In light microscopy it is natural to use toolsets like tweezers, knives, probes and several different measurement tools. Without this many present-day products and methods would not exist.

The operators of SEM/FIB-Systems generally work without toolsets, although the wavelength limit of light is no physical boundary. It can be imagined how technology would be pushed when a SEM/FIB Workbench reaches the same degree of practicability and utilization as toolsets for light microscopes.

The success of in-SEM/FIB-Nanorobotics depends on several important features:
- Nanomanipulators in automation, for movement of endeffectors, sample handling, and preparation,
- Endeffectors for nano-probing, cutting, cleaning, force measurement, gripping, sorting or material preparation,
- Automatic 3D tool- and sample position detection, 3D sample topography measurements,
- Precise control of all tool positions including SEM/FIB sample stage in global coordinates,
- SEM picture assisted haptic interface by “Live Image Positioning”,
- One common automation control for Nanorobotics and SEM/FIB.

Expanding the SEM/FIB to a material processing system and a nano-analytical workbench by fulfilling these upper development tasks enables new applications in research and production of material research, live sciences, tribology, environmental & forensic research and semiconductor technology.

Several examples of these new interdisciplinary research and development fields will be described, together with the invitation to participate at our research network forming further new applications.

A few examples of Nanoworkbench applications are highlighted in Fig 1. Although these examples may raise the impression of a review about different machines and their usage, this is not the case. Described is the development of the Nanoworkbench.

References:
[5] Supported by European Commission, IST and Ziel2.NRW
Fig. 1: Fig. 1 includes the rows: Nano-Probing [2]: The electrical conductivity along these gold chains is measured. Nano-Tribology can be performed in high resolution [4]. Nano-Cutting: Fast milling of structures. 3D-Nanofinger: Measurement of gold and EBID structures. Particle-Sorting: Gripping of a rigid CNT bundle [3].