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**Theory of Chiral Block Copolymer Melts: Mesoscopic Helicity from Inter-Segment Twist** GREGORY GRASON, WEI ZHAO, THOMAS RUSSELL, University of Massachusetts Amherst — We study the effects of chirality at the segment scale on the thermodynamics of block copolymer melts using self consistent field theory. In linear diblock melts where segments of one block prefer a twisted, or cholesteric, texture, we show that melt assembly is critically sensitive to the ratio of random coil size to the preferred pitch of cholesteric twist. For weakly-chiral melts (large pitch), mesophases remain achiral, while below a critical value of pitch, two mesocopically chiral phases are stable: an undulated lamellar phase; and a phase of hexagonally-ordered helices. We show that the non-linear sensitivity of meso-scale chiral order to preferred pitch derives specifically from the geometric and thermodynamic coupling of the helical mesodomain shape to the twisted packing of chiral segments within the core, giving rise to a second-order cylinder-to-helix transition.

Gregory Grason
University of Massachusetts Amherst

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