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PROPOSITIONS
accompanying the thesis
TOPOLOGY AND GEOMETRY IN CHIRAL LIQUIDS



1. Despite its simplicity, the Ising model describes the universality class of *many* sorts of transitions, for instance chiral-achiral structural transitions in toroidal nematic droplets. [This thesis part I]

2. By breaking time reversal symmetry, active polar liquids confined in a proper geometry may be used to self-assemble chiral topological acoustic metamaterials classically mimicking the celebrated quantum Hall effect. [This thesis part II]



3. As density increases, emergent spatiotemporal order in active chiral spinner materials is ultimately destroyed by the same terms that are responsible for that order in the first place. [This thesis part III]

4. Using the method of variational integrators, Newton's equations of motion for Riemannian manifolds can be solved numerically, yielding a novel first-order symplectic integrator. [This thesis part IV]

5. Quincke rollers are an excellent candidate for experimentally realizing a self-assembled topological acoustic metamaterial composed of an active polar liquid when confined to the right geometry.
[A. Bricard et al., doi:10.1038/nature12673]

6. By changing the intrinsic curvature of the confining space, a flow in active chiral fluids can be induced, analogous to the mechanism described by D. Banerjee et al. [D. Banerjee et al., arXiv:1702.02393]



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7. In the past decades active matter research has mostly focused on the effects of self-propulsion of some sort. Useful and interesting physics may arise when this self-propulsion is combined with *intelligent* interactions. [M. C. Marchetti et al., doi:10.1103/RevModPhys.85.1143]
 8. Intelligent machines are slowly entering the realm of theoretical physics – theoretical physicists may soon start using intelligent machines to assist in the search of novel ideas. [M. Ceriotti et al., doi:10.1038/nphys3757]
 9. Conventions, rules, regulations and social alignment are often anti-growth, anti-change and anti-progress – dealing with organisations that impose inefficiency-inducing ideas can lead to stress and frustration. [M. Sousa, hdl.handle.net/10362/9827]
 10. The widespread idea that more democracy – despite its great achievements – is the best and only cure to society’s maladies is one of the sad misconceptions of the last century. [B. Caplan, “*The Myth of the Rational Voter*”]
 11. As the world is inherently capitalist, rationality arguments combined with the law of supply and demand explain a great deal of actions and behaviors – once understood sufficiently, we may begin to realize how we can motivate entrepreneurs to fix the world’s problems. [D. D. Friedman, “*Hidden Order*” and “*The Machinery of Freedom*”]
 12. Love is the ultimate – and perhaps only – reason for the existence of this thesis. As a whole, for most of us, love is often a greater incentive than money – provided there is sufficient of the latter.



BENJAMIN CHAI VAN ZUIDEN
LEIDEN, 27 SEPTEMBER 2017

