Defect Dynamics in Cholesterics: Beyond the Peach–Koehler Force — Supplemental Materials

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In this supplemental information we provide captions for supplementary movies 1 to 7.

Supplementary Movie 1: The relaxation dynamics of a pair of τ-lines of opposite winding in a cholesteric, the simulation shown in Fig. 1 of the main text. This pitch is $p = h$ for h the height of the simulation box. We show the emerging structure from three different fields of view. Directors are shown as gray sticks, merons as green tubes, defects as purple tubes. When shown from above (leftmost panel) the xy plane is coloured according to the angle between the x and y components of the director field, from the which the winding of the defects may be deduced.

Supplementary Movie 2: The relaxation dynamics of a pair of τ-lines of opposite winding in a cholesteric, with the defect orientations being rotated by 90 degrees from those shown in Fig. 1 and Supplemental Movie 1. This pitch is $p = h$ for h the height of the simulation box. We show the emerging structure from three different fields of view. Directors are shown as gray sticks, merons as green tubes, defects as purple tubes. When shown from above (leftmost panel) the xy plane is coloured according to the angle between the x and y components of the director field, from the which the winding of the defects may be deduced.

Supplementary Movie 3: The relaxation dynamics of a pair of χ-lines (with $q = 1$) of opposite winding in a cholesteric, the simulation shown in Fig. 2 of the main text. This pitch is $p = h$ for h the height of the simulation box. W show the emerging structure from three different fields of view. Directors are shown as gray sticks, merons as green tubes, defects as purple tubes. When shown from above (leftmost panel) the xy plane is coloured according to the angle between the x and y components of the director field, from the which the winding of the defects may be deduced.

Supplementary Movie 4: The relaxation dynamics of isolated τ-lines of winding $+1/2$ (left panels) and $-1/2$ (right panels) in a cholesteric, at pitch $p = h$ for h the height of the simulation box. We show the emerging structure from above and from the side. Directors are shown as gray sticks, merons as green tubes, defects as purple tubes. When shown from above (bottom panels) the xy plane is coloured according to the angle between the x and y components of the director field, from the which the winding of the defects may be deduced. The motion of the $+1/2$ defect (left) is clear, as is its conversion into a meron tube. The $-1/2$ defect (right) does not move. Simulations performed for fixed boundary conditions on the x, y boundaries of the box, and periodic in z.

Supplementary Movie 5: The relaxation dynamics of chargeless defect loop in a cholesteric, corresponding to the simulation shown in Fig. 4 of the main text, with pitch length $p = 0.75h$ for h the height of the simulation box. Directors are shown as gray sticks, merons as green tubes, defects as purple tubes. Simulations performed for periodic boundary conditions in x and y, with the director field fixed at the z boundaries.

Supplementary Movie 6: Defect coarsening in a cholesteric with pitch length $p = 0.75h$ for h the height of the simulation box. Directors are shown as gray sticks, merons as green tubes, defects as purple tubes. The initial director field is random in the bulk and fixed to align with the x-axis on the z boundaries. Simulations performed for periodic boundary conditions in x and y, with the director field fixed at the z boundaries.

Supplementary Movie 7: The conversion from a hedgehog to a hyperbolic defect in a cholesteric droplet of

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radius R with fixed radial anchoring and pitch length $p = R$. The initial director is purely radial, with the defect displaced slightly from the droplet centre. Over time, it changes its structure. We show the droplet from the side (left panel) and above (middle panel), with the oriented director field shown as gray arrows on the $x = 0$ slice and $z = 0$ slice, respectively—the orientation is chosen consistently so the director points out from the boundary. In each case we shown the Pontryagin–Thom (PT) surface $n_z = 0$, coloured according to the winding between the x and y components of the director. We also shown the twist distortion and director field on the $z = 0$ slice (right panel). The defect can be identified as the centre of the colour winding in the PT surfaces, or the region of strong negative twist (dark blue) in the rightmost panel.