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Abstract for an Invited Paper
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David Adler Lectureship Award Talk: Friction and energy dissipation mechanisms in adsorbed molecules and molecularly thin films[1]

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Studies of the fundamental origins of friction have undergone rapid progress in recent years, with the development of new experimental and computational techniques for measuring and simulating friction at atomic length and time scales [1]. The increased interest has sparked a variety of discussions and debates concerning the nature of the atomic-scale and quantum mechanisms that dominate the dissipative process by which mechanical energy is transformed into heat. Measurements of the sliding friction of physisorbed monolayers and bilayers can provide information on the relative contributions of these various dissipative mechanisms. Adsorbed films, whether intentionally applied or present as trace levels of physisorbed contaminants, moreover are ubiquitous at virtually all surfaces. As such, they impact a wide range of applications whose progress depends on precise control and/or knowledge of surface diffusion processes. Examples include nanoscale assembly, directed transport of Brownian particles, material flow through restricted geometries such as graphene membranes and molecular sieves, passivation and edge effects in carbon-based lubricants, and the stability of granular materials associated with frictional and frictionless contacts.

[1] J. Krim, Advances in Physics, **61**, (2012) pp155-323

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