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DNA is well known to self-assemble to form the iconic double helix structure; peptides also self-assemble into beta sheets and alpha helices which form the foundation of protein structure. We aim to combine these two moieties in the search for new materials with properties which are as yet unseen outside of nature.

Abstract

Hierarchal and Emergent Assembly through DNA – Peptide Conjugation.

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This research aims to take two naturally occurring self-assembling models and coerces them to work together to produce self-assembled materials with properties which stem from the interaction of their respective assembly regimes in an orthogonal approach.[1] Orthogonal self-assembly generally takes two forms; hierarchal self-assembly where one interaction leads to the formation of a structure and a second interaction leads to the formation of a super structure;[2] and emergent assembly, where the indirect interaction between different systems leads to the development of new occurrences,[3] similar to those found in biology. DNA is well known for self-assembling into double helix structures. Peptides are well known for producing secondary structures such as beta sheets; alpha helices and 3D structures such as coiled coils.[4] These systems have complex and varied uses within nature, however their use in synthetic systems are as yet basic in comparison to natural systems.[5] Most biological reactions rely upon small molecule interactions such as catalysis by an enzyme.[6] However more complex tasks require cooperation between molecules from different families, an example of this cooperation can be taken from ribosomes which use both RNA and proteins to produce proteins.[7]

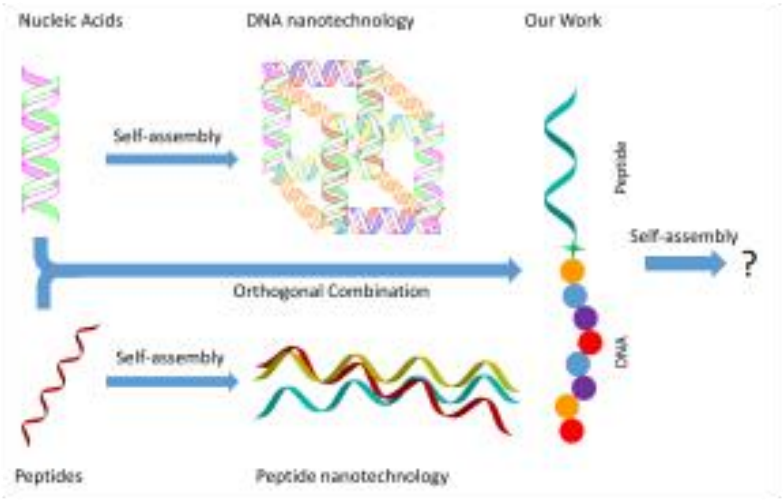

Figure 1: Design strategy for DNA-peptide hybrid nanostructures.

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