Interrogating enzymatic reactions using nucleic acid molecular recognition and assembly

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Nucleic acids are exquisitely adept at molecular recognition and assembly, enabling them to direct nearly all of the processes that make life possible. These capabilities have been fine-tuned by billions of years of evolution, and more recently, have been harnessed in the laboratory to enable the use of DNA and RNA for applications that are completely unrelated to their canonical biological roles. In our lab, we seek to use DNA and RNA for applications in biosensing and biomolecular imaging. Specifically, we utilize DNA aptamers as recognition elements for the development of new assays for small-molecule detection and enantiopurity measurement. This has enabled applications including the detection of small-molecule metabolites under conditions where antibody-based assays fail, and high-throughput monitoring of small-molecule enantiopurity for reaction optimization. We have also harnessed the specificity of protein-nucleic acid recognition to demonstrate selective enrichment of inosine-containing RNAs using EndoV for non-covalent capture. We anticipate this method will enable the identification of new sites of A-to-I editing in cells.)