Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Droplet Impact on Inclined Surfaces for Forensic Bloodstain Analysis[1] MARC SMITH, MICHAEL LOCKARD, G. PAUL NEITZEL, Georgia Institute of Technology — During a crime scene investigation, bloodstains are used to infer the size, impact angle, and velocity of the blood droplet that produced the stain. This droplet impact process was explored using experiments and numerical simulations of droplets impacting planar, inclined surfaces with different roughness and wetting properties over a range of Reynolds numbers (1,000 – 5,500) and Weber numbers (200 – 2,000) typical of some forensics applications. Results will be presented showing how the size and shape of the final elliptical bloodstain varies with impact angle and surface roughness. The common forensics practice to predict the impact angle is fairly accurate for near-normal impacts, but it under-predicts the angle for oblique impacts less than about 40 and this effect worsens for rougher surfaces. The spreading of the droplet normal to the impact plane is shown to follow that of a droplet under normal impact as the impact velocity increases. This effect is also lessened by increased surface roughness. The reasons for these effects will be explored using a new GPU-based wavelet-adaptive flow simulation, which can resolve the flows near the solid surface and near the moving contact line of these droplets for the large Reynolds and Weber numbers of these experiments.

[1]Supported by the National Institute of Justice.

Marc K. Smith
Georgia Institute of Technology

Date submitted: 31 Jul 2015 Electronic form version 1.4