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New collaboration on DNA nanotechnology

Prof. Chunhai Fan, who is a recipient of the Humboldt Research Award, has been conducting research at the University of Stuttgart since June. Fan works closely with Prof. Laura Na Liu of the 2nd Physics Institute. Both researchers are among the world's leading experts in the field of DNA nanotechnology.

“The University of Stuttgart’s strong culture of interdisciplinary collaboration, combined with its close proximity to leading regional research institutions such as the Max Planck Society, provides access to an extensive network of expertise and world-class research resources,” says Chunhai Fan, a full professor and dean of the School of Chemistry and Chemical Engineering at Shanghai Jiao Tong University. “The University of Stuttgart offers an exceptional environment for advancing research at the interface of DNA self-assembly, physical chemistry, and synthetic biology.” The Chinese scientist will spend the next twelve months making regular research visits to Stuttgart. Together with Stuttgart-based Professor Laura Na Liu, he aims to advance innovative research ideas in the field of DNA nanotechnology.

Building technical systems and structures from DNA

In DNA nanotechnology, molecules – known as carriers of genetic information – serve as a material that can be precisely engineered. It can be used to build structures or moving systems, such as machines, on the nanometer scale. Using this approach, researchers such as Laura Na Liu and her team are developing, for example, artificial cellular components to specifically control the transport of molecules. The findings help us better understand biological processes; furthermore, this basic research may also lead to new treatment approaches in medicine in the future. DNA nanotechnology is making it possible to create programmable materials: Their properties can be altered through the targeted arrangement of DNA structures. The long-term goal of DNA nanotechnology research is to develop increasingly complex artificial systems that, much like natural cells, can work together in a coordinated manner and perform tasks autonomously.

Chunhai Fan's research

“Chunhai Fan is an internationally recognized pioneer in this field,” says Laura Na Liu, director of the 2nd Physics Institute at the University of Stuttgart. “He combines intellectual vision, scientific creativity, and outstanding leadership.” She also appreciates his generosity as a collaborator, his dedication to mentoring early-career researchers, and his commitment to fostering international scientific exchange. More than 30 members of Fan's research group now hold professorships at universities.

Fan pioneered the use of programmable DNA nanostructures for the development of biosensors, leading to highly sensitive diagnostic platforms. His research findings on drug delivery and molecular machines have since been incorporated into clinical development. Fan`s group also demonstrated a DNA-based programmable computing unit – a fundamental component for a future molecular computer. The scientist's work therefore influences not only basic research but also practical applications.

Fan's and Liu's working groups complement each other perfectly

The close collaboration between Fan and Liu is expected to lead to significant progress in this field of research, such as in the development of molecular machines and the construction of life-like artificial systems – such as protocells and simple cells – from their basic components. “The technical strengths of our two groups complement each other perfectly,” says Chunhai Fan. “My team specializes in single-molecule imaging and biophysical characterization, while the Stuttgart group is highly skilled in membrane techniques, the assembly of lipid bilayers, and the integration of DNA nanostructures into cellular interfaces. This is how we intend to tackle challenging interdisciplinary problems.”

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Further information

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