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Janus surfaces reveal the hidden face of splashing ANDRZEJ LATKA, MICHELLE DRISCOLL, SIDNEY NAGEL, James Franck Institute, University of Chicago, Chicago, Illinois 60637, USA — When a drop impacts a dry solid surface, a rapidly moving contact line is created. Subsequently, a thin liquid sheet is ejected from the vicinity of this contact line. The thin sheet then breaks apart to form a splash. Previous work has shown that if the solid surface has a micron-scaled roughness, the thin sheet fails to eject and splashing is suppressed. A striking phenomenon can be observed if the drop impacts a hybrid surface comprised of a rough region, where the initial liquid-solid contact takes place, and a smooth region that is reached by only part of the spreading drop: splashing occurs only where the liquid-solid contact line encounters the smooth surface. Consequently, one observes part of the drop splashing, while the other part spreads on the rough surface undisturbed! The splashing outcome is sensitive to the location of the roughness boundary. Crucially, if the velocity of the contact line as it crosses over into the smooth region is below a threshold velocity, u_{stop}, the drop will not splash even though it has left the rough surface. We describe how this hitherto unidentified characteristic velocity depends on other experimental parameters, such as the liquid viscosity and ambient gas pressure, and discuss the insights it provides into the physical mechanisms underlying splashing.

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