New Scanning Microscopes that Traverse Atomic Landscapes

Jane E. Frommer

The landscape spreads before you as rolling hills, punctuated by occasional pits and holes, and leads westerly to a precipitous cliff. Whereas this scene resides in many a photo journal from summer holidays, it is appearing also in laboratories in images from scanning microscopes. The imaged hills are really atomic steps and terraces, while the pits are random atomic vacancies and the cliff is a screw dislocation. What allows us to draw this analogy between the large and small scales of nature? In part, it is the modern techniques of graphics visualization of data; in larger part, however, it is the stunning resolution of atomic and molecular features that this class of microscopes is able to produce. The ability to directly access the physics and chemistry of surfaces with the scanning tunneling and atomic force microscopes (STM and AFM) raises new questions, e.g., to what extent can the imaged surface be willfully manipulated?