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Seeing and Sculpting Nematic Liquid Crystal Textures with the Thom construction BRYAN CHEN, University of Pennsylvania, GARETH ALEXANDER, University of Warwick — Nematic liquid crystals are the foundation for modern display technology and also exhibit topological defects that can readily be seen under a microscope. Recently, experimentalists have been able to create and control several new families of interesting defect textures, including reconfigurably knotted defect lines around colloids (Ljubljana) and the "toron," a pair of hedgehogs bound together with a ring of double-twist between them (CU Boulder). We apply the Thom construction from algebraic topology to visualize 3 dimensional molecular orientation fields as certain colored surfaces in the sample. These surfaces turn out to be a generalization to 3 dimensions of the dark brushes seen in Schlieren textures of two-dimensional samples of nematics. Manipulations of these surfaces correspond to deformations of the nematic orientation fields, giving a hands-on way to classify liquid crystal textures which is also easily computable from data and robust to noise.

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