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Differential Geometry Approach to Liquid-Crystal Elastomers and Glasses[1] JONATHAN SELINGER, THANH-SON NGUYEN, Kent State Univ - Kent — We present a theory for liquid-crystal elastomers and glasses using the language of differential geometry. The basic physics behind this approach is the Warner-Terentjev trace formula, supplemented by their semi-soft elastic term. By expressing the theory using differential geometry, we obtain several new insights. First, we can see that the theory of liquid-crystal elastomers is analogous to recent research on swellable gel sheets, which develop complex 3D shapes in response to programmable swelling patterns. Second, we can model the distinction between liquid-crystal elastomers and liquid-crystal glasses, depending on how strongly the director is locked into an orientation determined by the elastic distortion. Third, for soft elasticity, we can analyze the set of degenerate configurations in ideal elastomers, and see how the degeneracy is broken by the non-ideal semi-soft elasticity. Finally, for elastomers with blueprinted director configurations, we can assess which configurations remain stress-free as they distort under a temperature change.

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