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Programming colloidal phase transitions with DNA strand displacement WILLIAM ROGERS, VINOTHAN MANOHARAN, Harvard University — Specific interactions induced by transient bridging of complementary DNA strands grafted to colloidal particles can direct assembly of nanostructured materials. These interactions have been used to 'program' the symmetry of novel equilibrium superlattices and could in principle enable self-assembly of prescribed structures. However, the ability to program the *transitions* between these equilibrium phases is currently limited: DNA-mediated attractions between particles decrease monotonically and steeply with increasing temperature, resulting only in high-temperature fluids and low-temperature solids that are inherently difficult to equilibrate. We show that by introducing free DNA strands that compete to bind with the grafted ones by strand displacement, the temperature dependence of interparticle interactions can be programmed through the base sequences of displacing strands. We use this scheme to create colloids with 'designer' phase behavior such as re-entrant melting, arbitrarily wide gas-solid coexistence, and reversible transitions between different binary crystals.

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