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Effect of Atomic Scale Geometry on Contact and Friction Between Rough Solids[1] TRISTAN A. SHARP, MARK O. ROBBINS, Johns Hopkins University — Microscopic roughness on real surfaces is known to have a profound influence on macroscopic contact mechanics. It has previously been reported that surfaces that differ only at the atomic level can show different relationships between load, stiffness, and friction. Here we use molecular dynamics simulations to study contact properties of self-affine rough surfaces that are identical at continuum scales, but differ at the atomic scale. We compare surfaces that have atomic positions displaced to a self affine surface to "stepped" surfaces that have been cut from a lattice. The stepped surfaces exhibit more plasticity, contributing to a larger contacting area at a given load. A unified framework captures the relation between roughness, system size, surface separation, stiffness, and contact area.

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