Fei Zhang Laboratory

Our research group specializes in the field of structural nucleic acid nanotechnology, including DNA-inorganic hybrid materials and molecular programming. We are equipped with the latest FastScan Atomic Force Microscope (AFM), enabling us to capture real-time images of dynamic nanostructured biomaterials. Our team has a distinguished publication history in leading journals focused on structural DNA and RNA nanotechnology.

Our research project for the Scholar involves the design, assembly, and analysis of switchable DNA nanostructures. These structures are programmed to alter their configurations in response to external factors like temperature, pH, and molecules. Given their high programmability, biocompatibility, and convenient interfacing with cellular processes, such responsive molecular nanorobotics have vast potential for biological and biomedical applications. This interdisciplinary research spans molecular programming, DNA self-assembly, molecular computing, and biomaterials design. It's particularly well-suited for undergraduate researchers for several reasons. First, with rapidly advancing automated design software, the training for structural design can be completed in 2-4 weeks. Second, the experimental techniques are accessible within 2-3 months of training, even for those without a biochemistry background. The switchable nanostructures offer a broad scope for exploration, accommodating various dynamic functions and flexible research durations. Undergraduate students will be involved in characterizing these dynamic nanostructures, including AFM imaging, under the mentorship of senior researchers.

Upon completing this project, students will gain insights into DNA self-assembly, use molecular programming software, and understand the interplay between materials science, biochemistry, computation, engineering, and nanotechnology.

As a mentor, I am committed to nurturing students into independent researchers with robust scientific training and problem-solving capabilities. When a new undergraduate student, including the Scholar, joins the group, we will craft a tailored 1-year research plan. I conduct bi-weekly group meetings for presentation practice and hold individual sessions for personalized guidance and experimental discussion. My "open door" policy ensures immediate support whenever needed. My "people-oriented" approach fosters a collaborative learning environment. Students, irrespective of their background, are trained in state-of-the-art research techniques and engage in tailored projects. The Scholar will receive one-on-one training in designing DNA nanostructures and experimental techniques, both from me and senior graduate students. From day one, they will participate in group meetings, gradually taking on reporting responsibilities. I provide detailed guidance on experiment troubleshooting during our one-on-one sessions and encourage participation in conferences for presentation experience. I have consistently supported undergraduate students with their applications to graduate or medical schools, including providing recommendation letters, and will extend this support to the Scholar.