

# The Mathematics of Liquid Crystals: Merging Theory, Simulations and Experiments

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Liquid crystals are classical examples of mesophases or phases of matter with physical properties intermediate between those of conventional solids and liquids. We review the key continuum theories for nematic liquid crystals, the most common type of liquid crystals that have revolutionized the display industry. We describe some model problems arising from new experiments and industrial applications, the mathematical modelling of such problems, the governing partial differential equations, the complex solution landscape and how it can be controlled by material parameters, temperature, geometry, boundary conditions etc. These model problems illustrate the rich intra-disciplinary and inter-disciplinary nature of the field as a fertile ground for new networks.