

## **Electrostatics and Soft matter: from star-branched polyelectrolytes to patchy colloids**

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In this talk, we will first review the physics of star-branched polyelectrolytes (SBP), demonstrating that the Physics of their conformations and interactions is dictated by electrostatics in a rather subtle fashion: whereas the mutual repulsions of the charged monomers play the decisive role in stretching the arms, the subsequent effective interactions between SBP's is dominated by the entropic repulsion between the counterions adsorbed in the interior of the SBP's [1]. We will present the extensions of the theory to both spherical polyelectrolyte brushes [1] and to rigid chains [2,3], proceeding to the investigations on adsorption of PE-stars onto oppositely charged flat surfaces [4] or colloidal spheres [5]. We argue that the complexes that form can be viewed as a novel type of patchy colloids [6], and we present an efficient way of coarse-graining their effective interactions to a manageable yet realistic mesoscopic model [7]. Finally, we discuss ongoing work on soft patchy colloids, emerging out of end-functionalized starburst block copolymers [8].

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