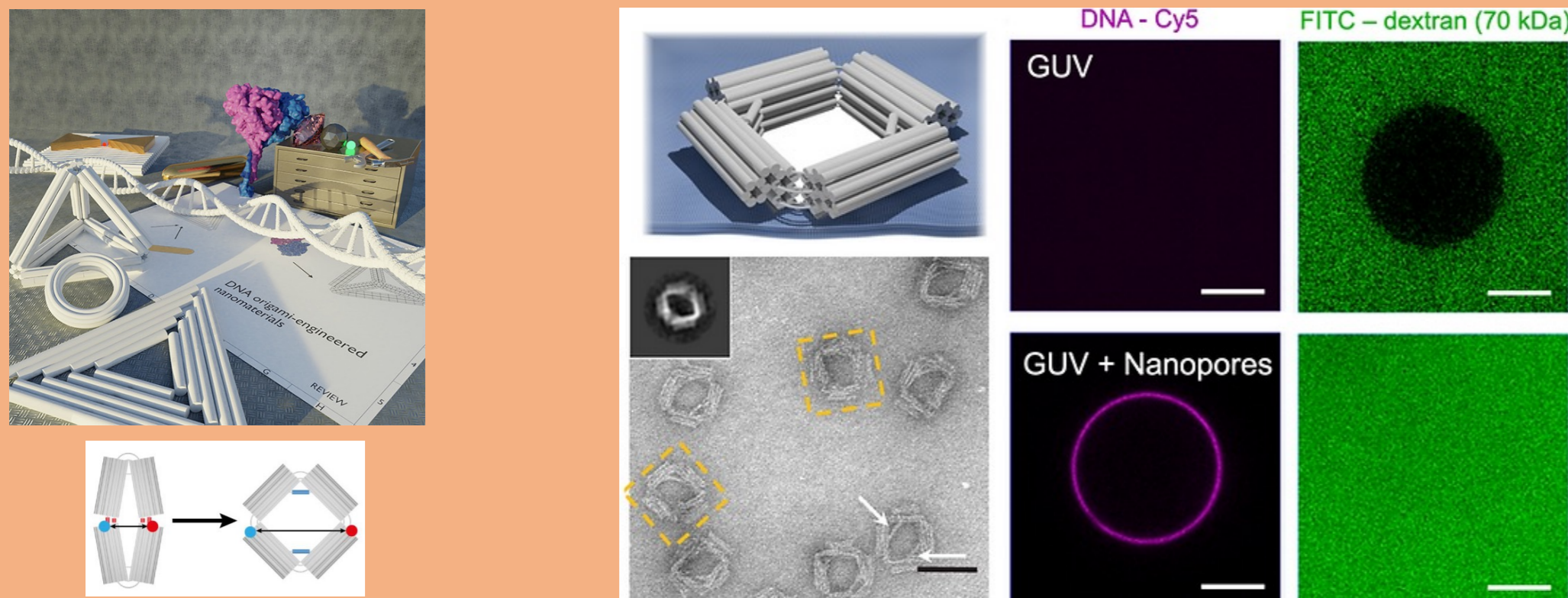


As a group working at the crossroads of nanotechnology and biophysics, we use nanodevices and microscopy/spectroscopy tools to study and engineer biology at the smallest scale. Projects range from **DNA origami nanoactuators**, **2D material optical biosensors** and **acoustofluidics**.

DNA origami nanoactuators

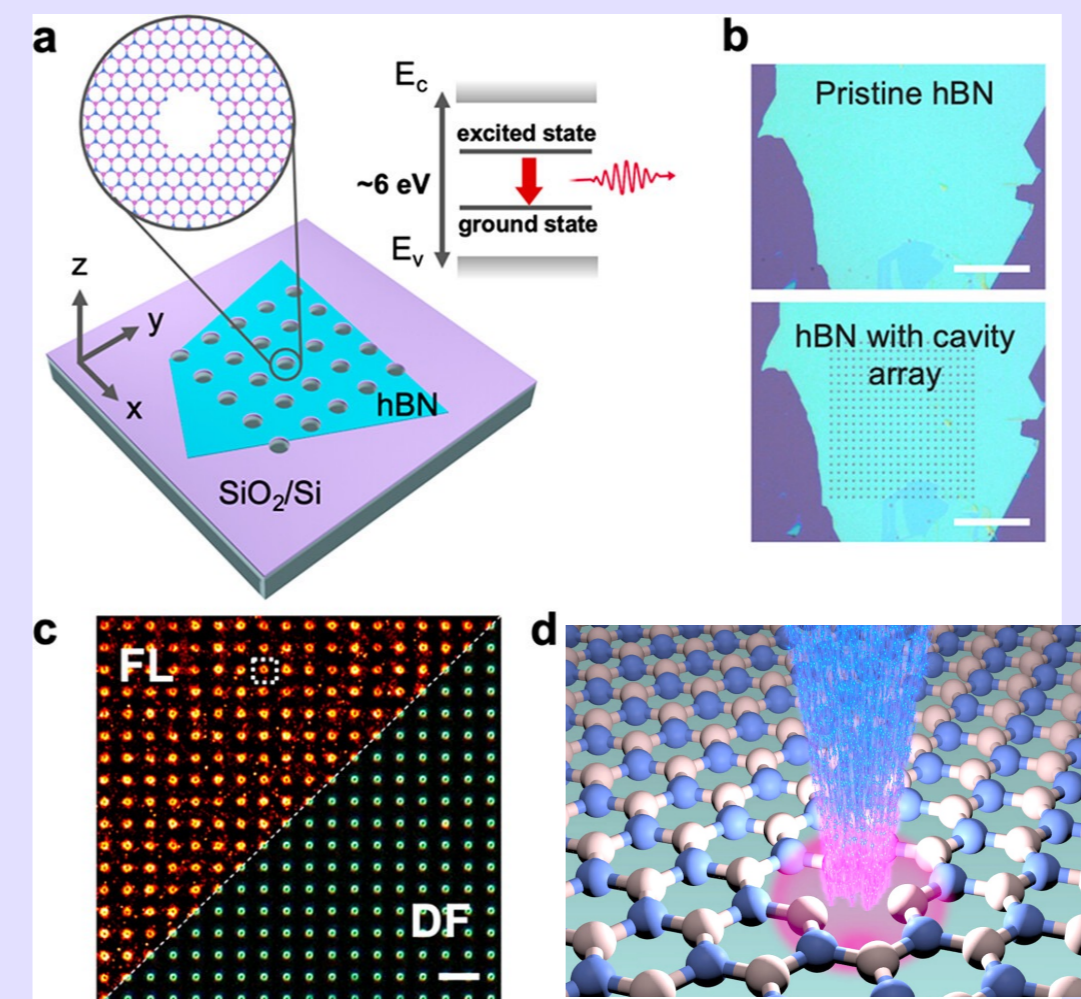
DNA origami nanotechnology is a powerful technique to design and assemble nanostructures with nanometer precision using DNA as a building material.



We build **dynamic nanodevices** by precisely folding DNA strands into predefined shapes. These nanoactuators can be used as **size-selective nanopores** that can be triggered on-demand to enable the passage of biomolecules across membranes.

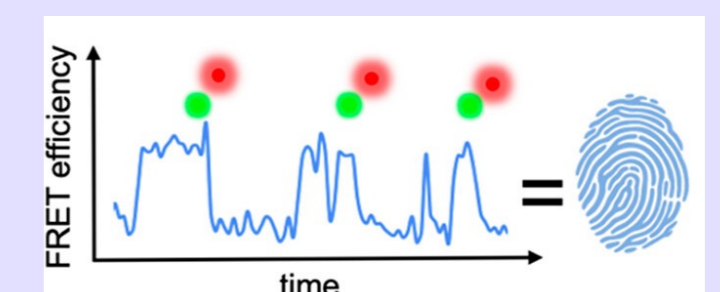
2D material nanophotonic biosensors

2D materials like hBN (**hexagonal boron nitride**) can host **optical emitters** that are ultrabright and stable at room temperature in liquid. They arise from **fluorescent crystal defects** that can be engineered via laser milling or ion/electron beam irradiation.



We are developing techniques to:

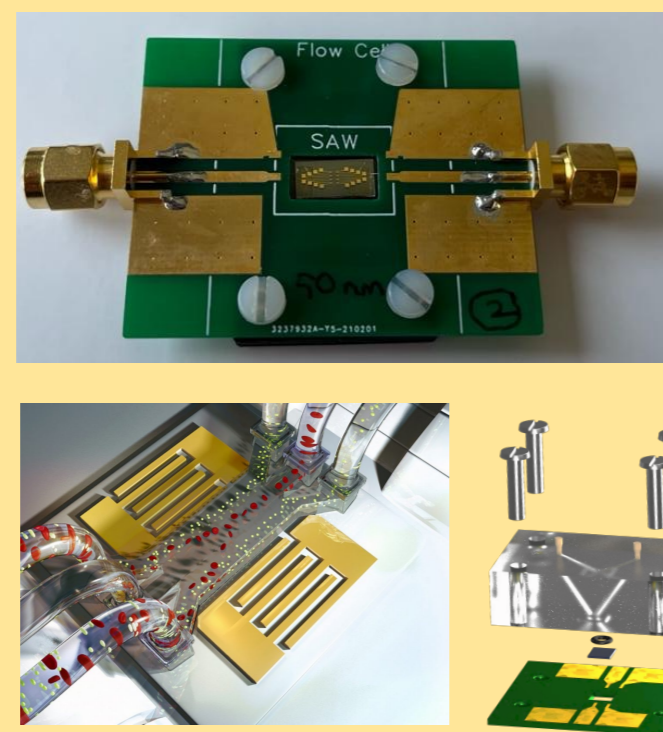
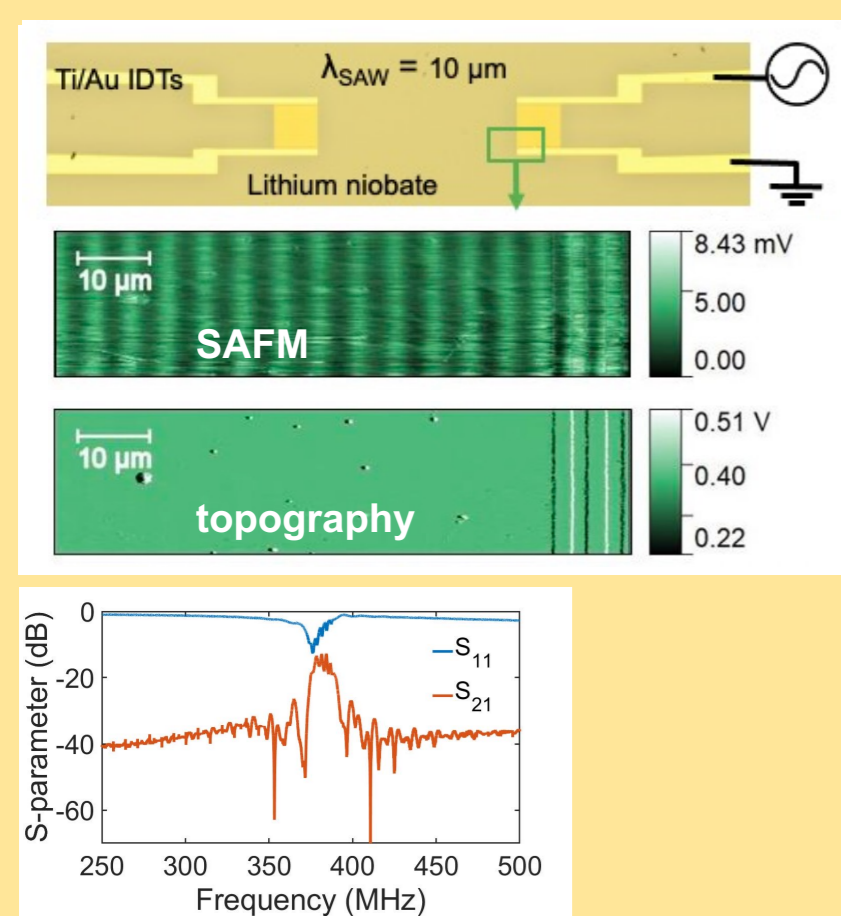
- Generate these optical emitters deterministically;
- Study their optical properties using spectroscopy and nanoscopy;
- Detect their interaction with biomolecules via fluorescence techniques (e.g. FRET)



PROTEIN FINGERPRINTING SCHEME

Surface acoustic wave devices

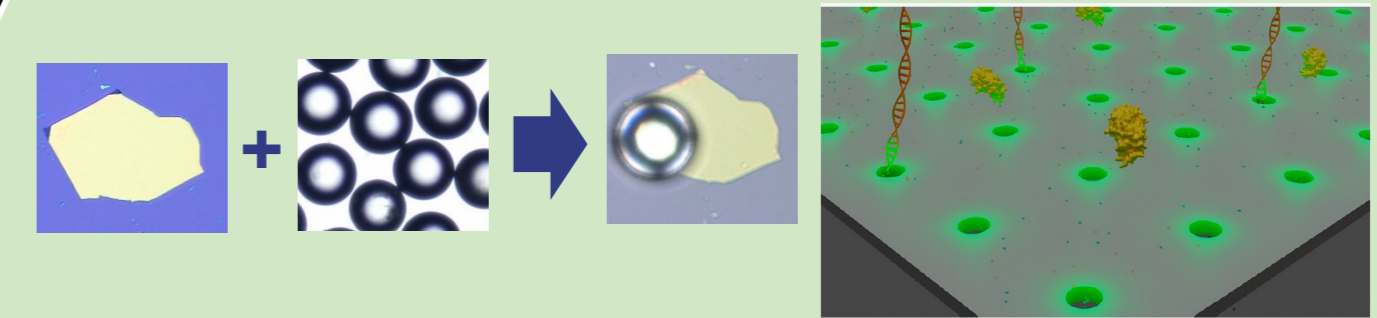
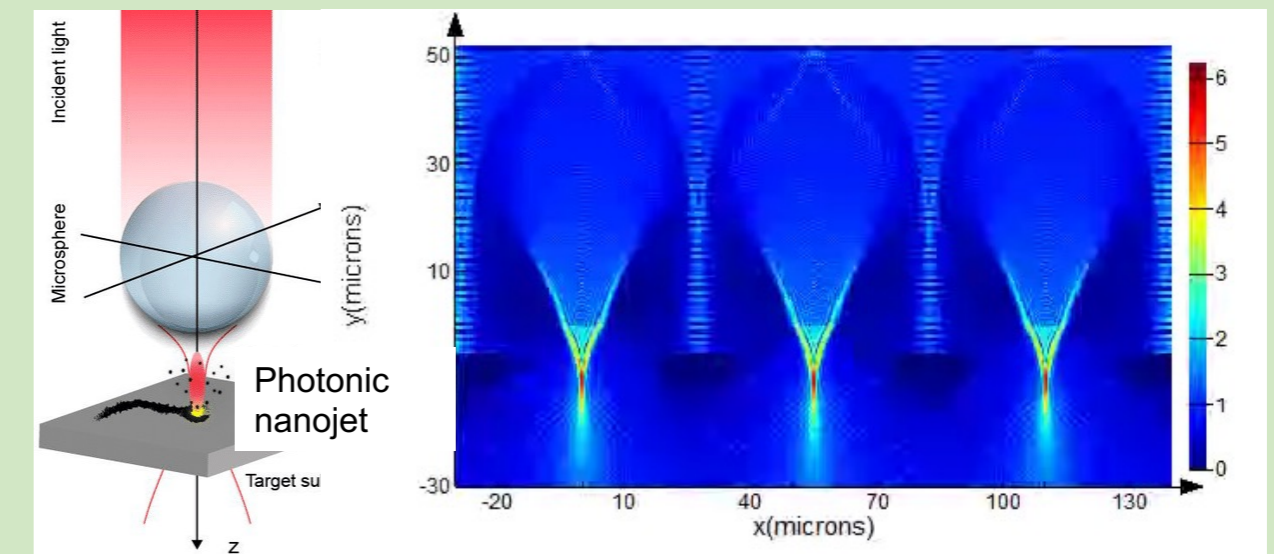
SAW devices use the interaction of sound waves with solids and liquids at the surface of a piezoelectric substrate to **pattern, localize and transport material** at the micro- and nano-scale in a non-invasive and reversible manner.



TUNABLE ACOUSTIC FIELDS

Microsphere-assisted laser fabrication

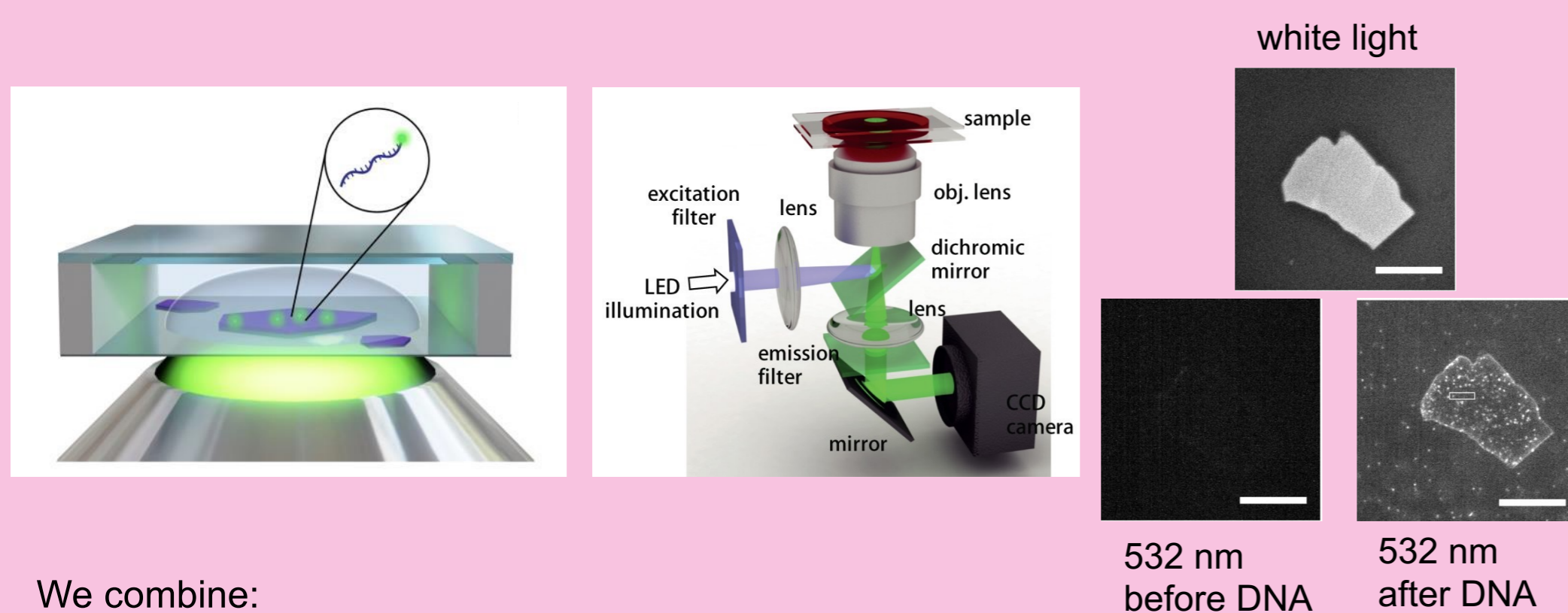
Photonic nanojets are highly focused laser beams that can be generated by placing a glass microsphere between a laser beam and a target substrate. We use these nanojets to make **optically active arrays of nanopores in hBN** for biosensing.



PHOTONIC NANOPORE ARRAY

Single-molecule imaging and transport

We **develop fluorescence-based techniques** to image how molecules move and interact with their environment. This is crucial in **single-molecule sensing devices**.

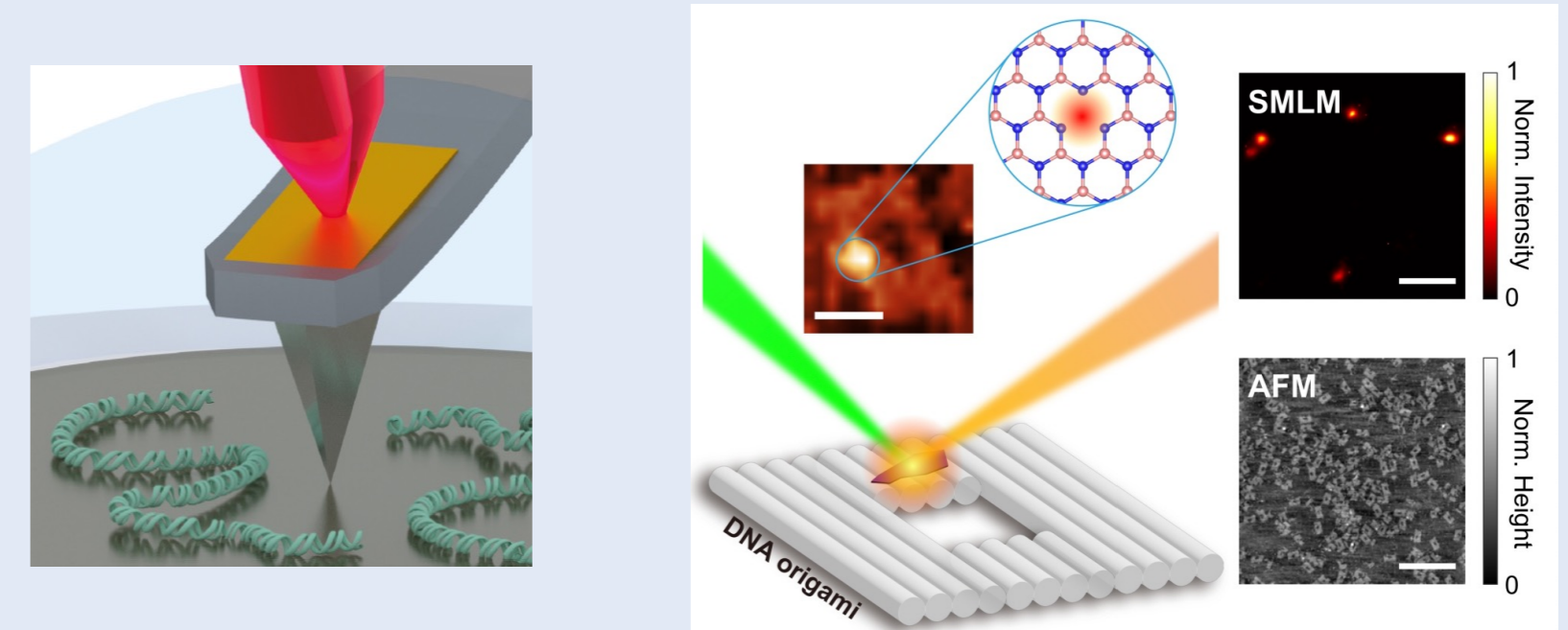


We combine:

- Advances in **single-molecule imaging**
- Novel **2D material** substrates
- Nanofluidic **flowcell engineering**
- Image analysis protocols for **automated single-molecule localization** and tracking

Hybrid 2D material-DNA platforms

We **integrate hBN nanoparticles (NPs) on DNA origami nanostructures**. This enables us to have optically-active components placed with nanometer precision on DNA origami nanopores to form optical biosensors



Optical and structural characterization is achieved via combined photoluminescence and AFM measurements.

We engineer preferential docking sites for the NPs and achieve simple and scalable **functionalization of DNA nanopores**.

Join our interdisciplinary team!

Gain hands on experience in microscopy, spectroscopy and engineering of novel nanodevices with new functionalities

