Seeing believes: Watching entangled sculpted branched DNA in real time

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Univ of Illinois - Urbana — The importance of branching in polymer physics is universally accepted but the details are disputed. We have sculpted DNA to various degrees of branching and used single-molecule tracking to image its diffusion in real time when entangled. By ligating three identical or varying length DNA segments, we construct symmetric and asymmetric \textit{Y} branches from elements of lambda-DNA with 16 \textmu m contour length, allowing for single-molecule visualization of equilibrium dynamics. Using home-written software, a full statistical distribution based on at least hundreds of trajectories is quantified with focus on discriminating arm-retraction from branch point motion. Some part of our observations is consistent with the anticipated \textit{relaxation through arm retraction} mechanism but other observations do not appear to be anticipated theoretically.

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