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Free surface dynamics of nematic liquid crystal[1] LINDA CUMMINGS, LOU KONDIC, MICHAEL LAM, New Jersey Institute of Technology, TE-SHENG LIN, National Chiao Tung University, Taiwan — Spreading thin films of nematic liquid crystal (NLC) are known to behave very differently to those of isotropic fluids. The polar interactions of the rod-like molecules with each other, and the interactions with the underlying substrate, can lead to intricate patterns and instabilities that are not yet fully understood. The physics of a system even as simple as a film of NLC spreading slowly over a surface (inclined or horizontal) are remarkably complex: the outcome depends strongly on the details of the NLC's behavior at both the substrate and the free surface (so-called "anchoring" effects). We will present a dynamic flow model that takes careful account of such nematic-substrate and nematic-free surface interactions. We will present model simulations for several different flow scenarios that indicate the variety of behavior that can emerge. Spreading over a horizontal substrate may exhibit a range of unstable behavior. Flow down an incline also exhibits intriguing instabilities: in addition to the usual transverse fingering, instabilities can be manifested behind the flowing front in a manner reminiscent of Newtonian flow down an inverted substrate.

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