

Single pore membranes for protein channels

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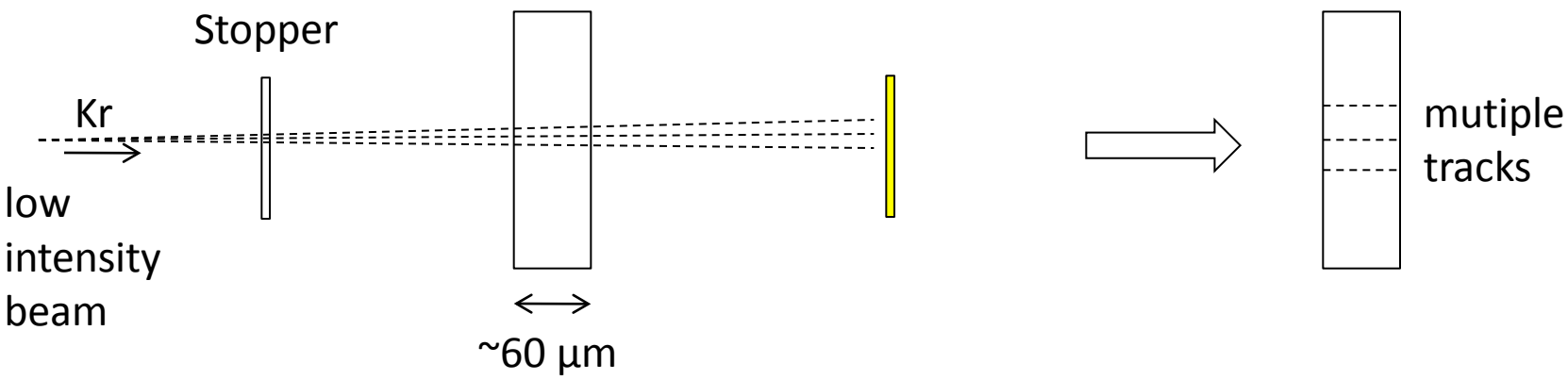
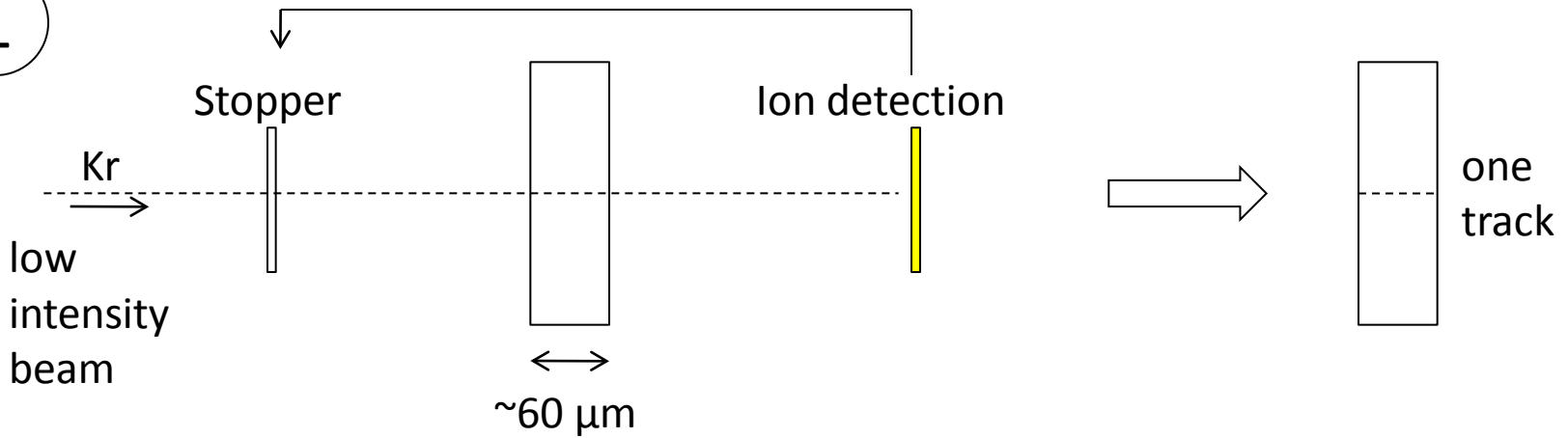
- Introduction
- Tracking methods and parameters
- Etching
- MscL
- Openings

- Nanopores as detectors
- PET films are used to support a phospholipid bilayer
- MscL (Mechano Sensitive Channels of Large Conductance)

Tracking

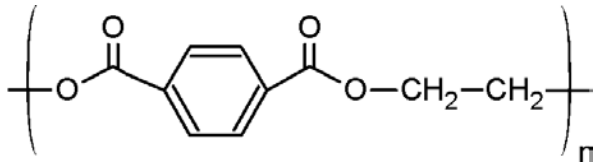
Coll. GANIL, Caen, France

1

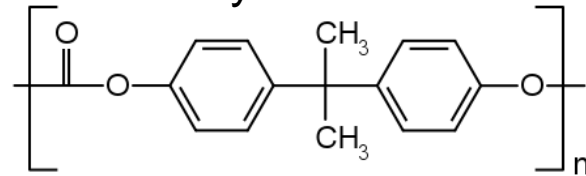


- PET and/or PC films (thickness 6 and 13 μm)

PET : PolyEthylene Terephthalate

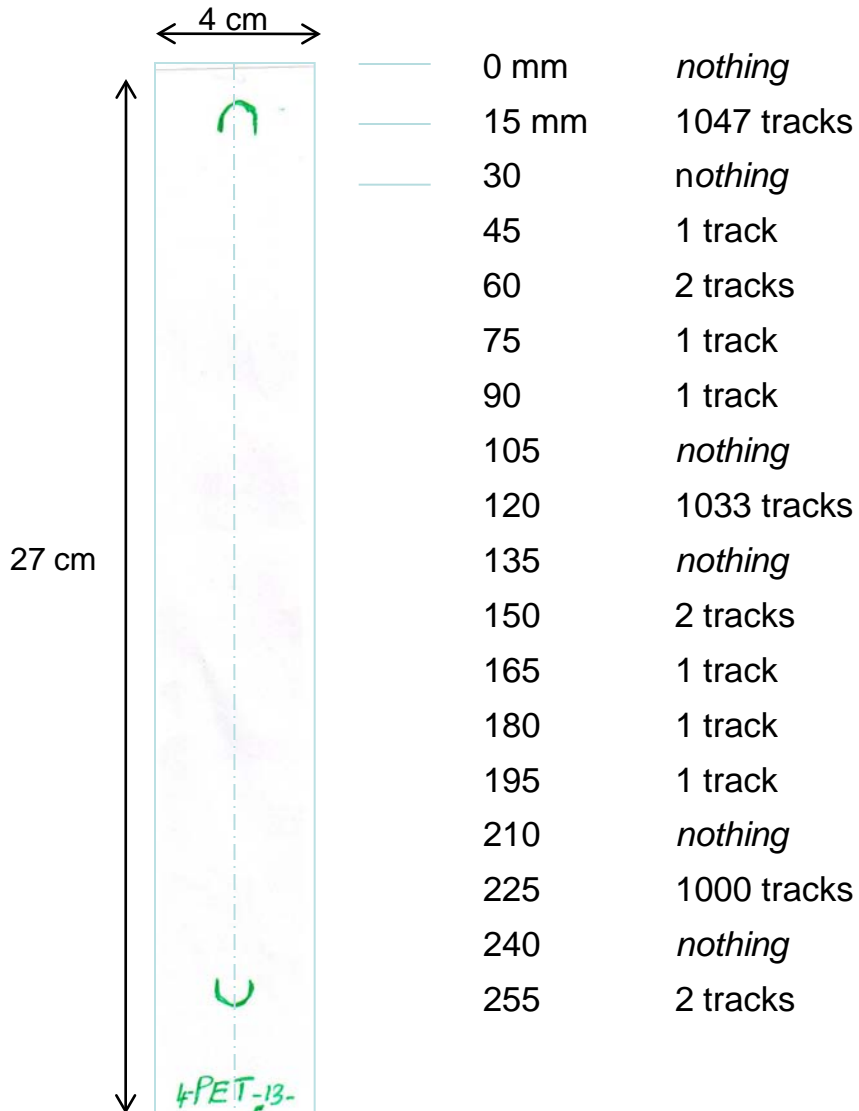


PC : PolyCarbonate



- Use of a SME Krypton beam through 7 stacked films

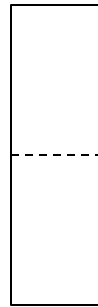
Tracking



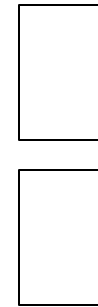
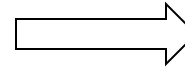
Tracks etched to get Pores,
located on the axis

Chemical etching

2

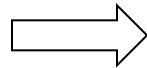


+ etchant



one
pore

3



BMD, Gröningen, NL

ϕ = Pore diameter

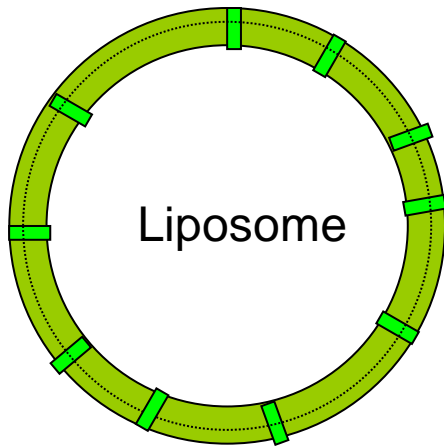
$$\phi = \sqrt{\frac{4LG}{n\pi\sigma}}$$

G= Electric conductance

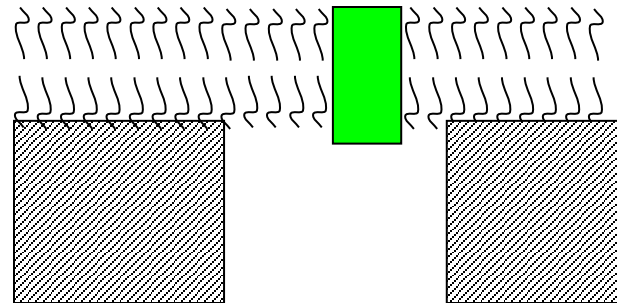
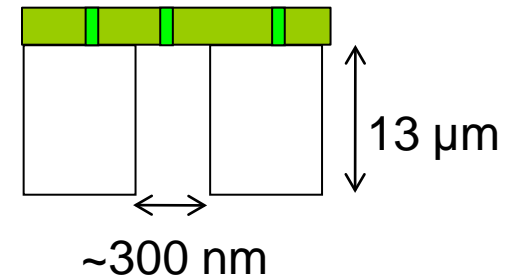
Chemical etching

- 2 nights exposure to UV
- Bath (5 min) in NaOH 2M at 50°C
- Subsequent work on pores about 300 nm

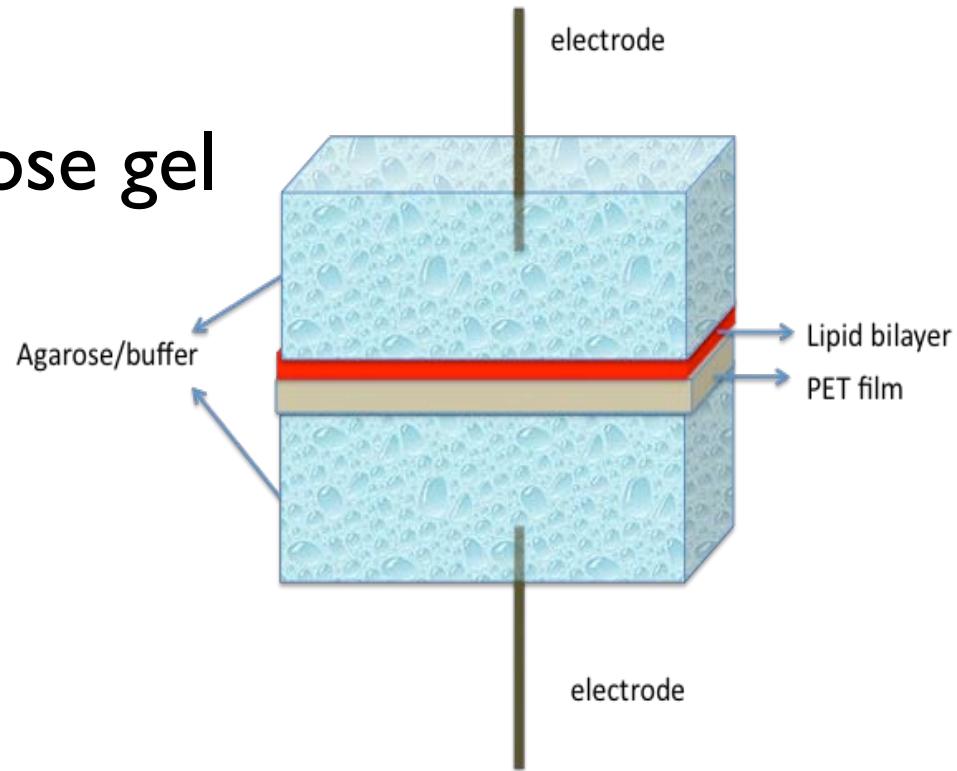
Track-etched monopore membrane with *supported bilayer* (Coll. Gröningen)



■ MscL
■ Protein assembly

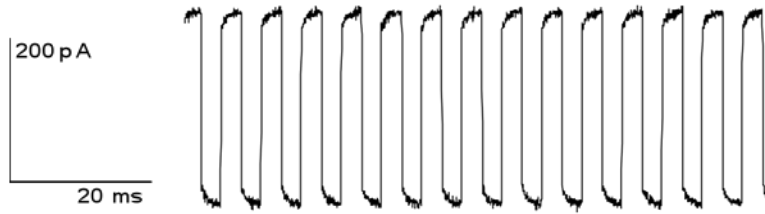


- Collapsing unfunctionalized liposomes
- Stabilizing with an agarose gel
- Stable over 3 days



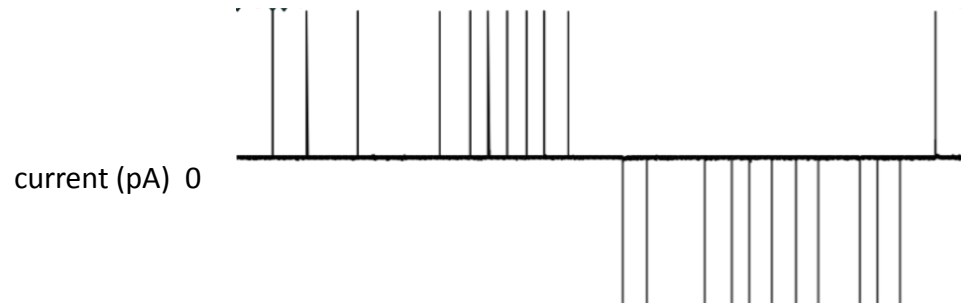
Results

Membrane capacitance signal in a lipid bilayer



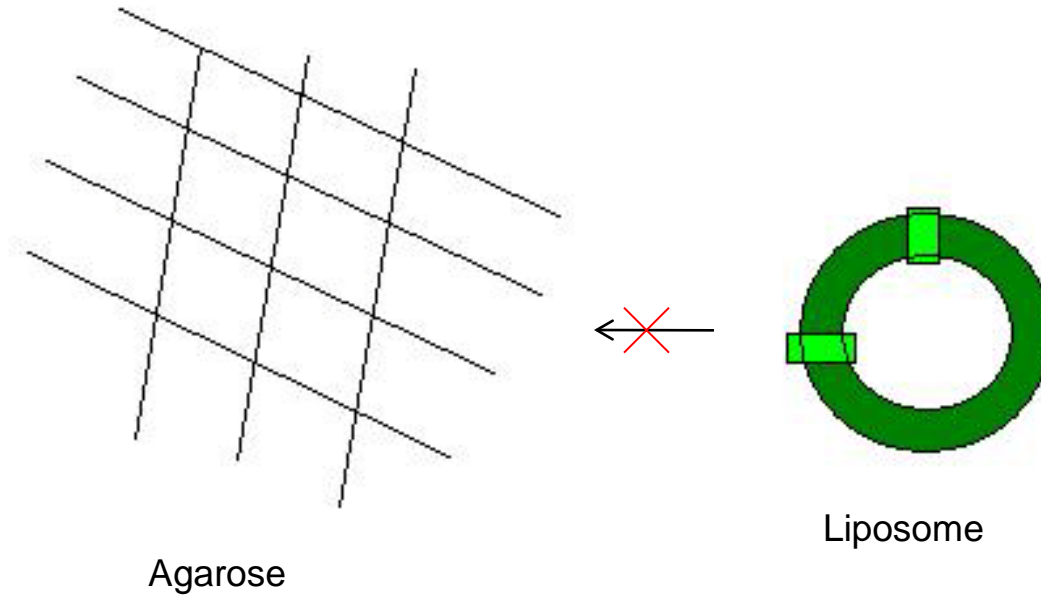
→ Membrane capacitance (500 pF)

Current-voltage relationship in the lipid bilayer



→ Bilayer doesn't leak any ions

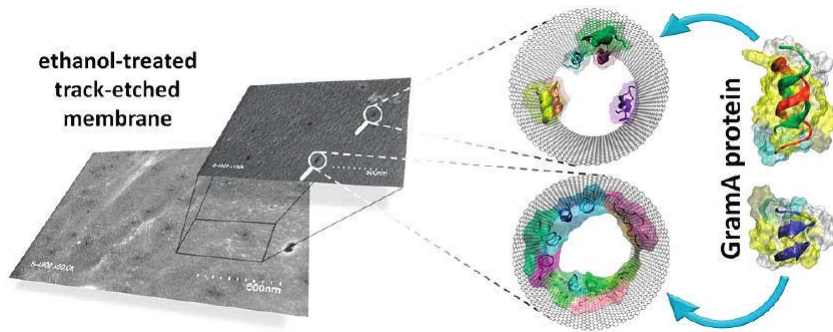
Results



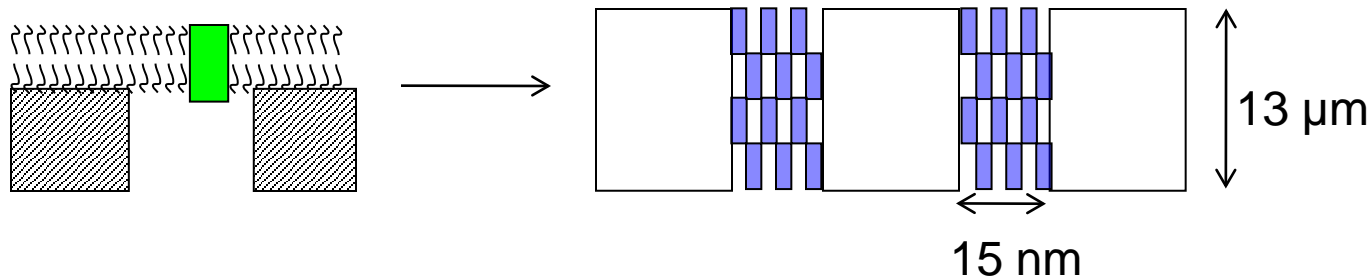
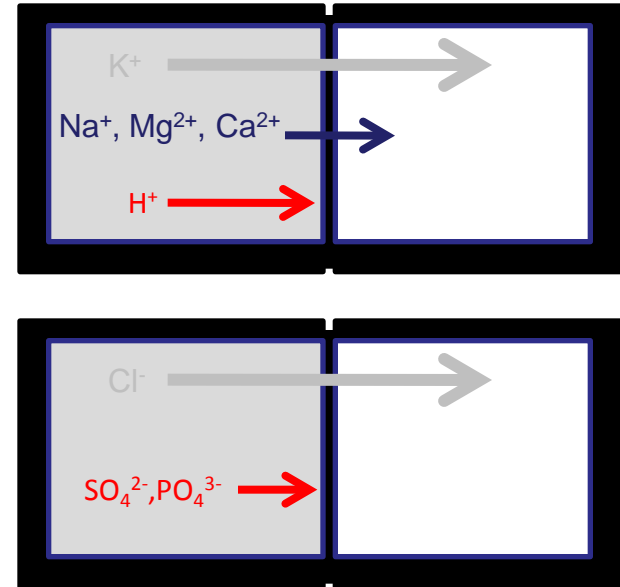
The agarose mesh size and dimensions were not suitable for the diffusion

Bio-inspired membranes

- Confined biological ionic channels
- Polymeric membrane

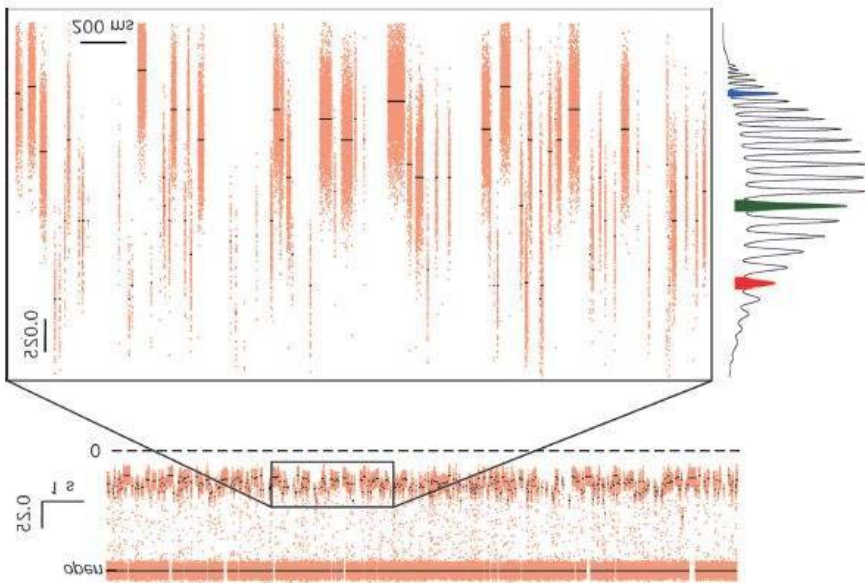


Balme, et al., Nano Letters, 2010. 11: p. 712-716

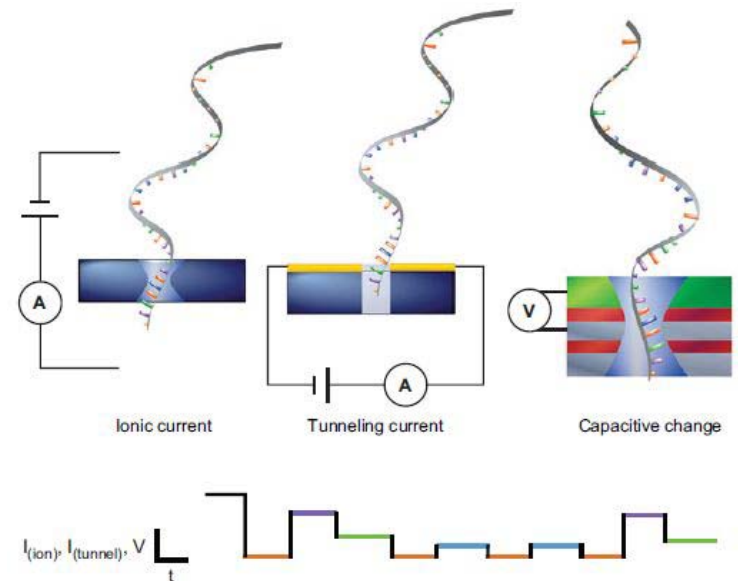


Reading macromolecules

- Macromolecule detection through a single nanopore



Robertson et al., 2007



Kasianowicz et al., 2008

Thanks

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A. Kocer and her team, Gröningen

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Thank you for your attention