**Folded and unfolded protein analysis with nanopores: catch and release**

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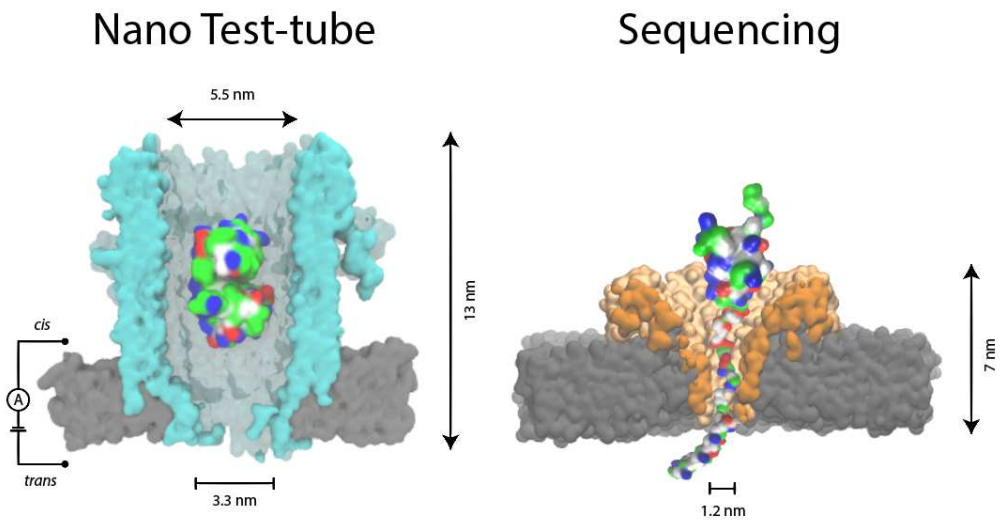
## Abstract

Ionic current through nanopore can be used to recognize molecules, sequence biopolymers or study reactions at the single-molecule level. The analysis of proteins with nanopore has proven more challenging, mainly because proteins don't have a fixed charge and the entry and translocation of folded and unfolded proteins cannot be easily controlled.

Here we show that by balancing the electroosmotic and electrophoretic forces inside the nanopore the entry and the transport of proteins and peptides across nanopores can be controlled. Folded proteins can be trapped by the precise distribution of charges on the protein surface. Small peptides can be translocated, stretched and unfolded by engineering strong electroosmotic flows through the nanopore. Using these approaches, nanopores may be used as nanoscale reactors for single-molecule enzymology studies, or sensors for sequencing individual proteins as they translocate across the nanopore.



**Short biography**

Giovanni Maglia was born in Bologna (Italy). He attended the University of Bologna for his undergraduate studies in Pharmaceutical Chemistry, and went to the University of Pennsylvania (USA) for his Masters thesis. He obtained his PhD from the University of Birmingham (UK) investigating the physical bases of the hydride transfer reaction catalyzed by dihydrofolate reductase. After a short spell at the university of Leuven (BE), he moved to the University of Oxford for his post-doctoral research on DNA nanopore sequencing. In 2010 Giovanni Maglia received an ERC starting grant to initiate his independent research at the University of Leuven (BE). From November 2014, he is associate professor of Chemical Biology at the University of Groningen (NL), and in 2016 he received a ERC consolidator grant. His research interests include nanopore biophysics, single-molecule enzymology, single-molecule proteomics and sensing, and designing artificial transmembrane machines.