Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Theory of Passive Polymer Translocation Through Amphiphilic Membranes[1] MARCO WERNER, Universitat Rovira i Virgili, Tarragona, Spain, JASPER BATHMANN, Technische Universität Dresden, Dresden, Germany, VLADIMIR BAULIN, Universitat Rovira i Virgili, Tarragona, Spain, JENS-UWE SOMMER, Leibniz-Institut für Polymerforschung Dresden, Dresden, Germany, ITN-SNAL "SMART NANO-OBJECTS FOR ALTERATION OF LIPID-BILAYERS" TEAM — We propose a theoretical framework for examining the translocation of flexible polymers through amphiphilic membranes: A generic model for monomer-membrane interactions is formulated and the Edwards equation is employed for calculating the free energy landscape of a polymer in a membrane environment. By the example of homopolymers it is demonstrated that polymer adsorption and the symmetry of conformations with respect to the membrane's mid-plane trigger passive polymer translocation in a narrow window of polymer hydrophobicity. We demonstrate that globular conformations can be taken into account by means of a screening of the external potential, which leads to excellent agreement of predicted translocation times with dynamic lattice Monte Carlo (MC) simulations. The work opens a theoretical road-map on how to design translocating flexible polymers by referring to universal phenomena only: adsorption and conformational symmetry. As confirmed by MC simulations on amphiphilic polymers, promising candidates of translocating polymers in practice are short-block amphiphilic copolymers, which in the limit of small block sizes resemble homopolymers on a coarse grained level.

[1]We gratefully thank the European Union's funding of the Initial Training Network SNAL (grant agreement no. 608184) under the 7^{th} Framework Programme.

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Date submitted: 11 Nov 2016 Electronic form version 1.4