DNA origami tools to explore biological processes

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Structural DNA nanotechnology is probably one of the most successful chemical methods of the past 40 years to achieve control of matter distribution at the nanometer scale [1]. In particular, the DNA origami approach demonstrated to be a robust and versatile method for the construction of DNA objects of almost any desired shape and size, thus offering numerous opportunities in diverse scientific disciplines [2]. We employ DNA origami tools to construct simplified models of complex biological systems, where single structural and functional parameters can be manipulated in a completely predictable fashion. Our scientific ambition is to gain a better understanding of fundamental aspects of biological self-assembly and to use this knowledge for the generation of biomimetic materials with customized properties. We are currently focusing on three aspects of natural self-assembling systems (Figure 1): (i) their capacity to self-assemble into hierarchical high-ordered structures [3]; (ii) their capability to respond to the external environment by changing their shape [4]; and finally (iii) their role as encaging systems, to control the spatio-temporal location and possibly the energetics of reactions [5]. Here, I will present our recent achievements in each of these areas.

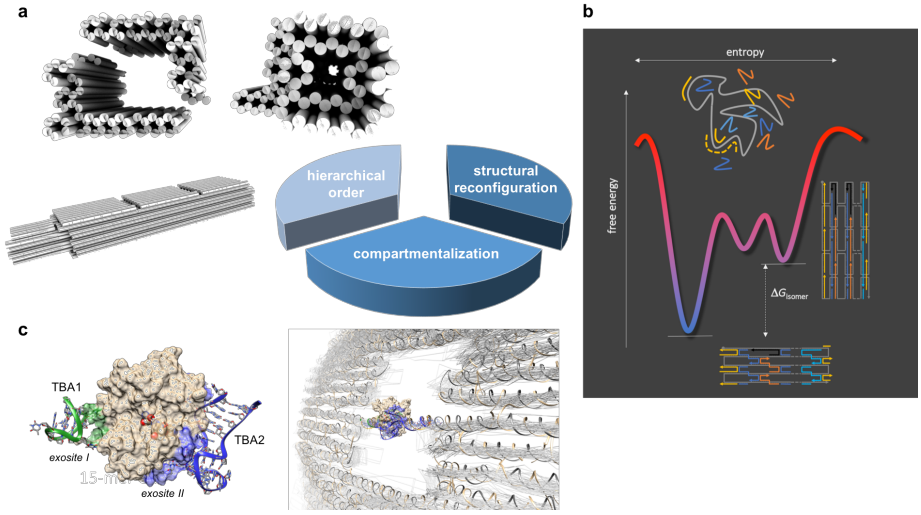

Figure 1. DNA origami tools to explore biological mechanisms. DNA origami tools can be employed to mimic and better understand fundamental properties of biological systems, such as (**a**) hierarchical order, (**b**) structural adaptation to external changes and (**c**) spatial confinement.

References

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