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### Milestones of charged particle guiding through nanocapillaries in insulating polymers

After the first observation that keV ions are guided through insulating nano-capillaries [1], the topic has received considerable attention during the past decade. The essential property of the capillary guiding is a self-organizing process, which governs the charge deposition inside the capillaries as shown in Fig. 1. With increasing deposition of the ions, the charge patch increases until the electrostatic field is large enough to deflect the ions (panel b). At equilibrium, the ions are guided maintaining their incident charge state (panel c).

Milestones of the field are summarized in accordance with a recent review over the studies of capillary guiding [2]. Experiments are described providing emphasis to the guiding of highly charged ions in the keV energy range. Recent experiments with insulating nano- and micro-capillaries are presented. Similarities as well as significant differences between the capillary types are pointed out. Moreover, significant differences between guiding mechanisms of ions and electrons are discussed. Apart from the experimental studies, theoretical concepts of the capillary guiding are presented [3]. Single tapered

capillaries are discussed involving an enhancement of the beam density and the production of a microbeam for various applications including biological matter. Altogether, it is shown that studies of capillary guiding revealed several novel phenomena

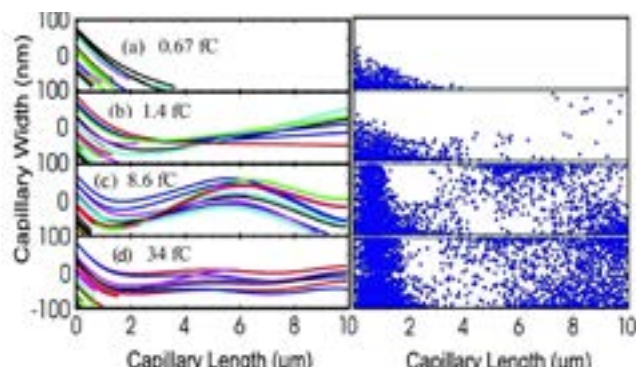


Fig. 1. Simulations modeling the trajectories of ions (left hand) and charge patches produced by deposited ions (right hand). Note that the aspect ratio is strongly reduced for graphical reasons.

### Biography

N. Stolterfoht has completed his PhD at the Free University Berlin (Germany) and in 1970 became a group leader at the Hahn-Meitner Institut Berlin where he habilitated. In the late 80<sup>th</sup> he became full professor at the University of Caen (France). In the 90<sup>th</sup> he returned to Berlin at Helmholtz-Zentrum where he served as senior scientist until being emeritus. He has 296 publications in reputed journals including a book with Springer.

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