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Progress on systems of DNA modified colloidal particles for self-replication PAUL CHAIKIN, MIRJAM LEUNISSEN, REMI DREYFUS, ROUJIE SHA, NADRIAN SEEMAN, DAVID GRIER, DAVID PINE, New York University — Our goal is to create new materials that can self-replicate and self-assemble. For this, we modify the interactions between micrometer-sized colloids by coating them with single-stranded DNA 'sticky ends', which specifically recognize complementary sequences on other colloids. We find that the aggregation-dissociation behavior is fully reversible for at least tens of temperature cycles. Using magnetic beads or optical tweezers, we form a chain-like 'seed' structure, which acts as a template to assemble copies of itself from a soup of singlets. To determine what are the preferred binding sites, we studied the interactions between the singlets and their complementary particles in the seed. Important in our replication scheme is that each particle has two different types of sticky ends: one for 'longitudinal' bonding along the chain and another for 'transverse' bonding between seed and daughter chains. Contrary to the transverse linkers, the longitudinal linkers form AT/TA bonds, which can be crosslinked with an intercalator and UV irradiation. In this way, we permanently fix the seed and its copies.

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