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**Adhesion and Friction of Surfaces:
Recent Nano- and Micro-Scale Studies on the
Transition from Liquid-like to Solid-like Behavior**

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100 Smith Hall

ABSTRACT — Recent experiments using the Surface Forces Apparatus have been conducted on the adhesion and friction of polystyrene (PS) surfaces and films in air. Both cross-linked and uncross-linked PS were studied in the molecular weight range from 590 to 3,000,000, thereby spanning the purely liquid-like to glassy and elastomeric regimes. Our aims were (1) to see whether the adhesion and friction/lubrication forces for liquid PS ($T \gg T_g$) are determined by the surface tension and bulk viscosity (they are), and (2) how each of these interactions change on passing through T_g , ending up in the solid state at $T \ll T_g$, where adhesive failure and friction are now determined by completely different material properties. We find that the deformations of the surfaces play a very important role in these processes and transitions. Preliminary comparisons will be made with similar experiments conducted on small, non-chain molecules of sugars whose viscosities can change by many orders of magnitude over a narrow temperature range, thereby making them ideal for these kinds of studies.