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Dynamics and statistical mechanics of semiflexible polymer bundles CLAUS HEUSSINGER, MARK BATHE, ERWIN FREY, Arnold-Sommerfeld Center for theoretical physics, University of Munich — Bundles formed from semiflexible polymers are ubiquitous in nature (e.g. filopodia) and many areas of technology (e.g. carbon nanotube bundles). Despite their simple structure, their mechanical and dynamical properties are only poorly understood. We set up an elastic energy functional that allows characterizing the dynamical and statistical mechanical properties of polymer bundles, in much the same way as the standard worm-like chain model (WLC) does for single polymers. The key result of our analysis is that bundles must be characterized by a wave-number dependent persistence length $l_p(q)$ instead of just a single q-independent value. This finding is shown to have dramatic consequences not only on the static and dynamic fluctuation spectrum of an isolated bundle but also on the scaling behaviour of their entangled solutions as well as their cross-linked networks.

Claus Heussinger
Arnold-Sommerfeld Center for theoretical physics, University of Munich

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