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How do fluids flow over surfaces ?

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Microfluidic technology, which is mainly driven by applications, also contributes to the investigation of fundamental phenomena. An example is the slippage of fluids over surfaces. It is now established that fluids (gas or liquids, simple or complex, with and without electric fields), generally slip over smooth surfaces. In the microfluidic lab of ESPCI, we performed experiments in which the flow velocity could be measured down to 20 nm from flat surfaces. We observed various effects, such as an enhancement of the slippage by the application of an electric field, a strange (uninterpreted) decananometric plug flow region for semi dilute polymers, and a particularly crucial nanometric lubrication effect for gel particules solutions. These observations contribute to understand better the near-wall structure of liquid flows in simple geometries.