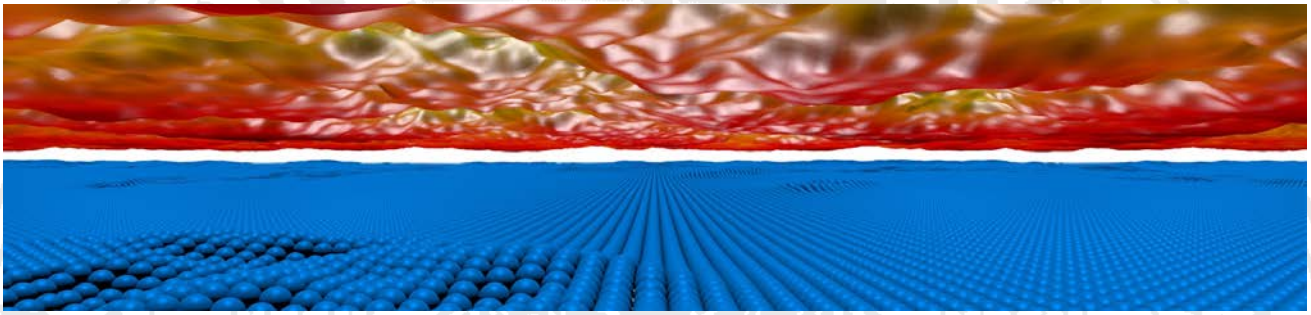
PHYSIKALISCHES KOLLOQUIUM

AM 17. JULI 2017 UM 17 UHR C.T.

IM HÖRSAAL I, PHYSIKHOCHHAUS



CONTACT AND ADHESION OF FRACTAL INTERFACES

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Experimental surfaces typically have roughness that can be described as self-affine fractal. Self-affine scaling has been observed on many materials and across wide range of length scales, from the atomic to the tectonic. This roughness greatly reduces the fraction of the area that is in intimate molecular contact and thus can contribute to friction and adhesion. The talk will describe recent numerical calculations of elastic and elasto-plastic contact between rough surfaces with nominally flat or spherical geometries on large scales. An efficient Green's function approach allows calculations for systems with roughness on nanometer to micrometer scales. These calculations exactly reproduce contact geometries measured using contact-sensitive fluorescent markers and reveal the role of plasticity played in contact. Results for a wide range of geometries can be collapsed using simple scaling relations that depend on the root mean squared surface slope, sphere radius, elastic modulus and work of adhesion. The scaling relations explain why adhesive interactions have little effect unless the surfaces are extremely smooth or soft.