BP 37: Closing Talk (joint session BP/CPP/DY)

Time: Friday 13:15–14:00 Location: H 0104

Invited Talk BP 37.1 Fri 13:15 H 0104

Virus traps and other molecular machines of the future — •Hendrik Dietz — Technische Universität München, Garching b. München, Deutschland

Our interest is in learning how to build molecular devices and machines that can execute user-defined tasks. To this end, we investigate how to adapt the physical principles underlying the formation of natural macromolecular assemblies such as viruses or molecular motors for our purposes. Programmable molecular self-assembly with DNA origami is an attractive route toward implementing these principles to create synthetic molecular machinery. We combine computational design and cryo electron microscopy to learn how to construct synthetic molecular objects with increasing accuracy and increasing complexity.

For example, we have learned from viruses how to program DNA blocks to self-assemble into icosahedral shells with specific geometry and apertures, which led to an interesting application: the virus trap, which we hope to develop into a programmable antiviral drug to neutralize viruses. We have also learned how to design DNA origami so that genetic instructions included within them can be read by mammalian cells.

We also have recently learned how to control the movement of nanoscale assemblies. For example, we have built autonomous, power-generating rotary DNA motors driven by AC fields and also turbines that can be driven by ion flux across membranes. With these new machines, opportunities are created to accomplish user-defined, energy-consuming tasks in various contexts.