The double helix is the iconic form of DNA, but this unbranched form is not the active one in vivo. Instead, it is branched DNA molecules that are central intermediates in genome duplication, repair of DNA damage and recombination. Branched DNA is also widely used for nanoscience and nanotechnology in the formation of self-assembled nanostructures. We are using single-molecule fluorescence tools to reveal unique information about the structure and dynamics of branched DNA. In this talk, I will describe our work on the structural determination of forked DNA and three-way junctions using high-resolution single-molecule Förster resonance energy transfer (FRET).