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DNA folding in a crowded environment[1] MARK TAYLOR, Dept. of Physics, Hiram College, Hiram, OH, WOLFGANG PAUL, Institute for Physics, Martin-Luther-Universitaet, Halle, Germany — At the molecular level, biological systems operate in very crowded solution environments. It has long been recognized that this crowding can affect the conformational stability and phase transitions of the biopolymers comprising such systems. Similar issues must be addressed in developing biotechnology applications based of dense arrays of surface-tethered polymers. In our recent work we directly measure the entropy reduction resulting from crowding/confinement using Wang-Landau computer simulation techniques [1]. Here we will discuss the folding transition of a specific single-stranded DNA oligomer that has been studied extensively by the Plaxco group [2]. We develop a coarse-grained model for this ssDNA and use it to examine the entropic effects associated with both surface tethering and surface crowding. For the tethered ssDNA oligomer crowded by other tethered oligomers, we find, in agreement with experiment, that both stabilization and destabilization are possible depending on the conformational state of the crowders. [1] Taylor, Macromolecules 50, 6967 (2017); J. Chem. Phys. 147, 166101 (2017); [2] Watkins et al, JACS 134, 2120 (2012); JACS 136, 8923 (2014).

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