

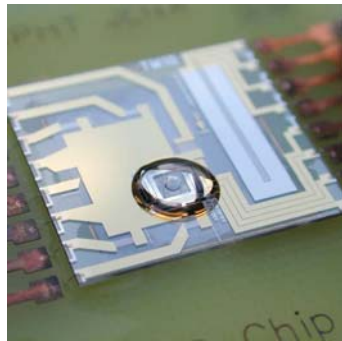


**Parallel approaches for the integration of individual molecular structures
into electrode arrangements**

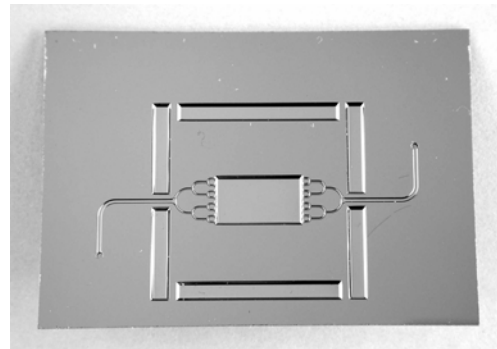
Wolfgang Fritzsche, Gunter Maubach, Robert Kretschmer, Andrea Csaki, Detlef Born
Institute for Physical High Technology Jena, Germany



Biotechnical Microsystems Department (W. Fritzsche)



DNA amplification
(PCR chip)



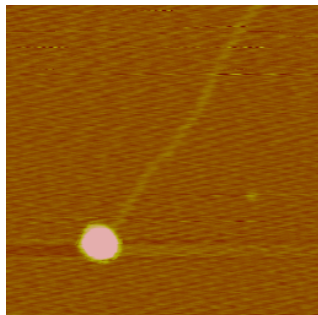
Protein crystallization chamber



Cell manipulation

Mikro- und nanosystems for biochemical applications

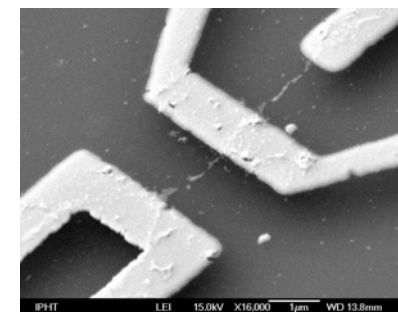
Particle-DNA conjugates



DNA microarray detection

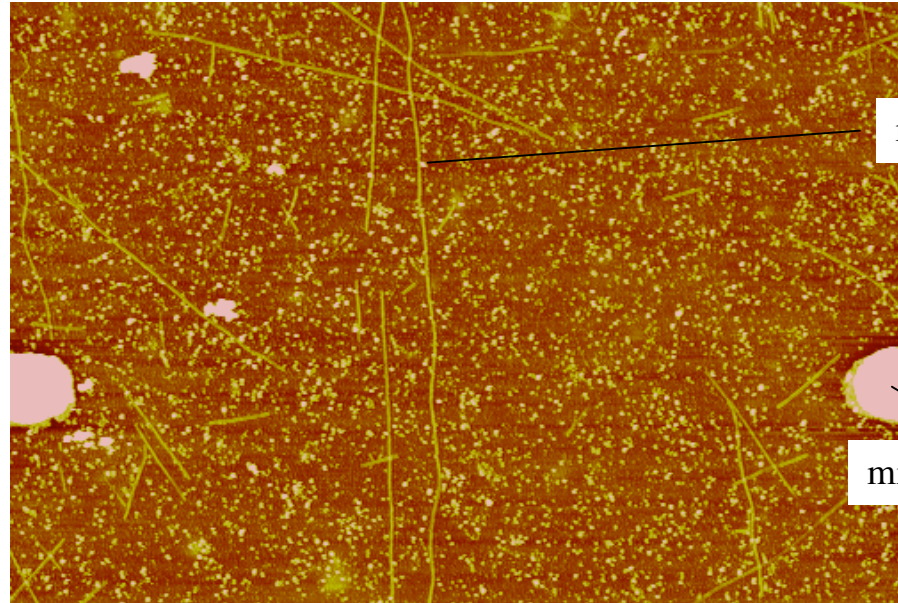


Integration of biomolecular structures



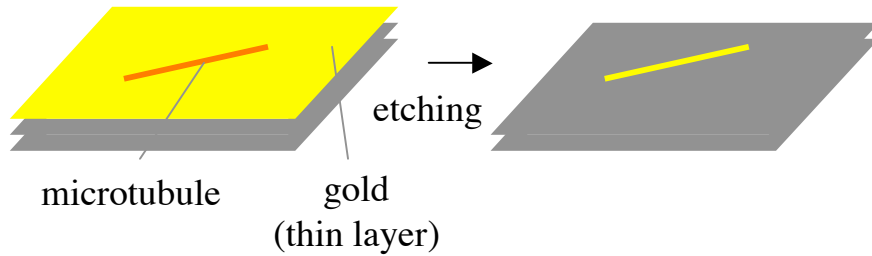
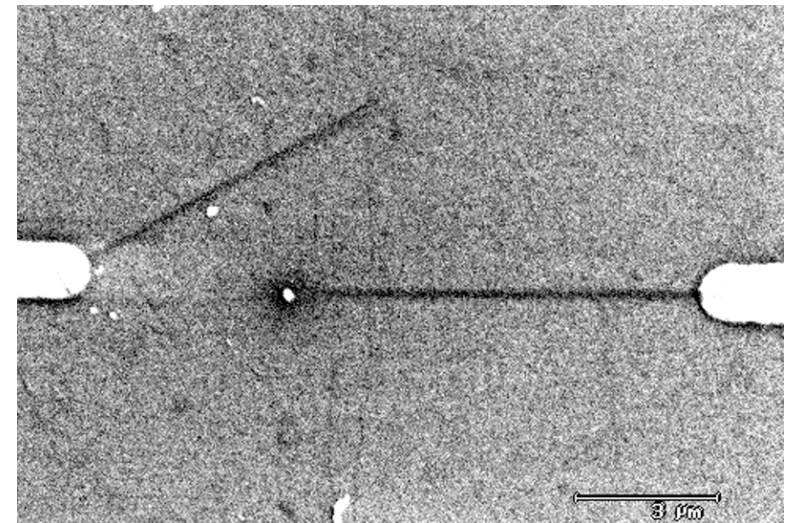
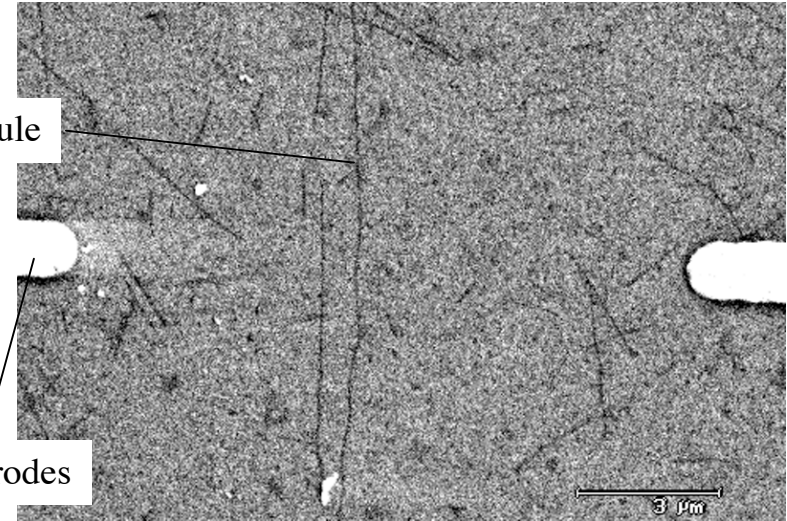


Molecular mask



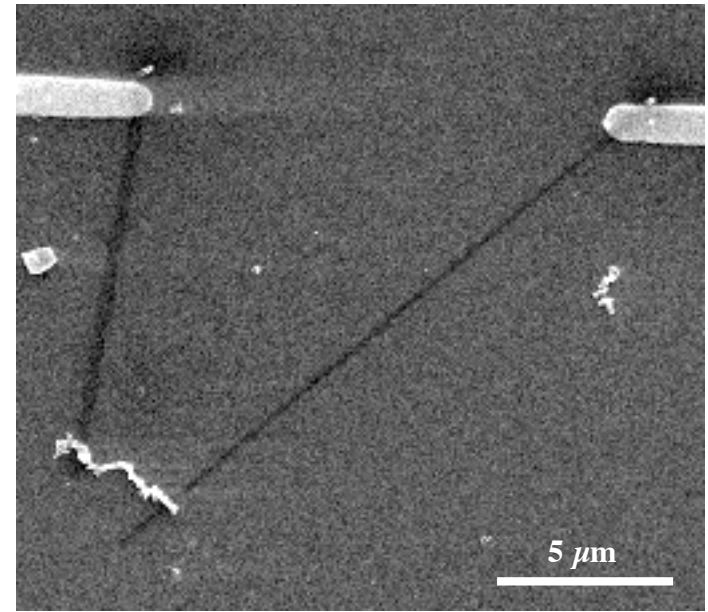
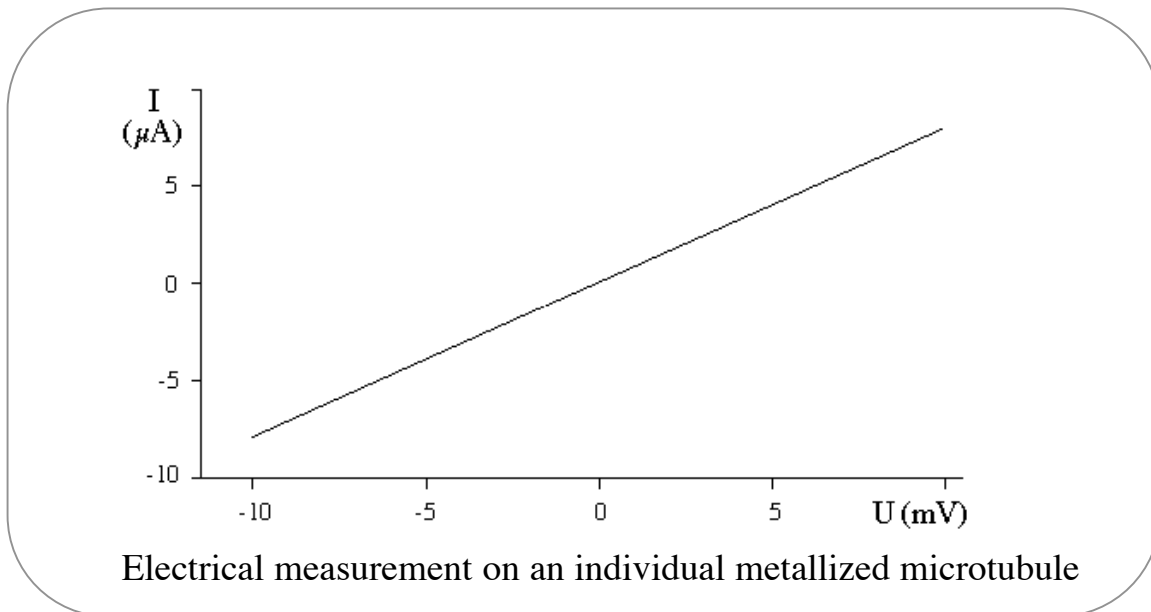
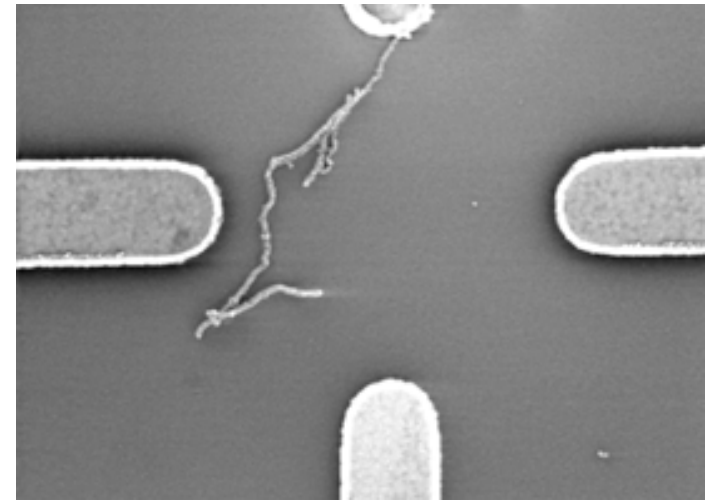
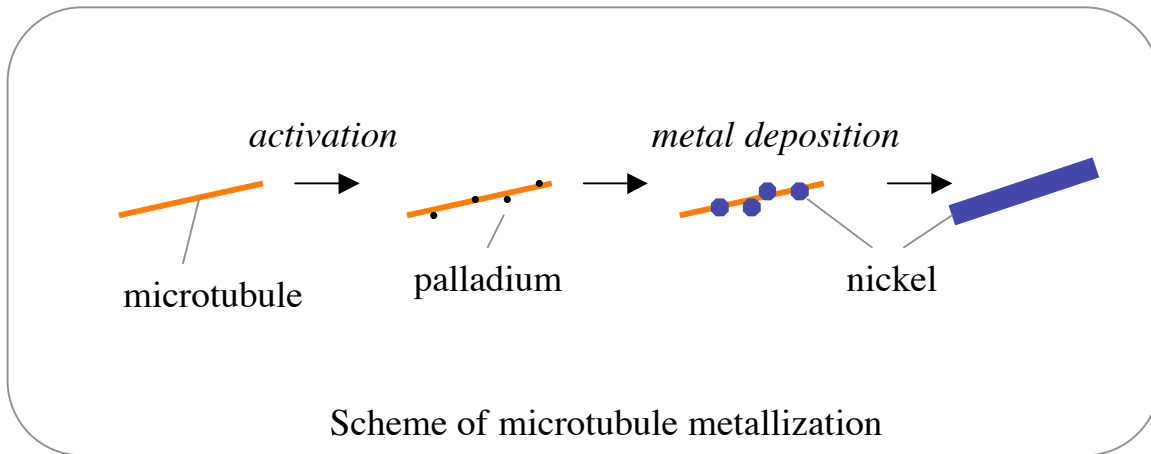
microtubule

microelectrodes



in collaboration with E. Unger & K. Böhm

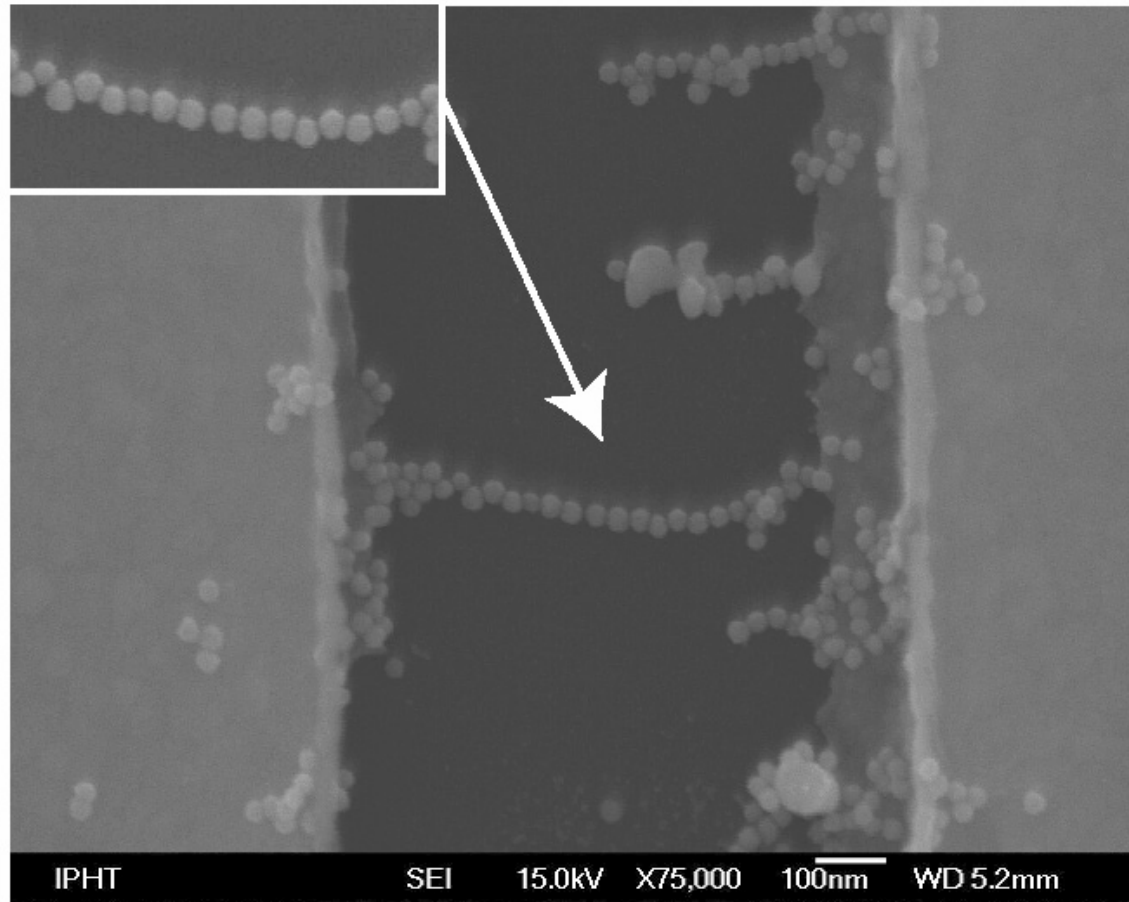
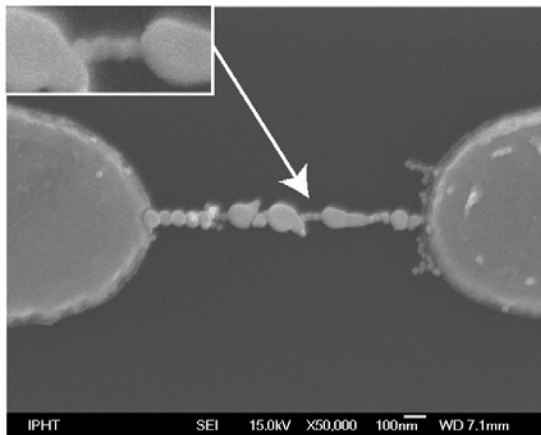
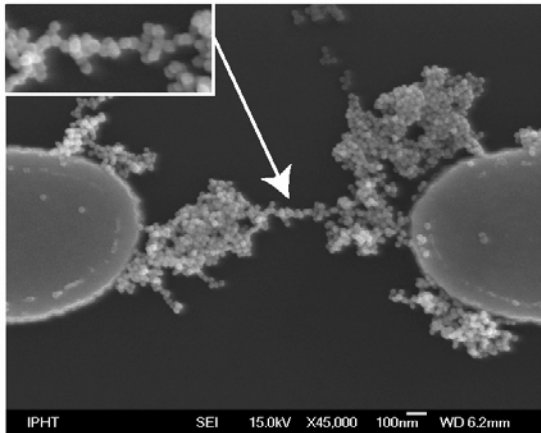
Applied Physics Letters 75 (1999) 2854



in collaboration with Böhm, Unger, Kirsch, Mertig



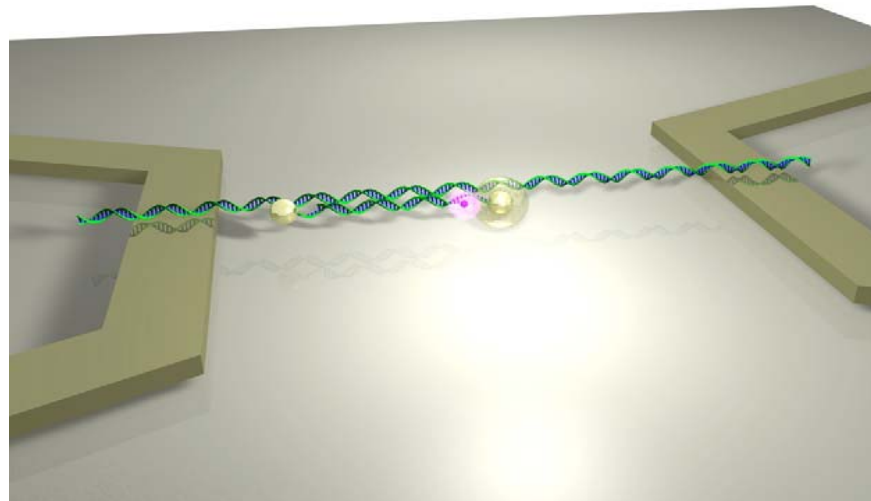
Dielectrophoresis for integration of molecular structures



Kretschmer & Fritzsche, Langmuir 20 (2004), 11797-11801



Single molecule integration

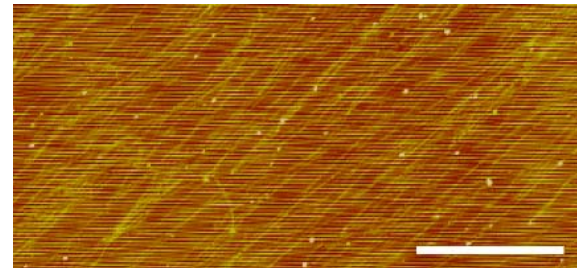
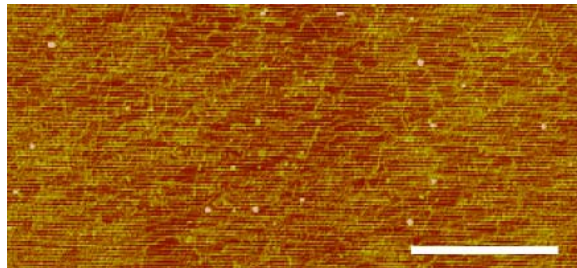
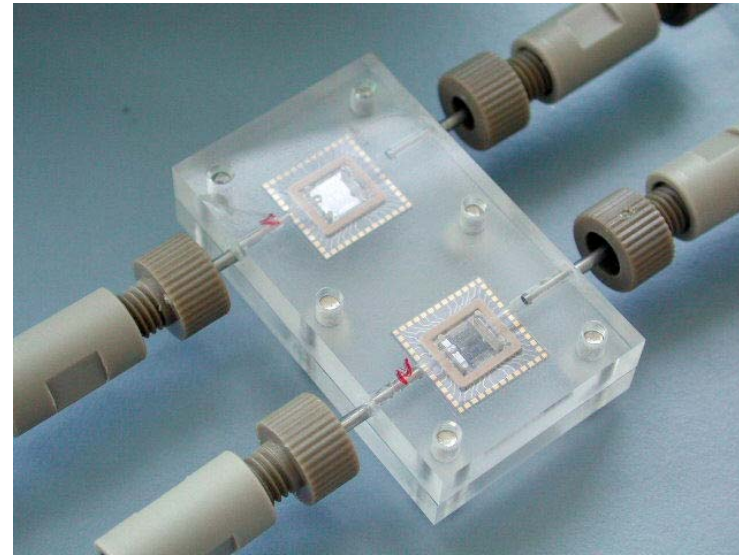
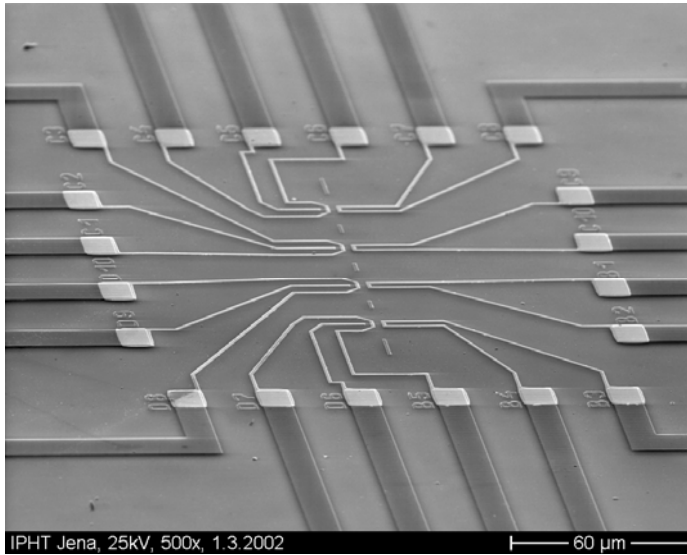


Requirements:

- individual (single) DNA structure integrated in microelectrode gap
- specific conjugation of metal nanostructures to positioned DNA



DNA stretching by fluid flow

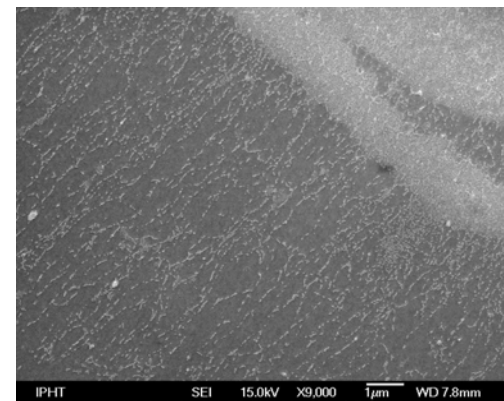
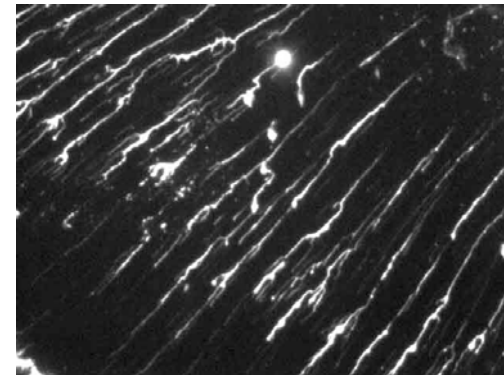
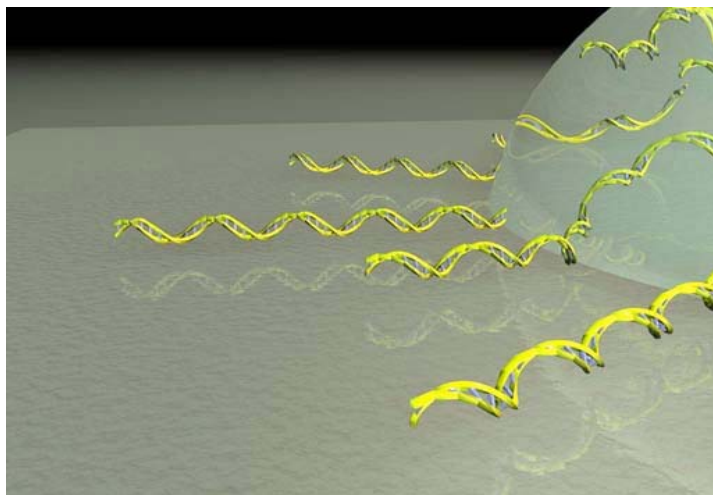
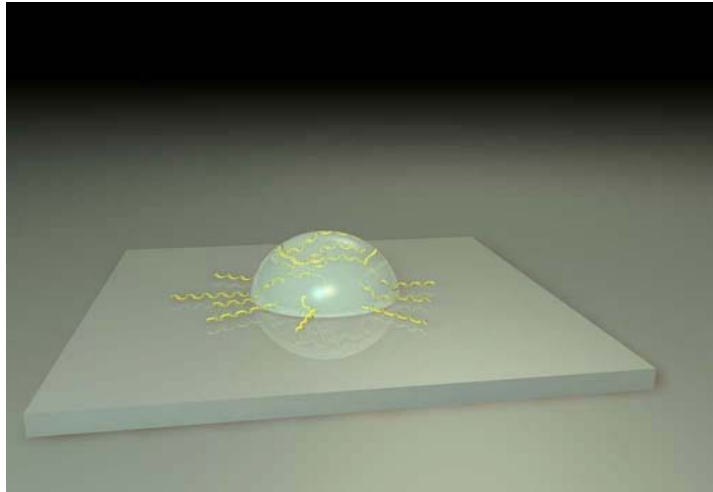




DNA stretching by fluid flow

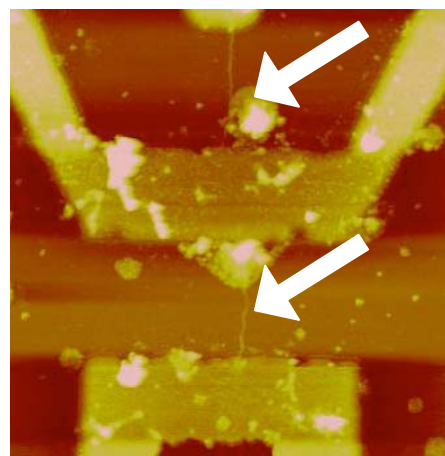
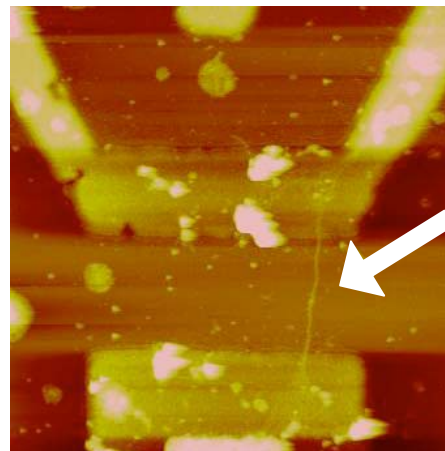
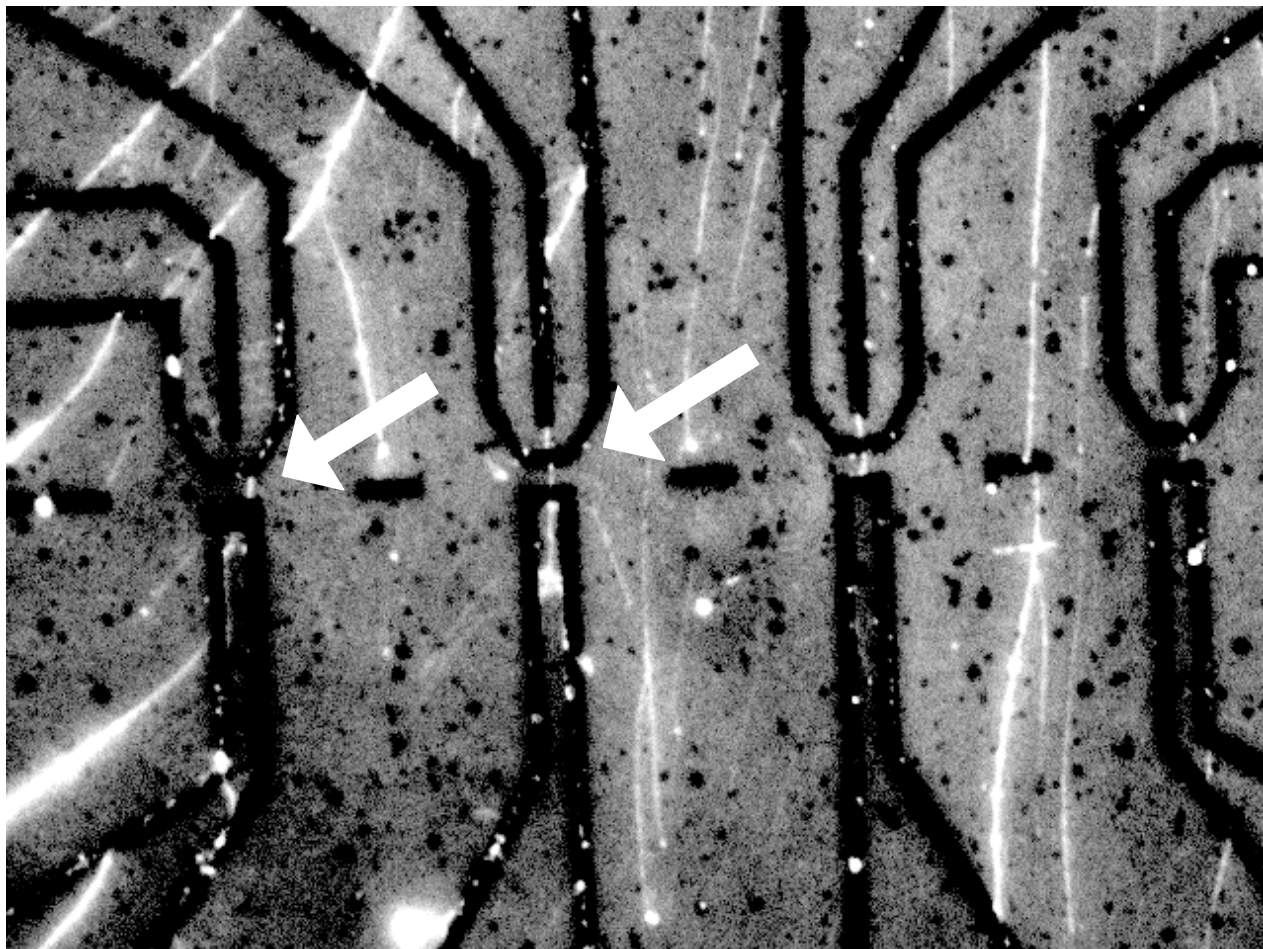


DNA stretching by receding meniscus



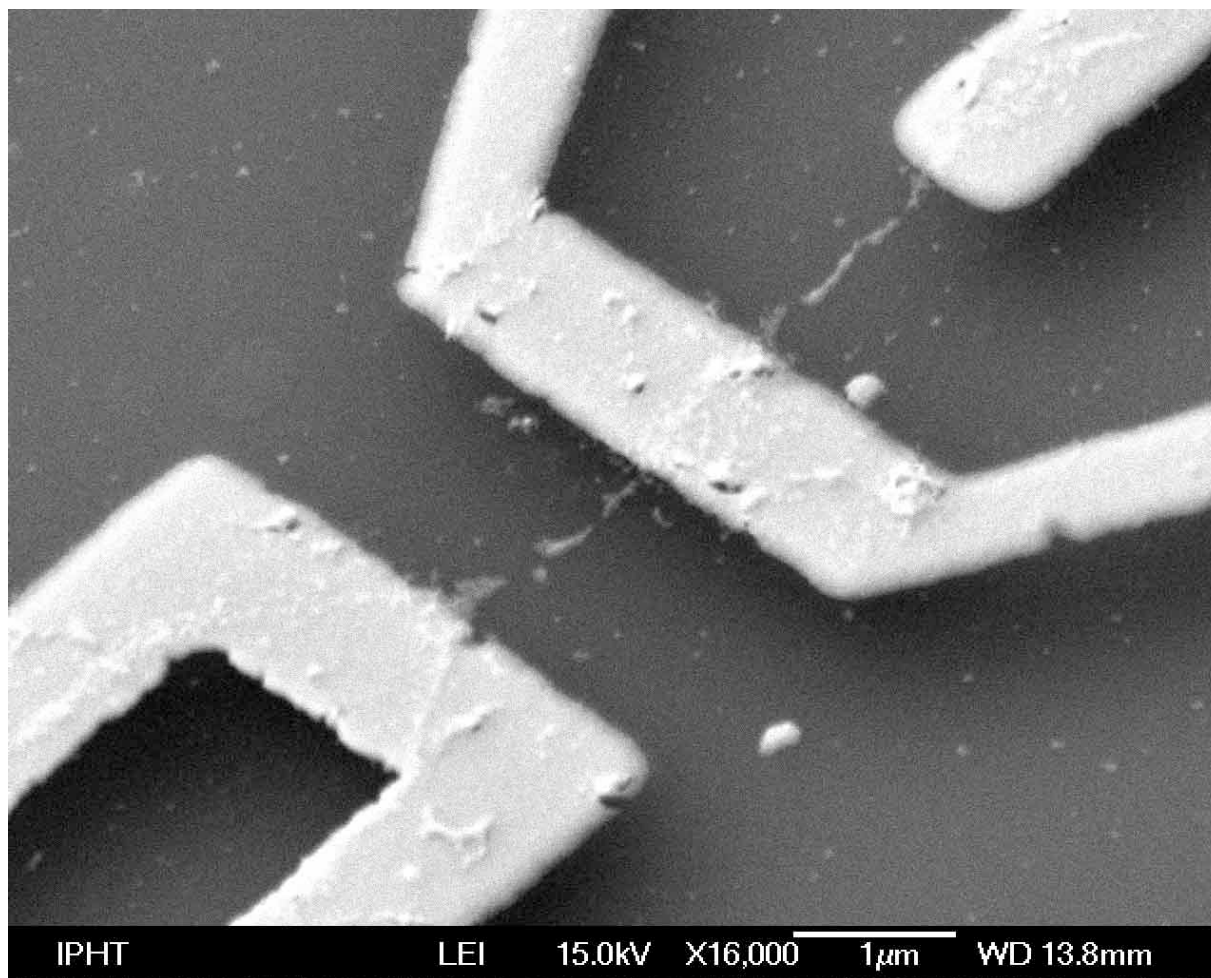
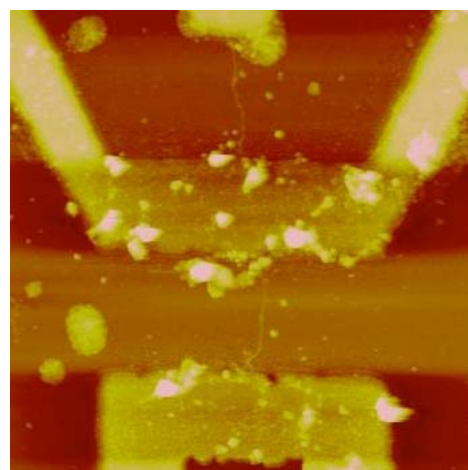
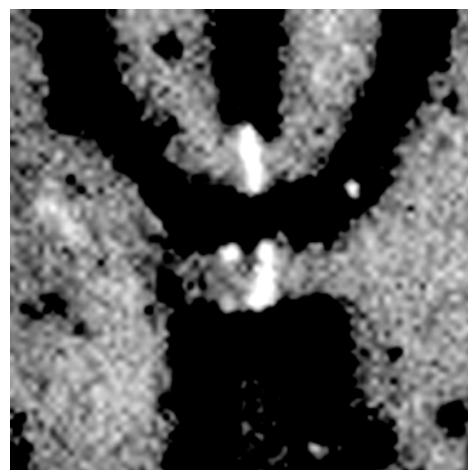


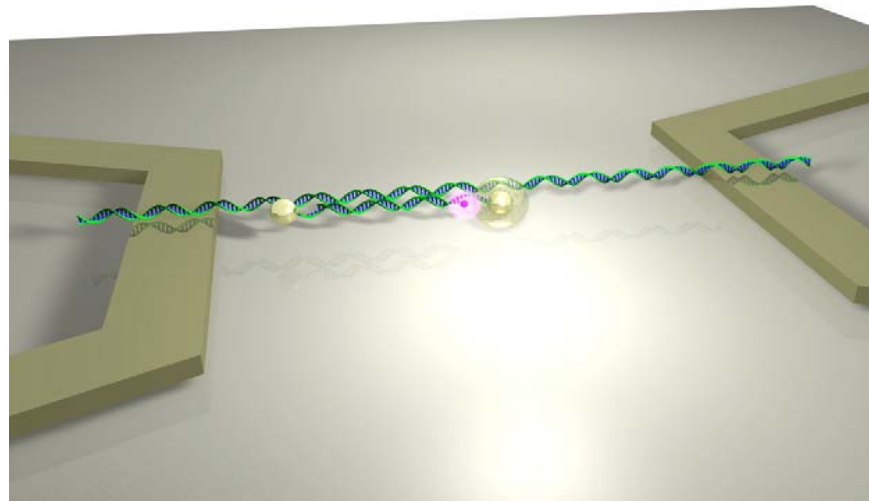
DNA aligned in microelectrode arrays





Individual DNA structure in gap

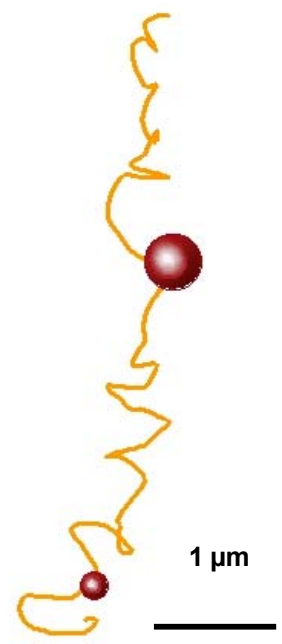
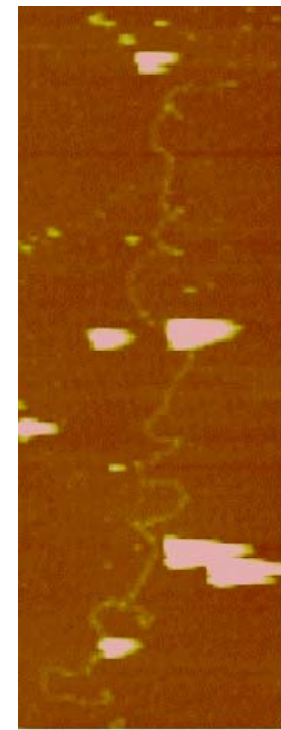
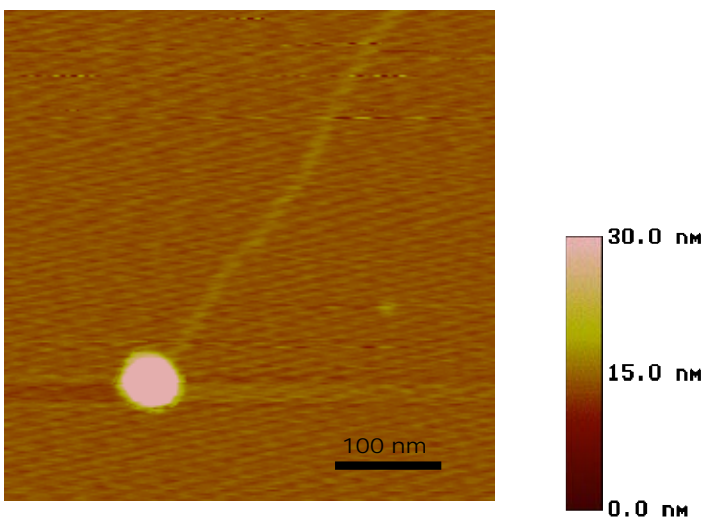
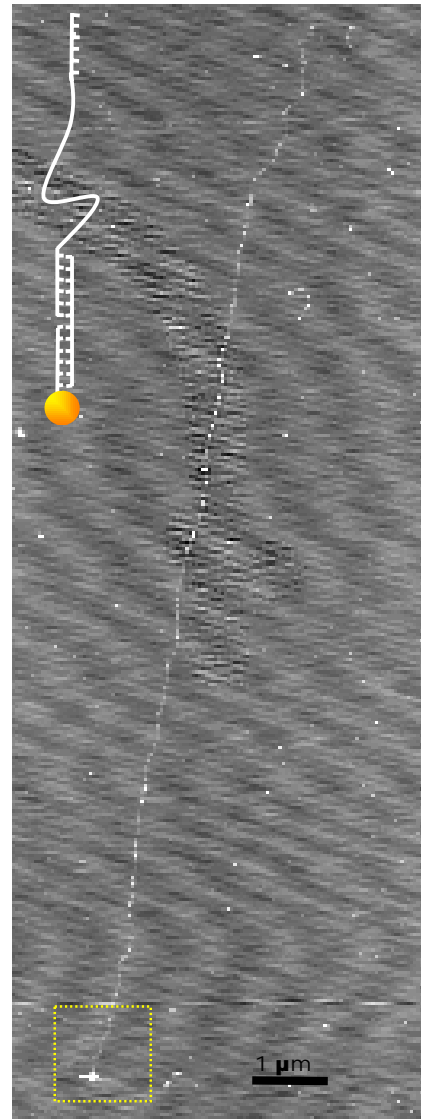
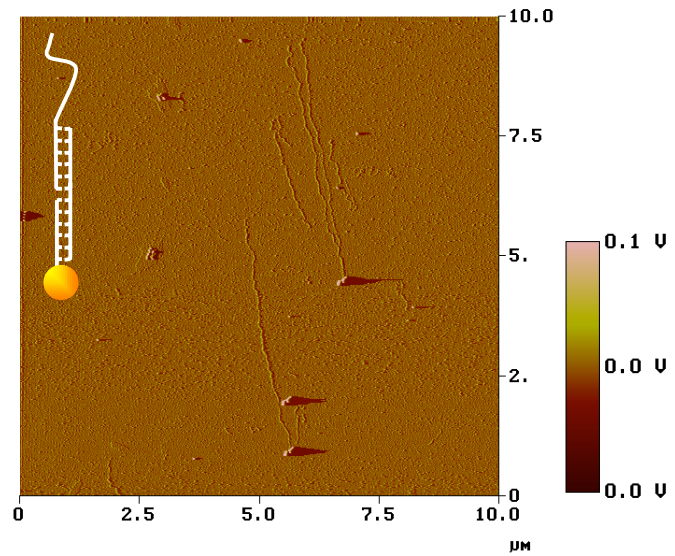




Requirements:

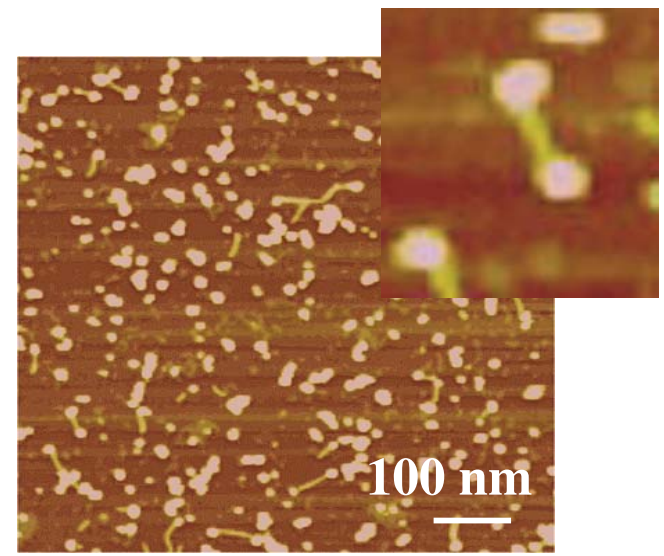
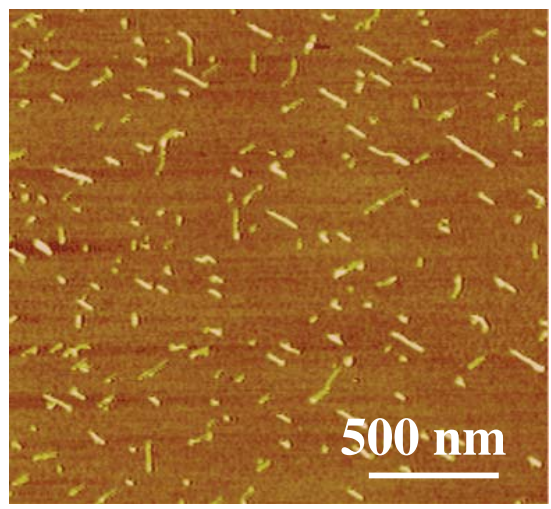
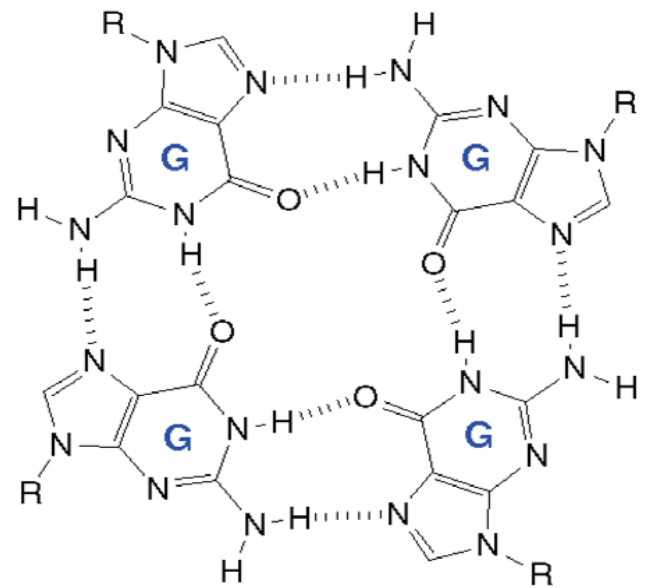
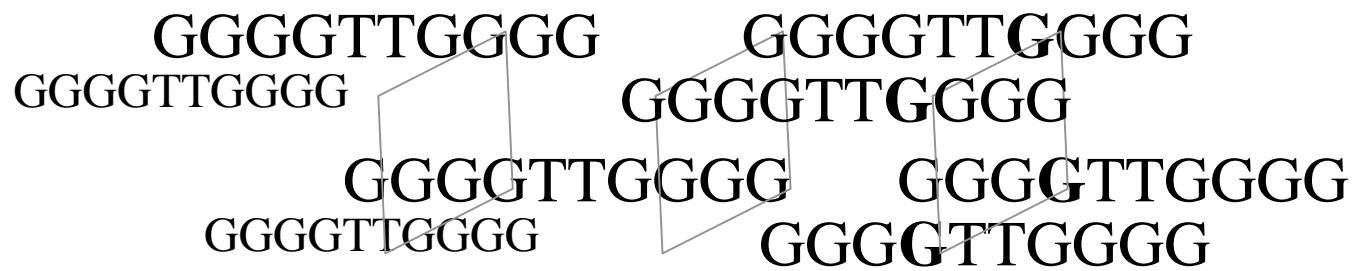
- individual (single) DNA structure integrated in microelectrode gap
- specific conjugation of metal nanostructures to positioned DNA

Particle conjugation (sequence specific)





G-wire: DNA superstructure with potential for nanotechnology

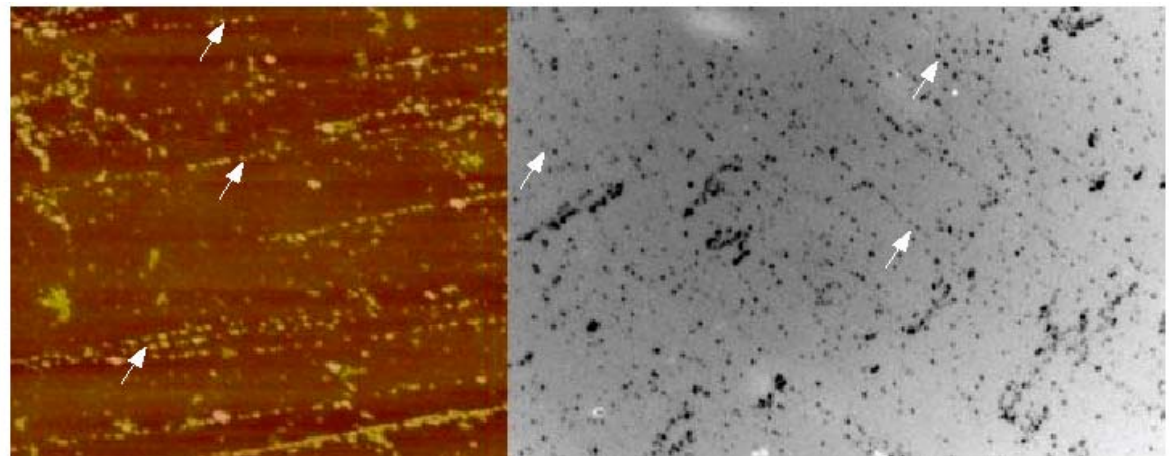
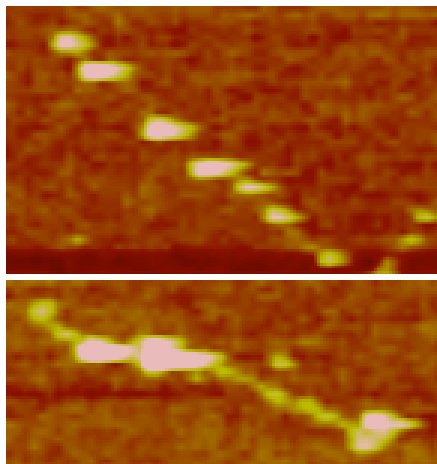


Metal deposition (molecule specific)

directly at biomolecule

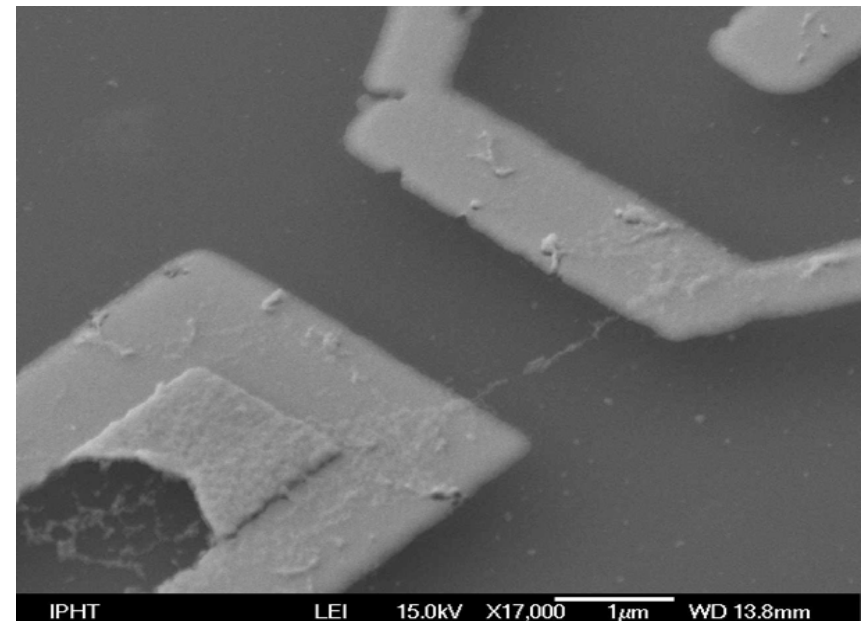
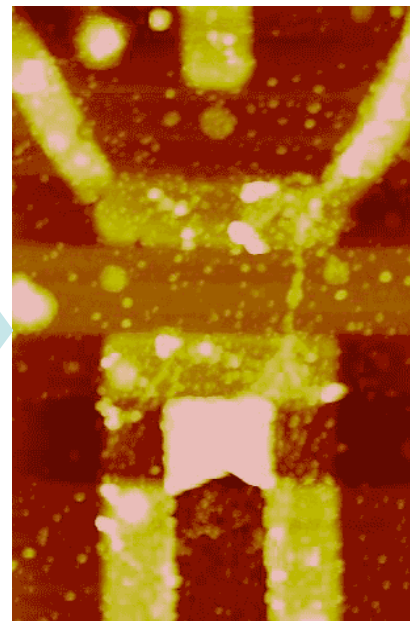
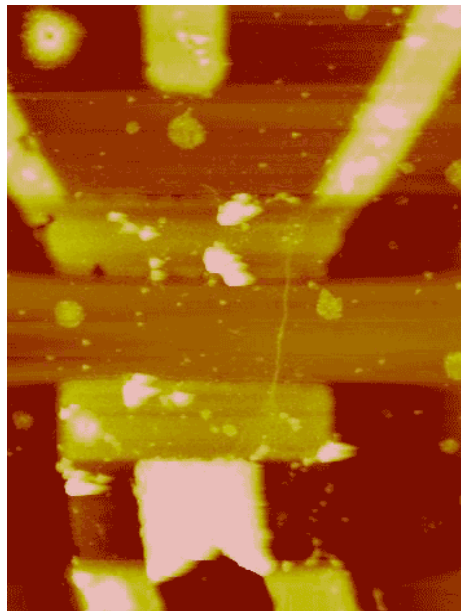
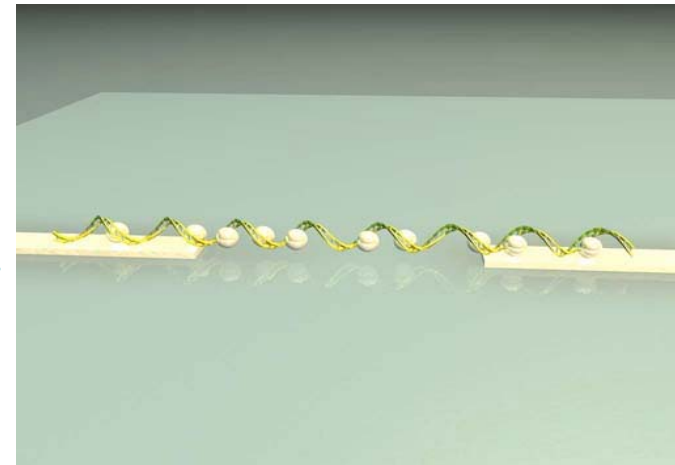
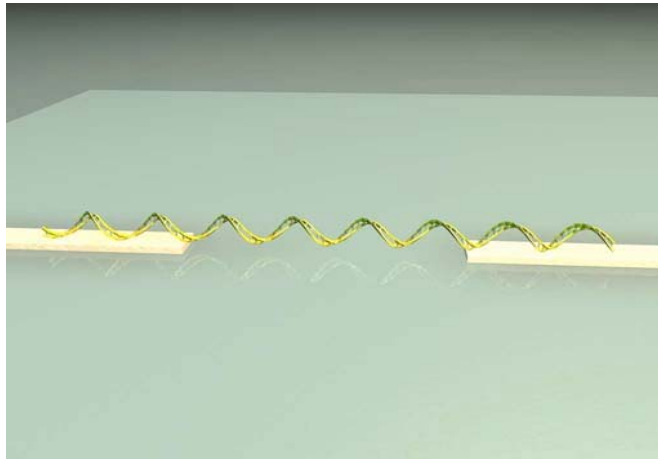


nanoparticle-primed



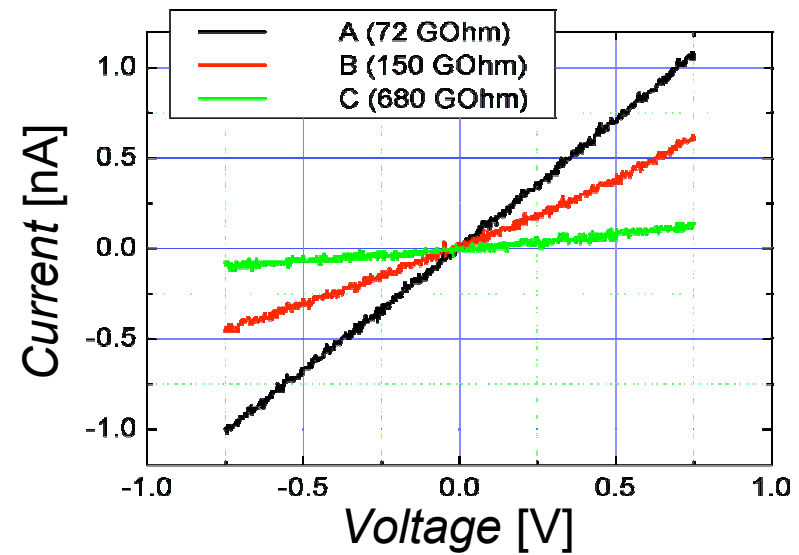
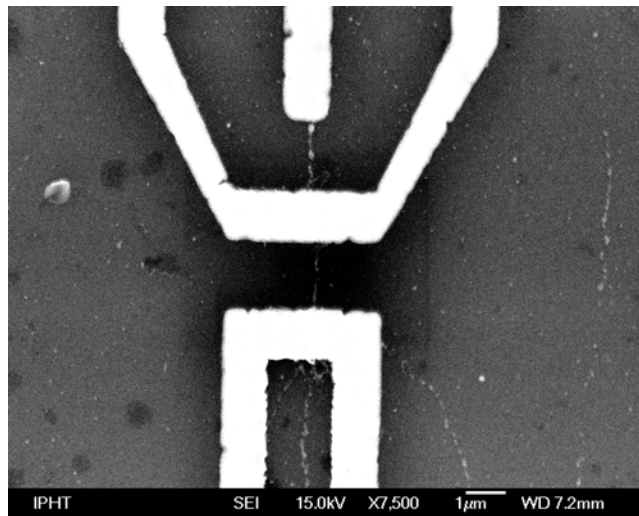
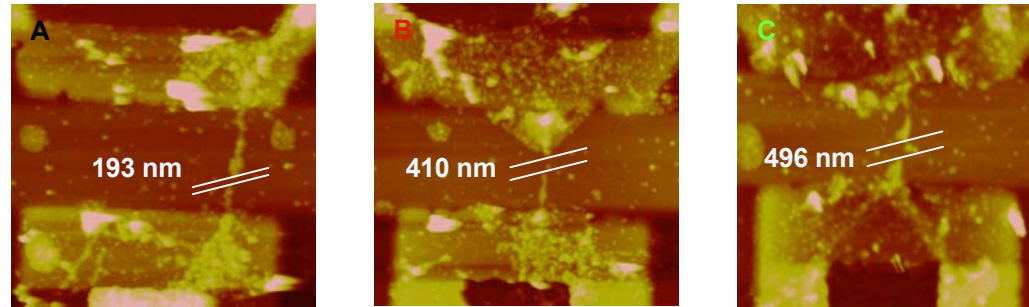


Metal nanostructures at individual DNA structures

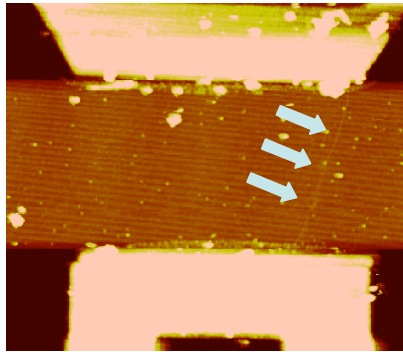




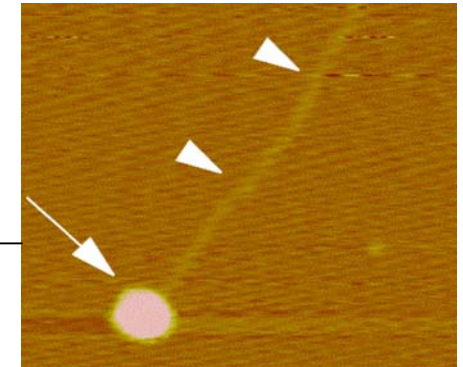
Electrical characterization of DNA-based metal nanostructures



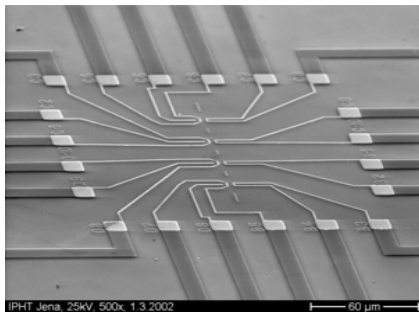
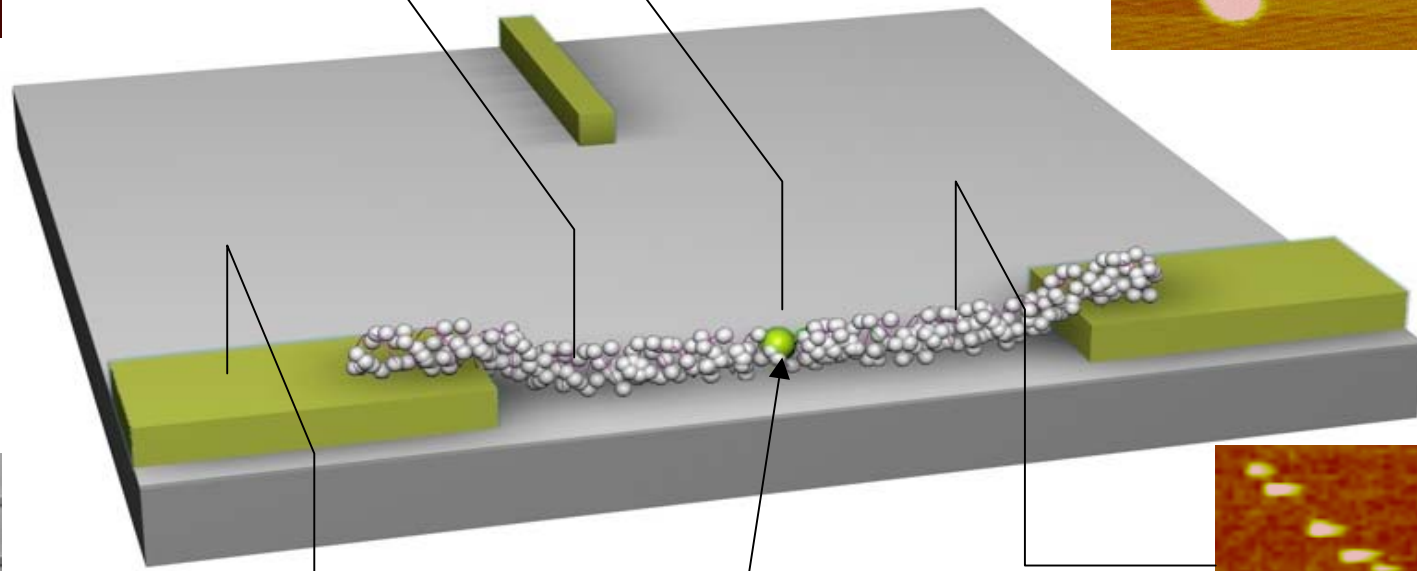
DNA-Nanoparticle-SET



Single DNA-molecule
between electrodes



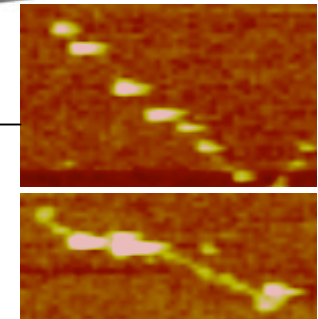
Nanoparticle
on DNA

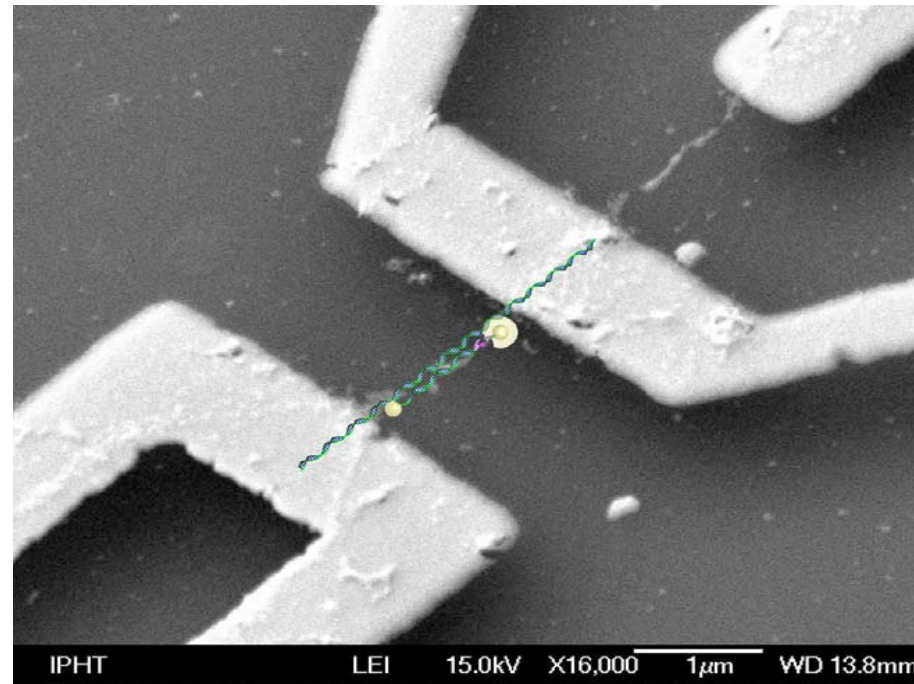


Mikrostructured
elektroden

tunneling barrier
(SAM)

Metallized
DNA





Nanoscale molecular constructs integrated in microsystem environments
For ultrasensitive bioanalytics, nanophotonics and nanoelectronics.

Acknowledgements



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Franka Jahn

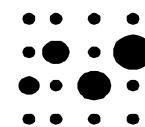
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Cinema 4 D - rendering: Uwe Klenz

<http://www.ipht-jena.de/a32e>



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