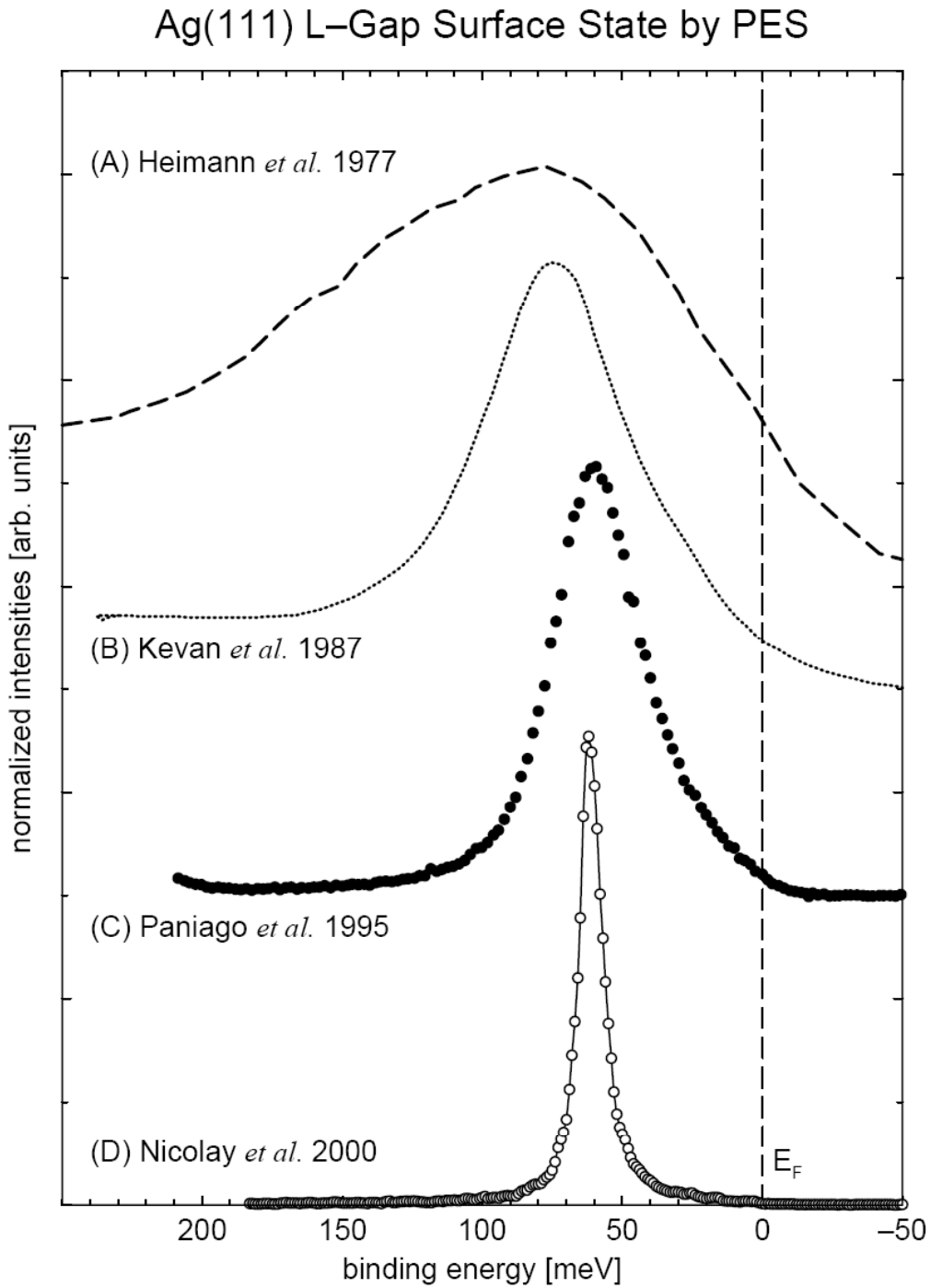


FIG. 1 Constant-current 500 Å × 500 Å image of the Cu(111) surface (V=0.1 V, I=1.0 nA). Three monatomic steps and about 50 point defects are visible. Spatial oscillations with a periodicity of ~15 Å are clearly evident. The vertical scale has been greatly exaggerated to display the spatial oscillations more clearly.

Fig. 3.30

M.F. Crommie, C.P. Lutz, D.M. Eigler, Nature 363 (1993) 542

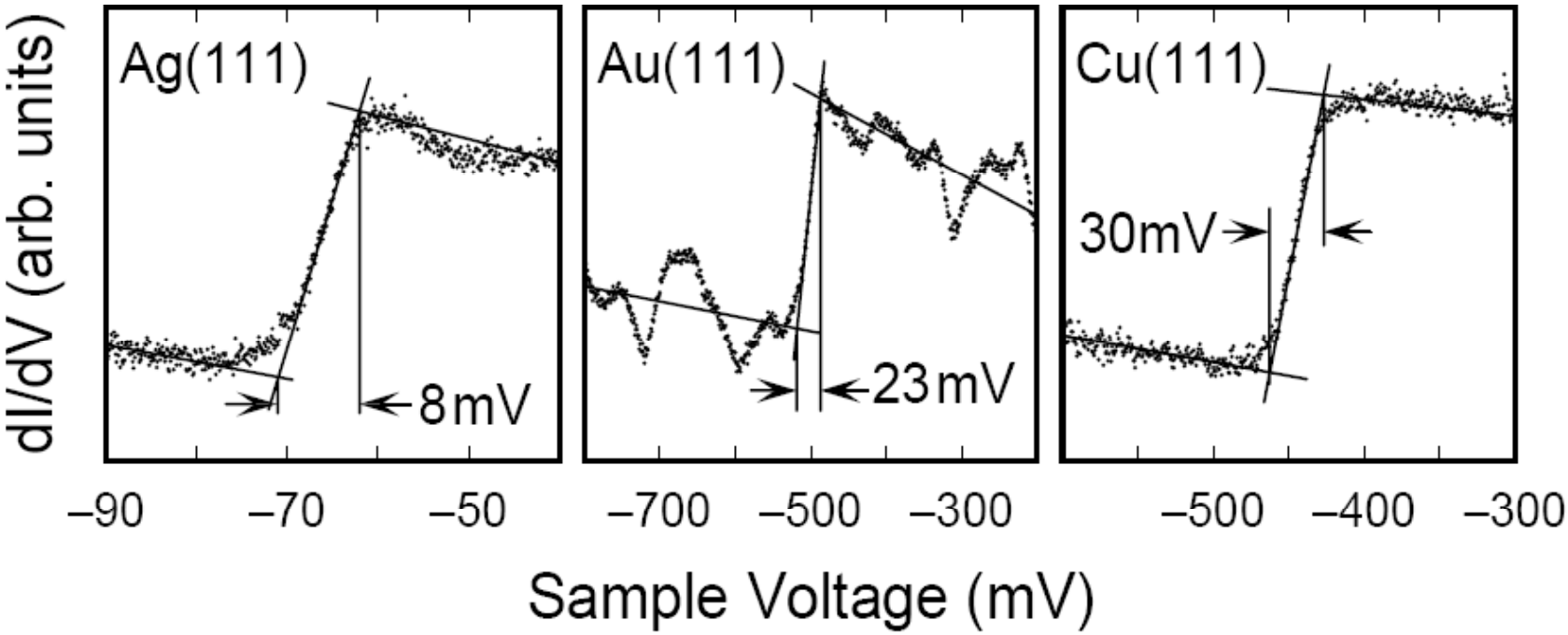
Improvement of PES technique



P.M. Echenique et al.,
Surf. Sci. Rep. 52 (2004) 219

Fig. 3.31

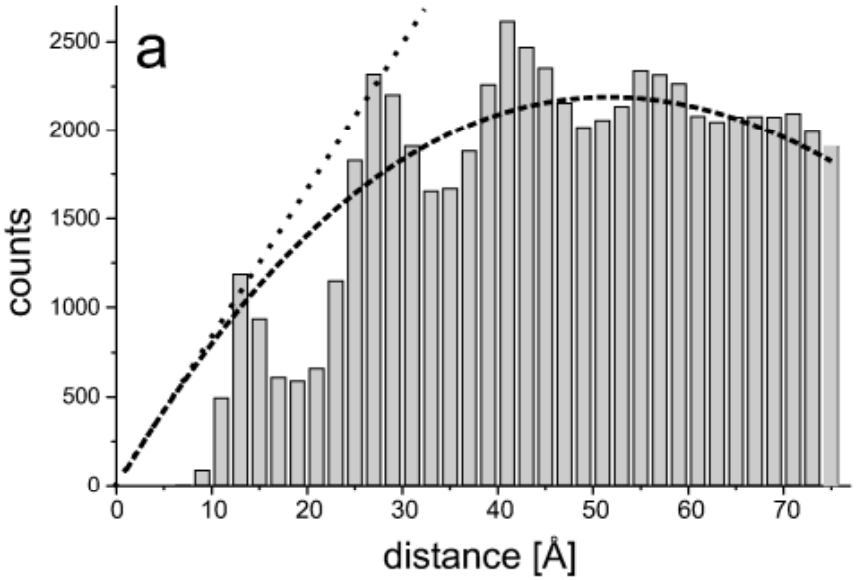
Linewidth measured by STM



P.M. Echenique et al.,
Surf. Sci. Rep. 52 (2004) 219

Fig. 3.32

Adatom-Adatom Interaction Through Friedel Oscillations: Cu on Cu(111)



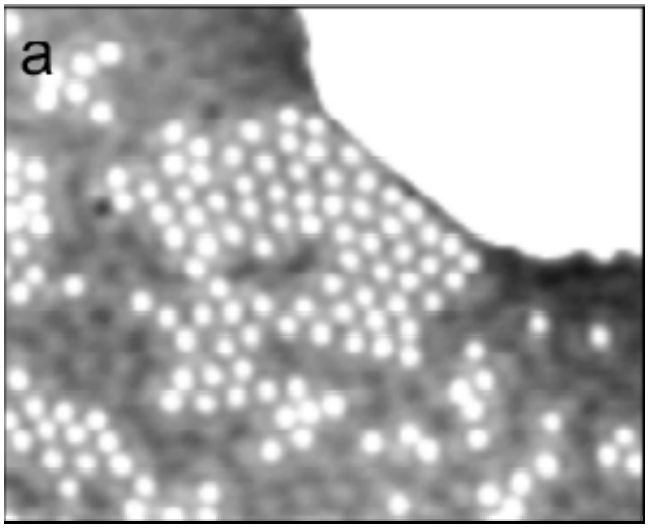


FIG. 1. Single Cu adatoms evaporated at 15 K on Cu(111). The STM images have been taken at 9 K. (a) The Cu adatoms form an island with local hexagonal order and an average distance of 12.5 Å.

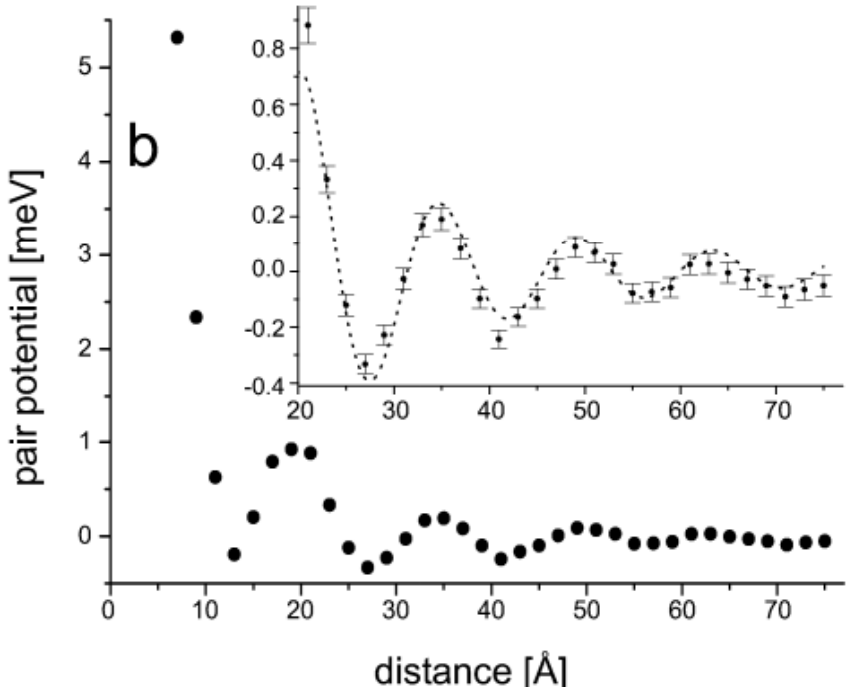


FIG. 2. (a) Histogram of the distribution of adatom separations determined from a series of STM images. The dotted curve displays the expected increase of the counts solely due to the linear increase of adsorption sites with separation d, and the dashed curve includes the effect of the finite image size. In the absence of adatom-adatom interactions, the measured data would follow the dashed curve. (b) Potential energy between two Cu adatoms. The inset shows the behavior for larger separations. The dotted line represents a fit based on Eq. (1) with $A = 0.08$ and $\delta_F = 0.3\pi$.

Fig. 3.33

J. Repp, F. Moresco, G. Meyer, K.-H. Rieder, PRL85 (2000) 2981

Quantum Corral

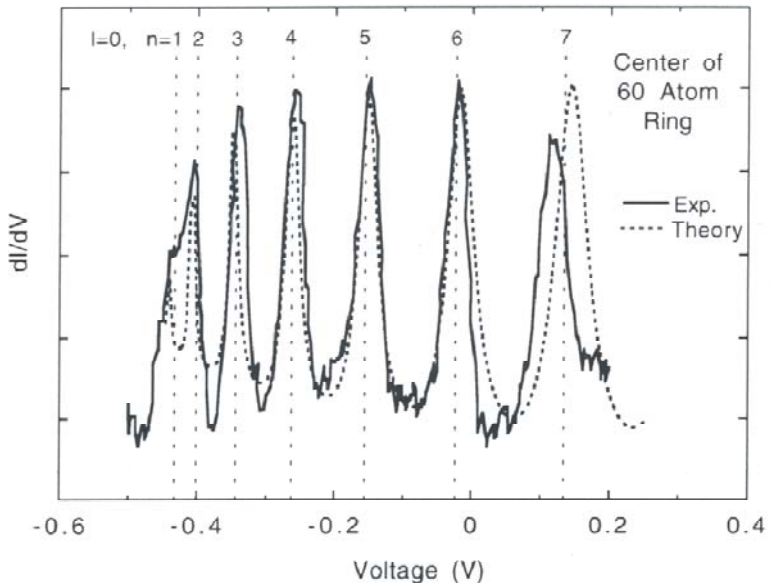
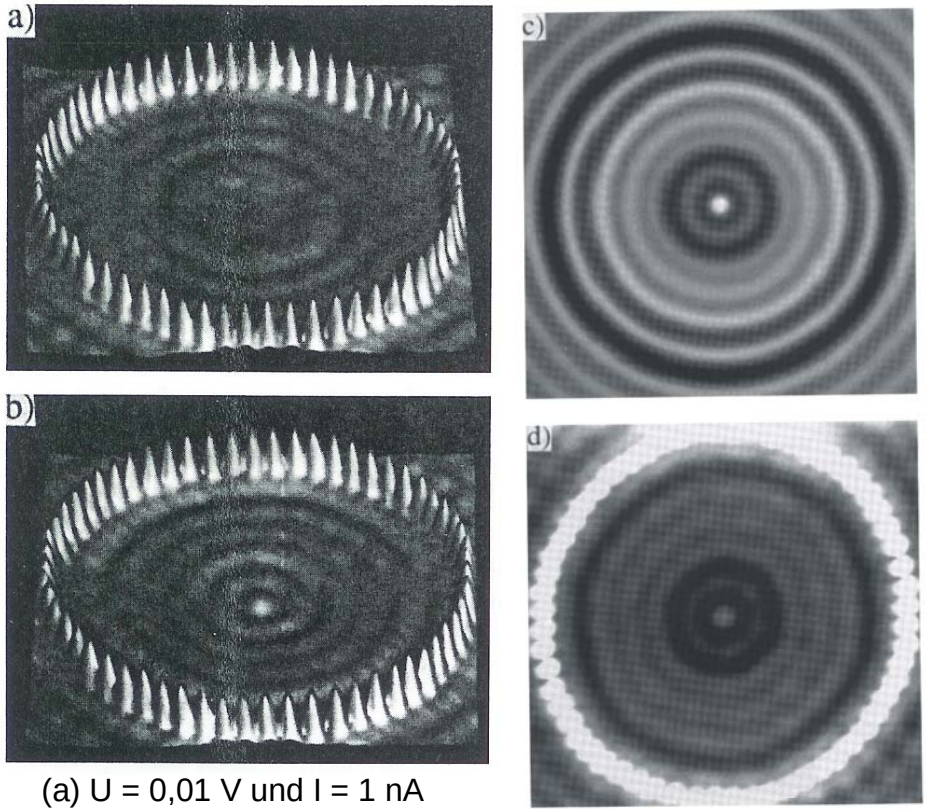


Fig. 9. Solid curve: dI/dV spectrum taken with the STM tip held stationary over the center of the 60 atom Fe ring. The experimental curve has had a smooth background removed. Broken curve: results of multiple-scattering calculation performed in the "black dot" limit (the offset and normalization of the theoretical curve are treated here as free parameters). Vertical lines: theoretical eigenenergies for $l = 0$ states of a round, 2D hard-wall box having the same dimensions as the 60 atom Fe ring.



(a) U = 0,01 V und I = 1 nA
(b) U = -0,01 V und I = 1 nA

Crommie et al. Physica D 83 (1995) 98

Fig. 3.34