

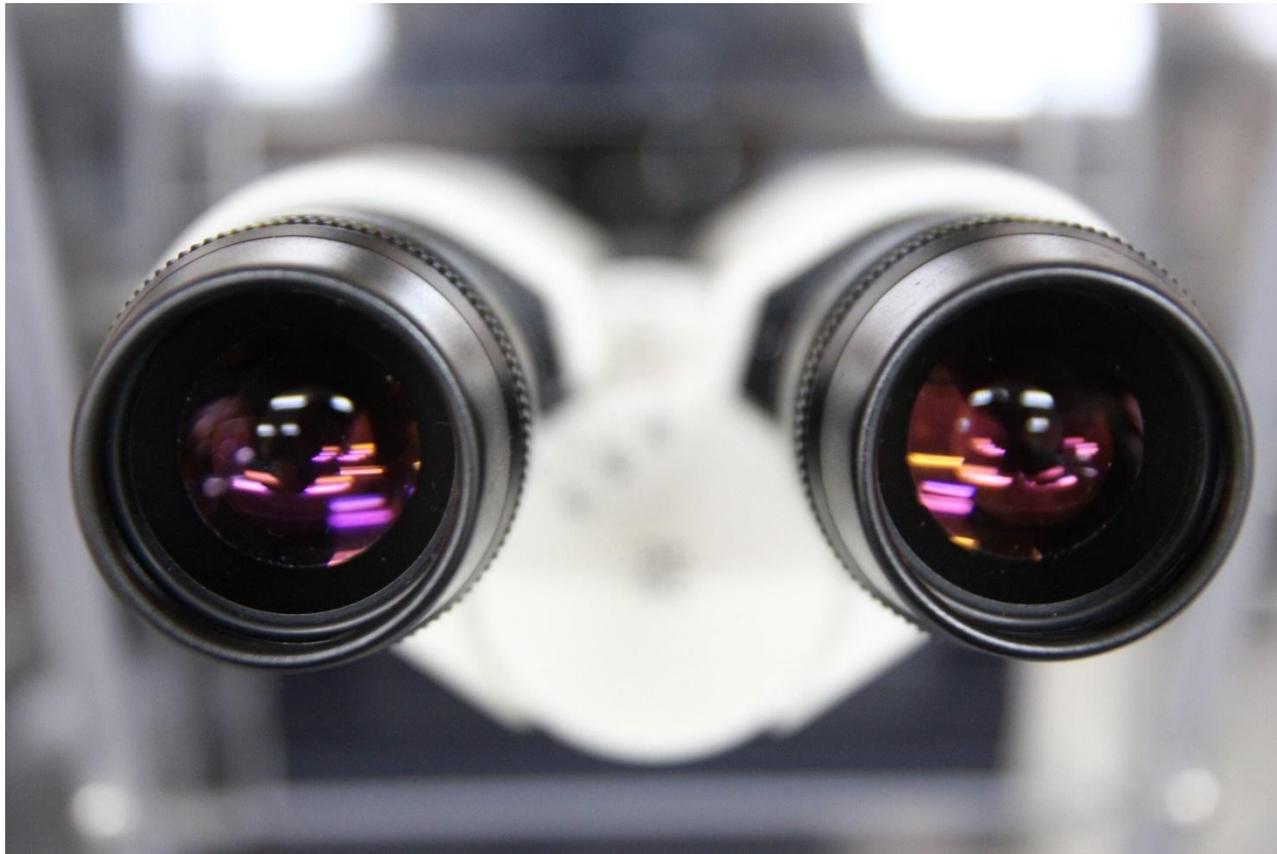


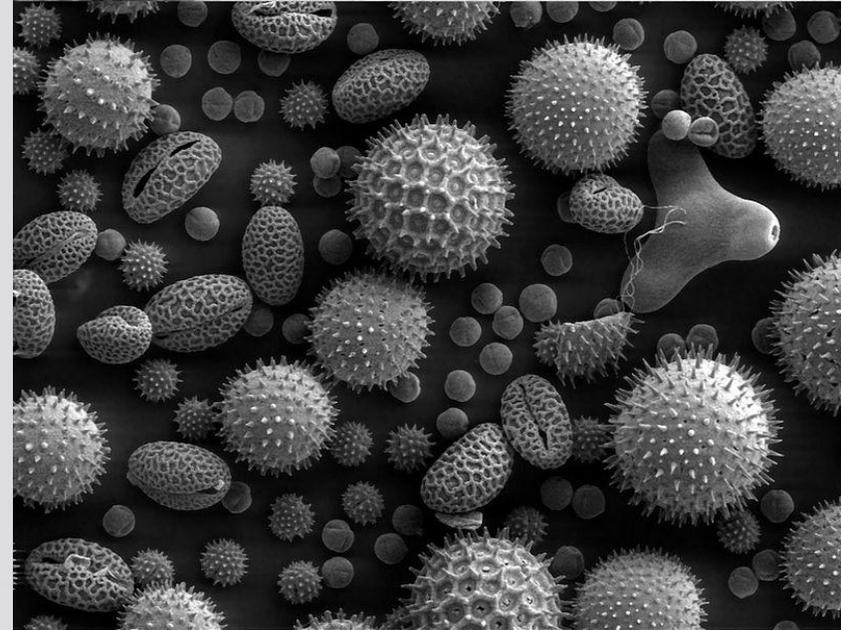
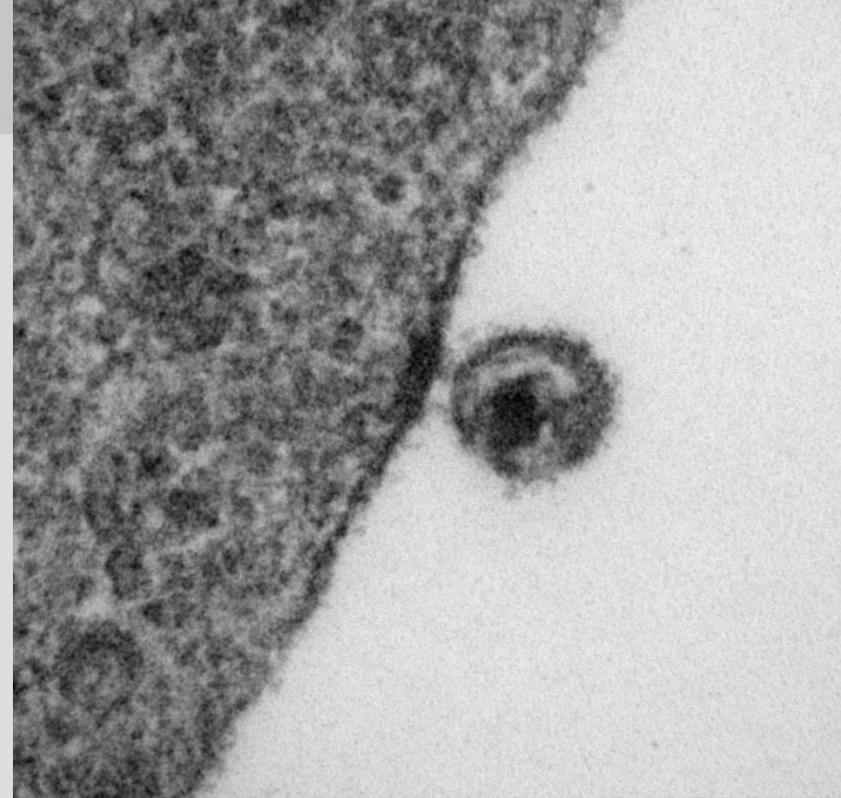
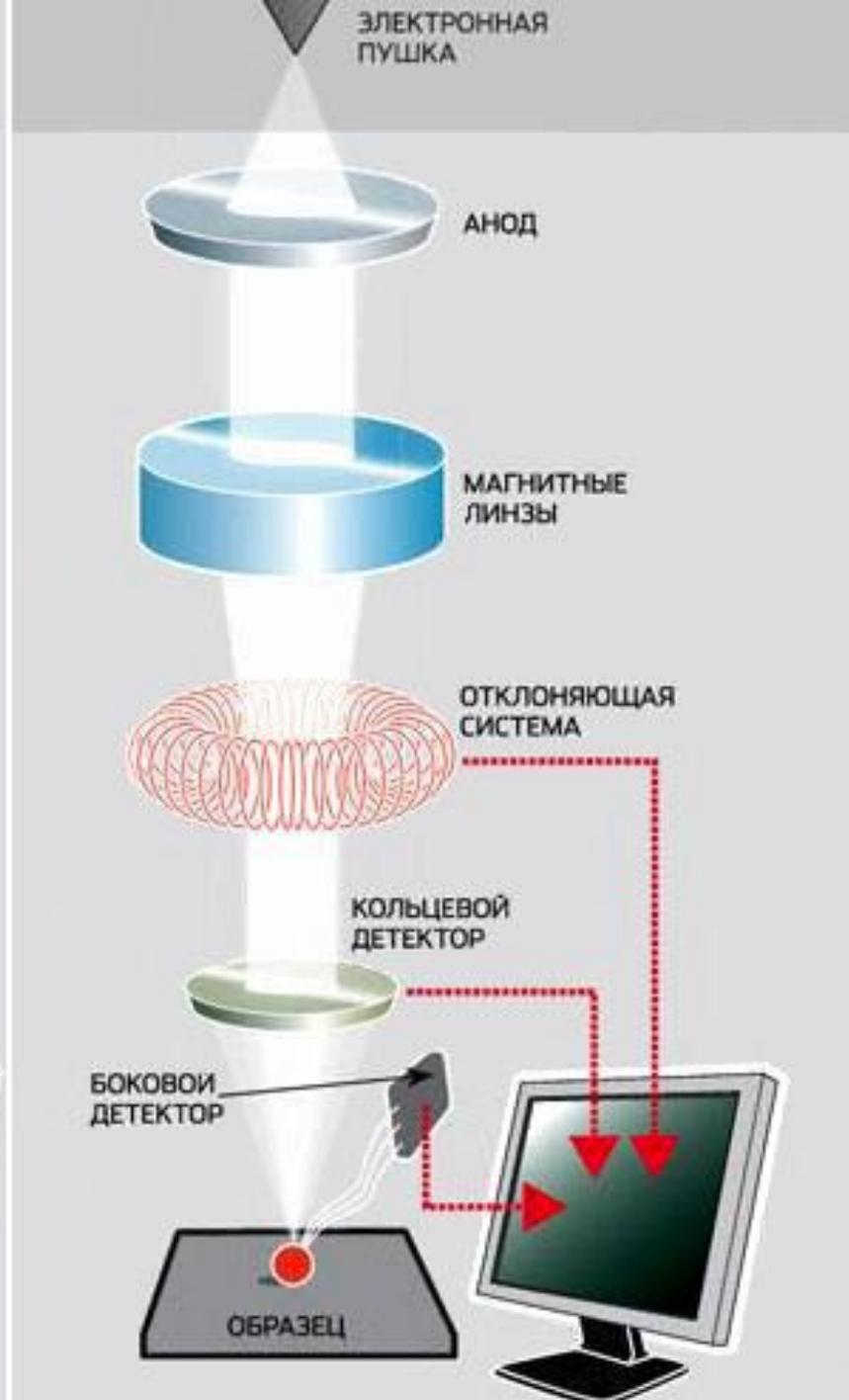
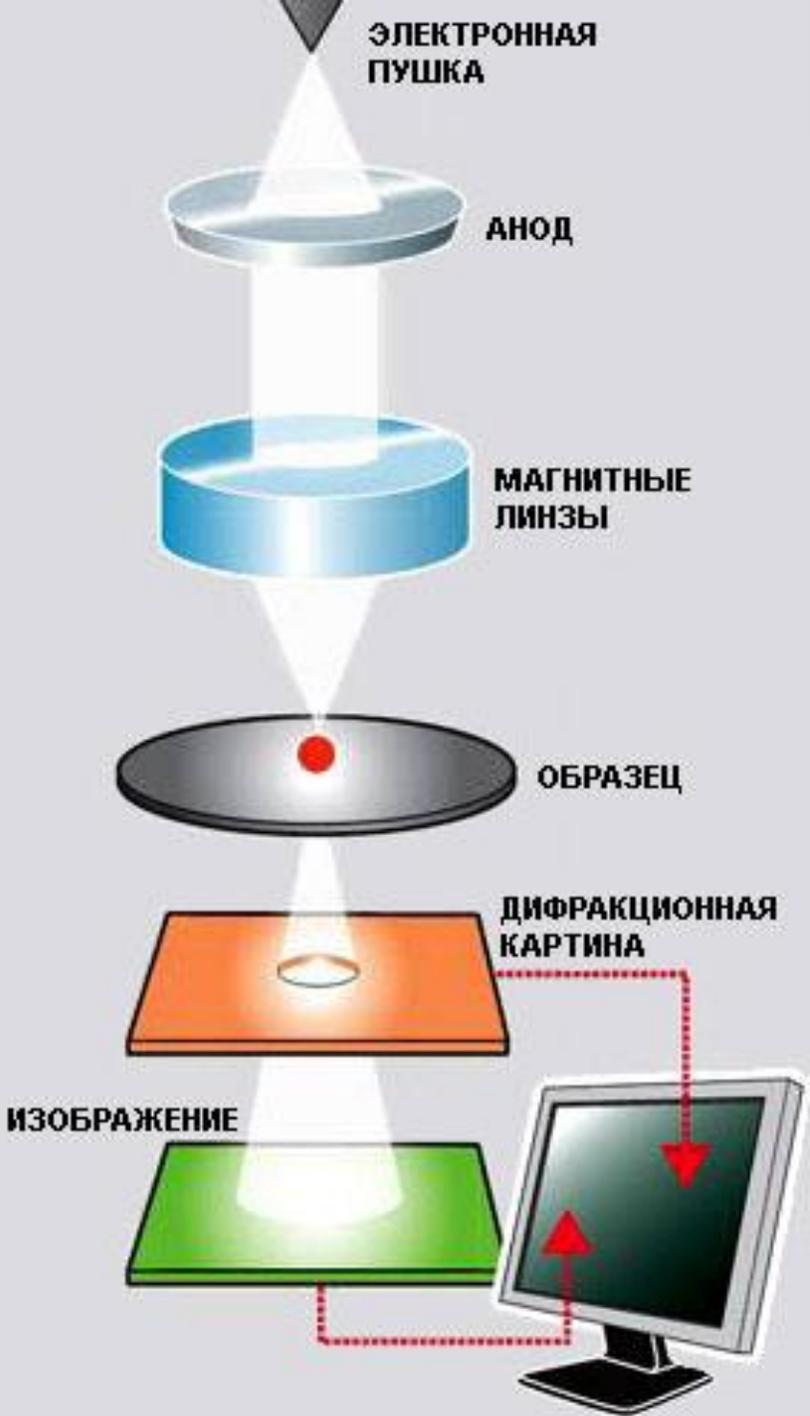
Увидеть невидимое

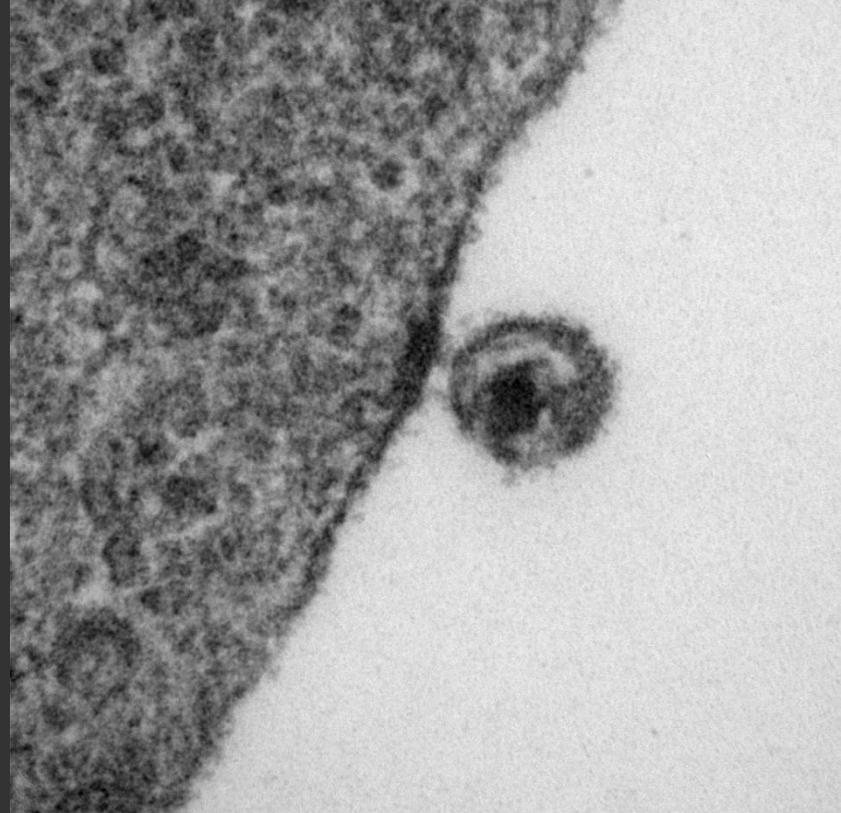
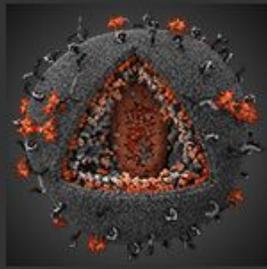
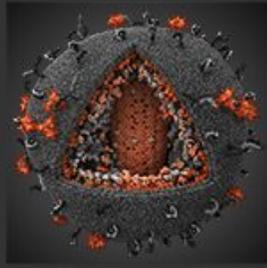
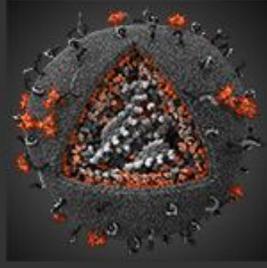
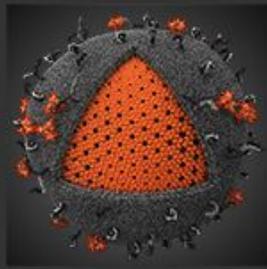
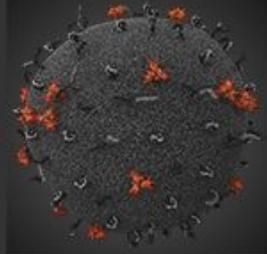
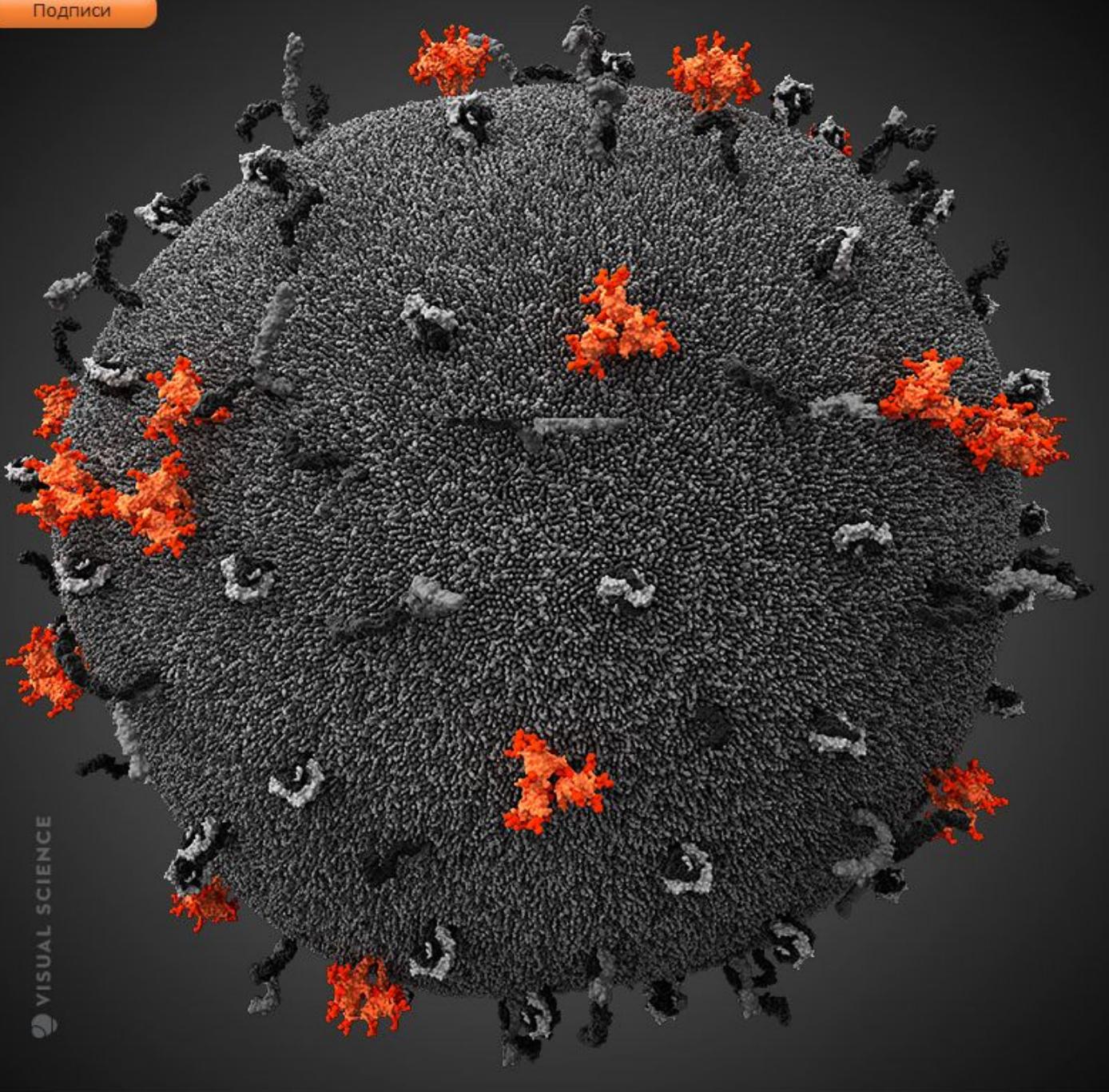
Даниил Браташов, доцент кафедры инноватики
ФНБМТ СГУ им. Н.Г. Чернышевского

Увидеть невидимое

- Как можно увидеть, что происходит внутри живого
- Как можно увидеть бактерии, вирусы, отдельные белки
- Как работают биомолекулы



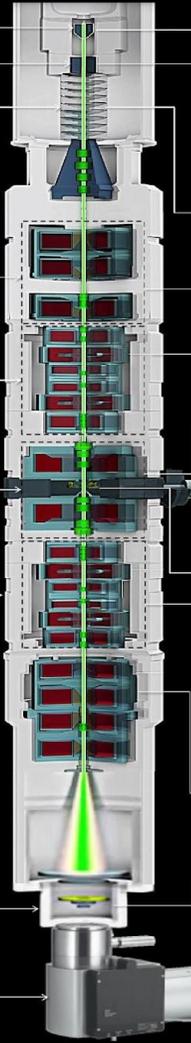
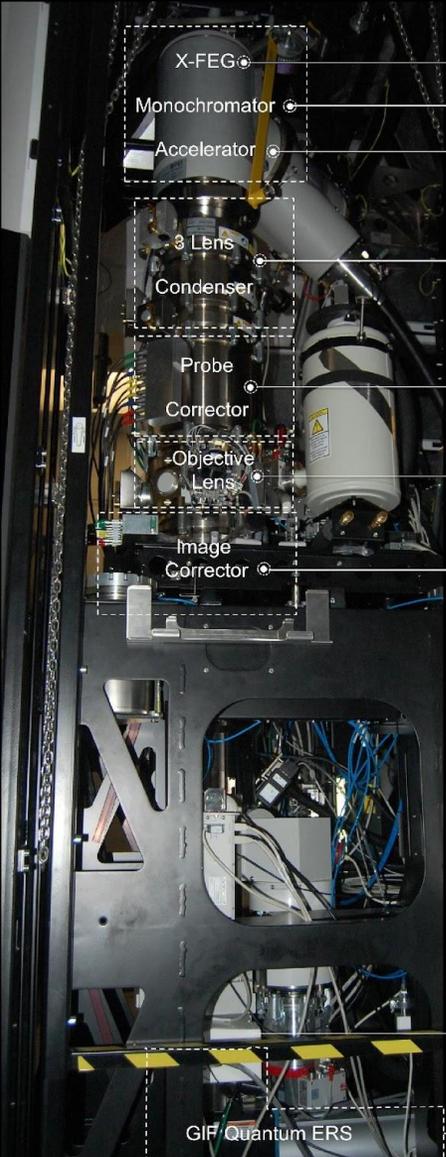




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HIV-TC145kXtecnai20
bio46
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Microscopist: Louisa

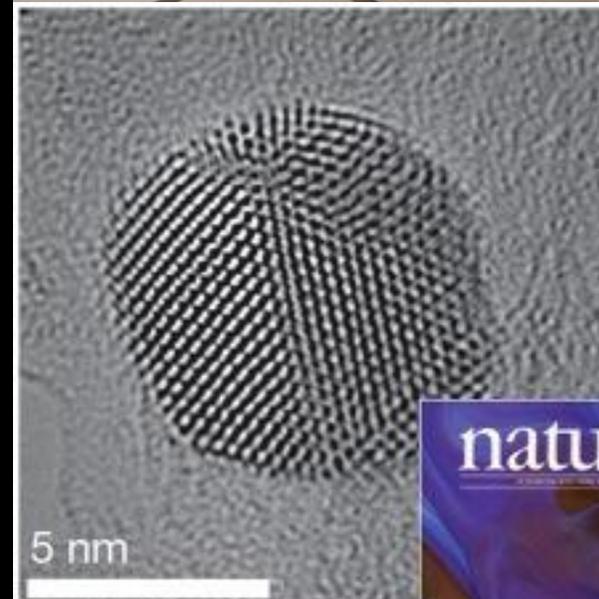
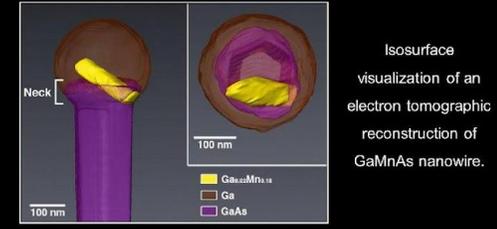
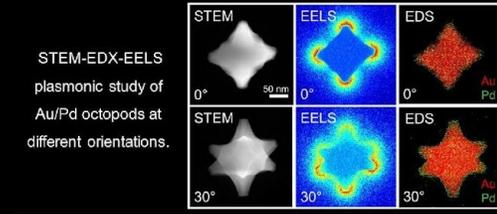
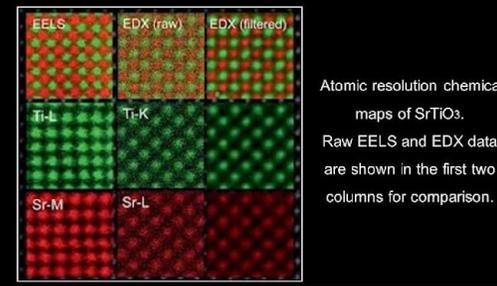
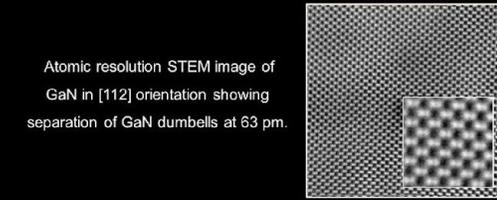
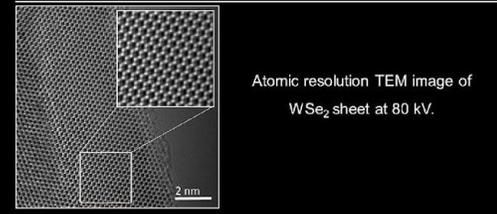
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HV=100kV
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AMT Camera System

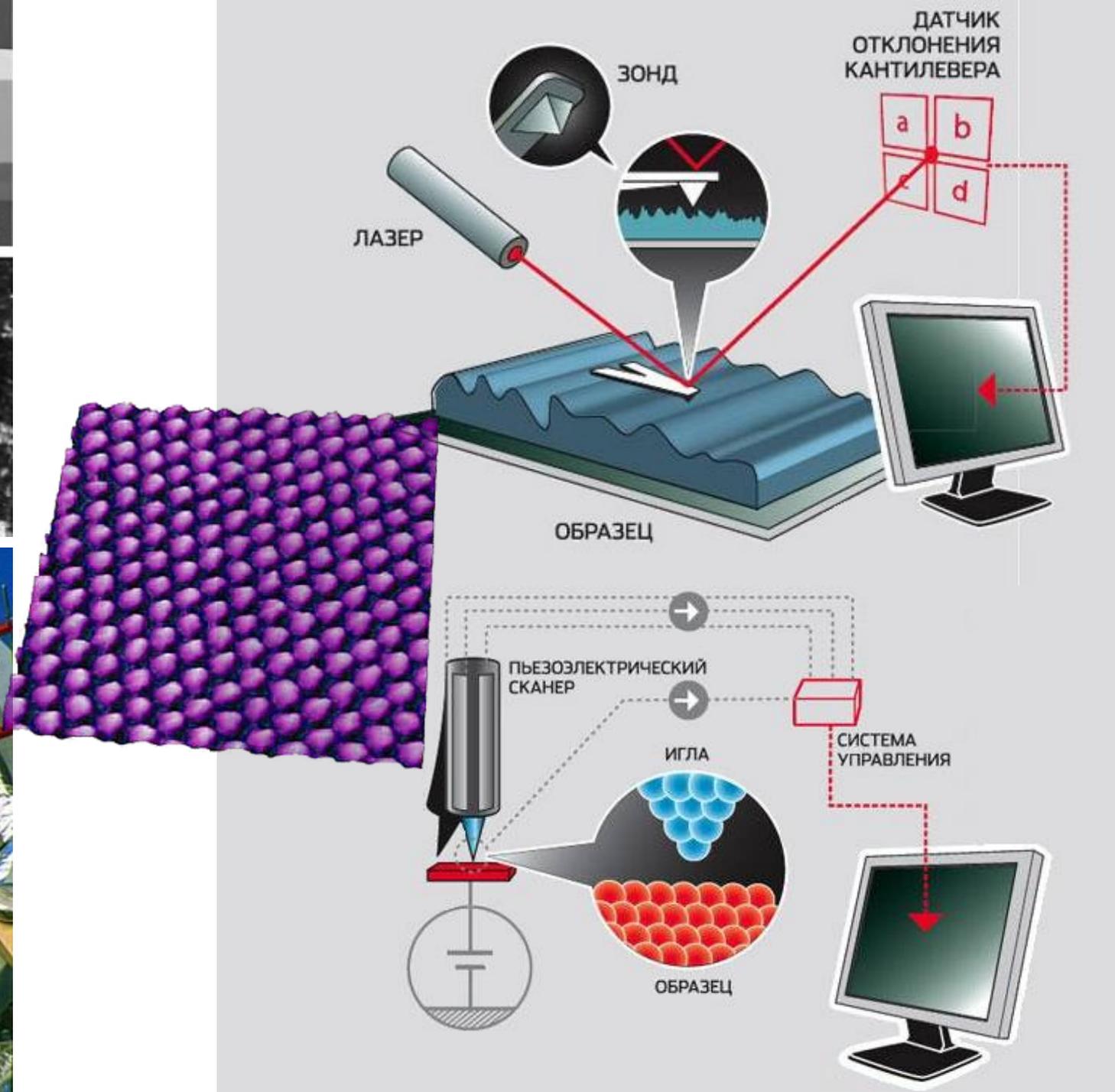
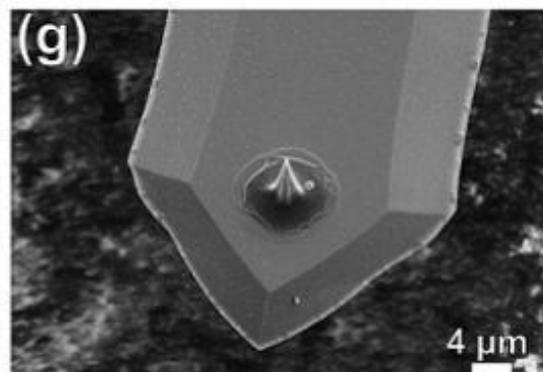
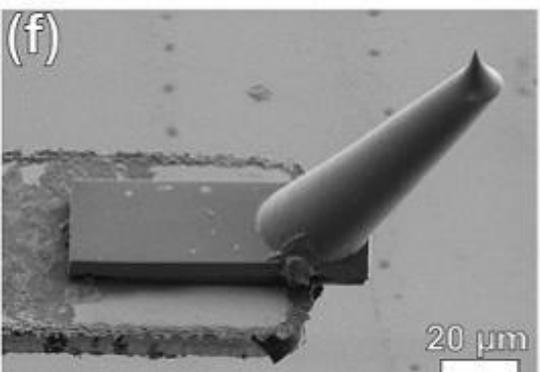
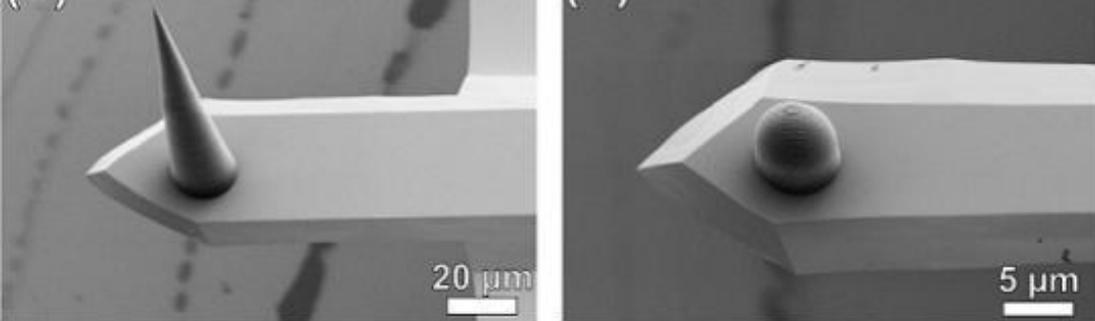
FEI Titan Themis³

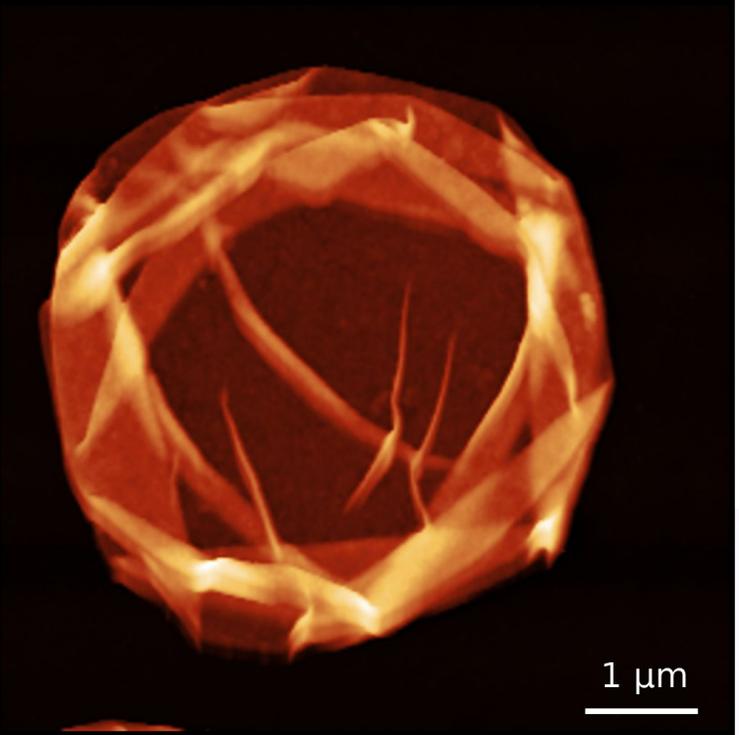
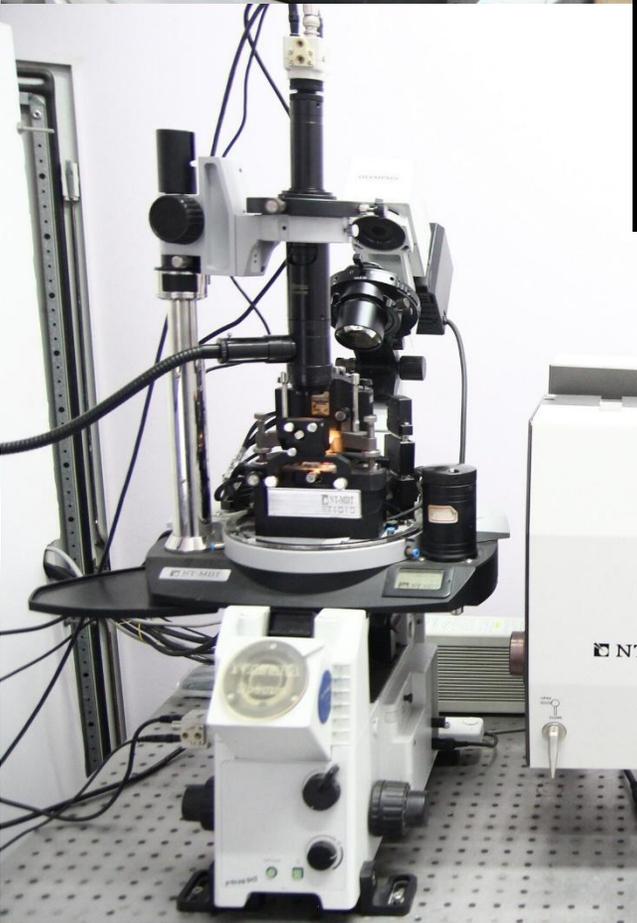
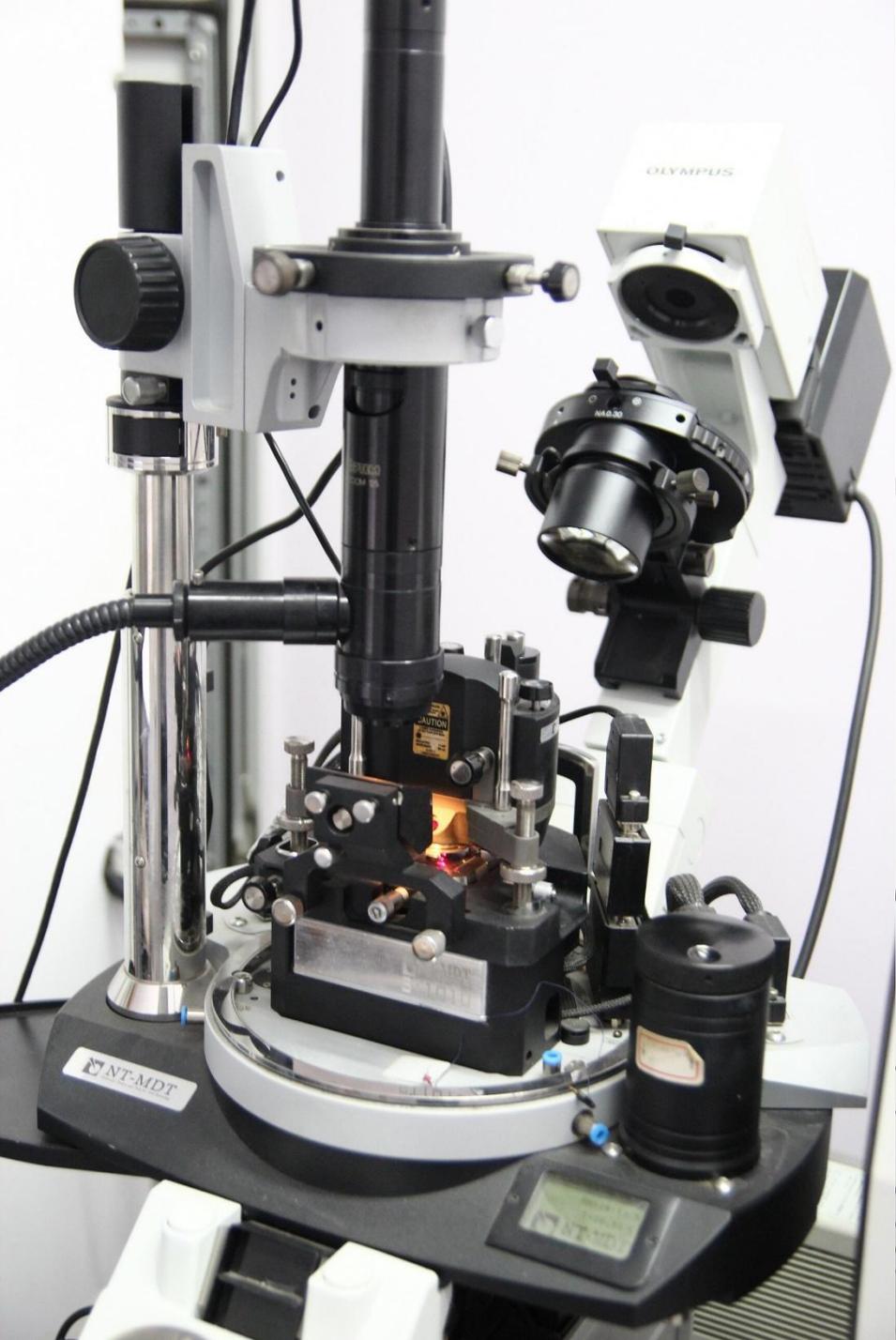


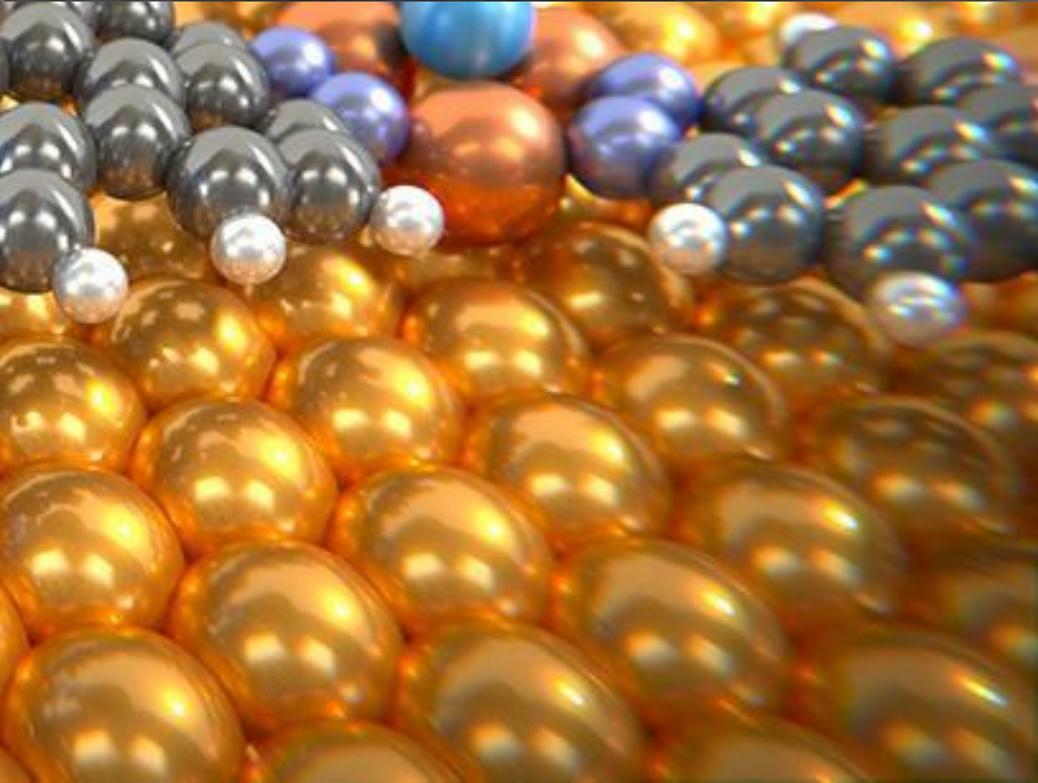
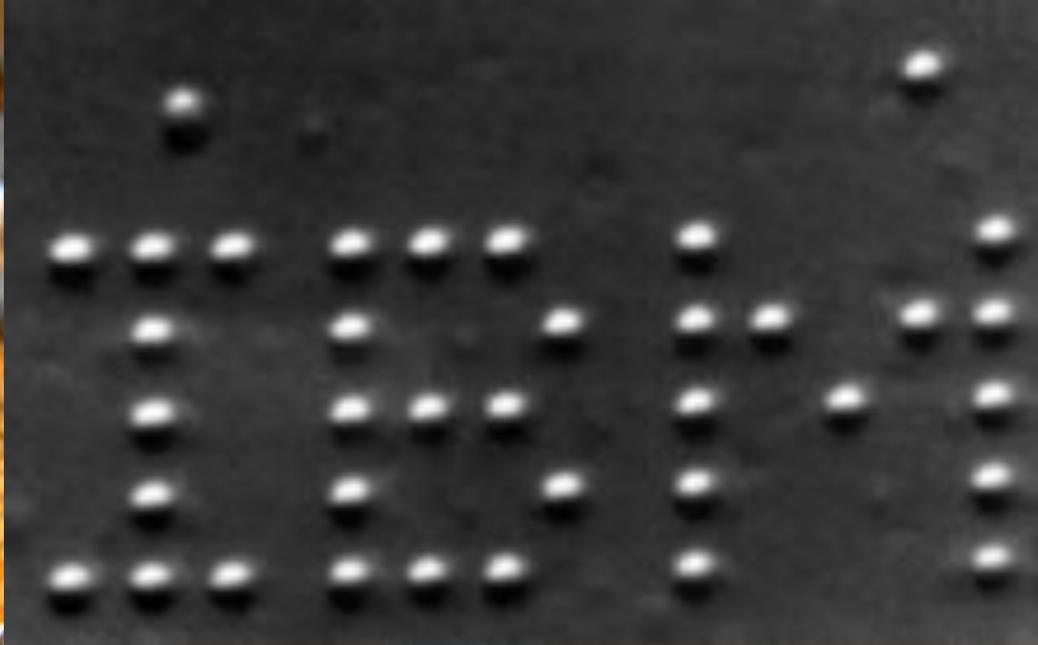
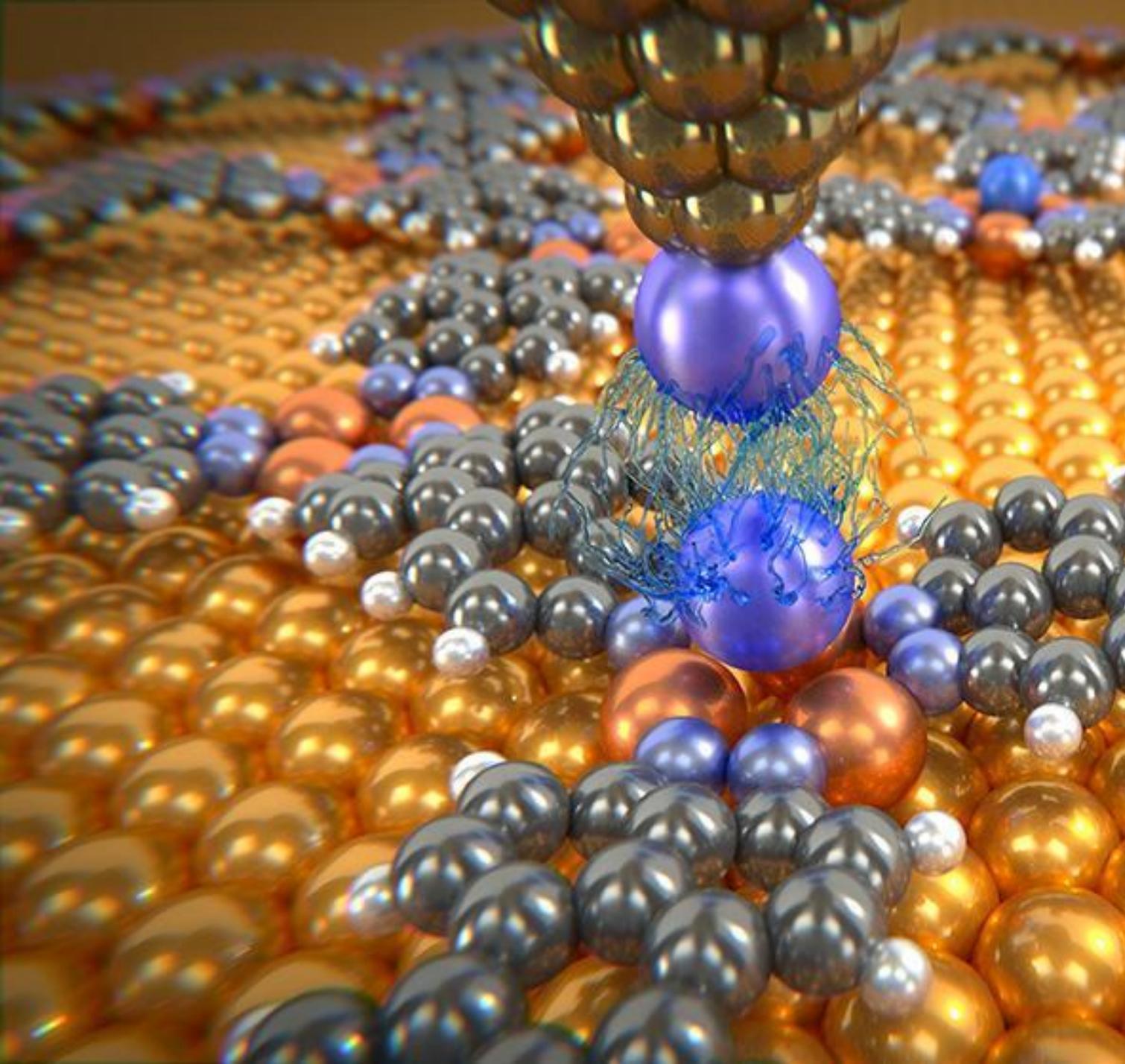
- **Extreme Field Emission Gun (X-FEG)**
 - + Brightness ($\geq 7 \times 10^7$ A/m² sr V)
 - + Current (≥ 50 nA before monochromator)
 - + Current-Stability ($\leq 1\%$ over 7 days)
 - + Spatial Coherency
 - + Temporal Coherency
 - (Energy resolution at 300 kV without monochromator ≤ 0.8 eV)
- **Monochromator**
 - + Energy resolution at 300 kV ≤ 0.2 eV
- **Accelerator**
 - + 60 to 300 kV
- **3 Lens Condenser**
 - + Large parallel illumination range in TEM (from nm to μ m)
 - + Large convergence angle range in STEM
- **DCOR probe Cs corrector**
 - + Correct high order aberrations (3rd, 4th and 5th order aberrations)
- **Super-Twin Objective Lens**
 - + Wide Pole Piece Gap (5 mm)
 - + Large sample tilt range ($\pm 70^\circ$)
- **Piezo Stage**
 - + Atomic step size in x,y,z (20 pm)
- **Super-X Detector (4 Silicon Drift Detectors)**
 - + Large collection angle (0.9 srad)
 - + Windowless
 - + High throughput rate (> 240 kcps)
 - + Energy resolution (< 136 eV)
 - + Dwell times per pixel down to 10 μ s
- **CETCOR Image Cs corrector**
- **4 Lens Projector system**
 - + Constant power (high stability)
- **Cameras**
 - + 4k x 4k CMOS-based CETA camera
 - + Ultrascan 2k x 2k CCD
- **Gatan Image Filter Quantum ERS**
 - + High speed (1000 spectra per second)
 - + Large EELS range (2000 eV)

Application Highlights:









A Boy And His Atom: The World's Smallest Movie



Moving Atoms: Making The World's Smallest Movie

ПОКАЗАТЬ ДРУГИЕ ВИДЕО



0:38 / 1:33



YouTube



ПОКАЗАТЬ ДРУГИЕ ВИДЕО

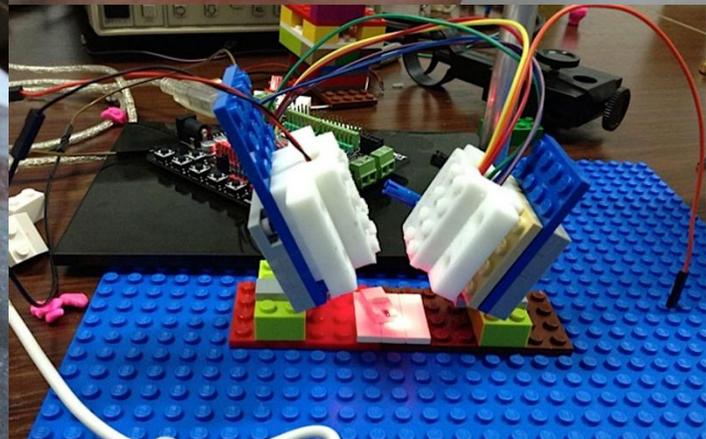
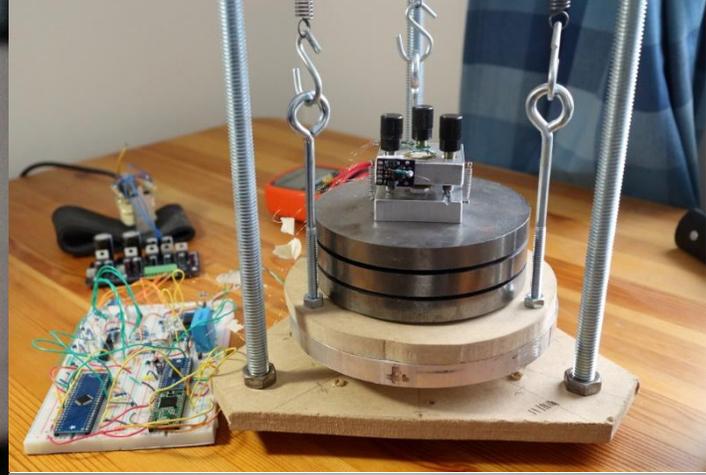
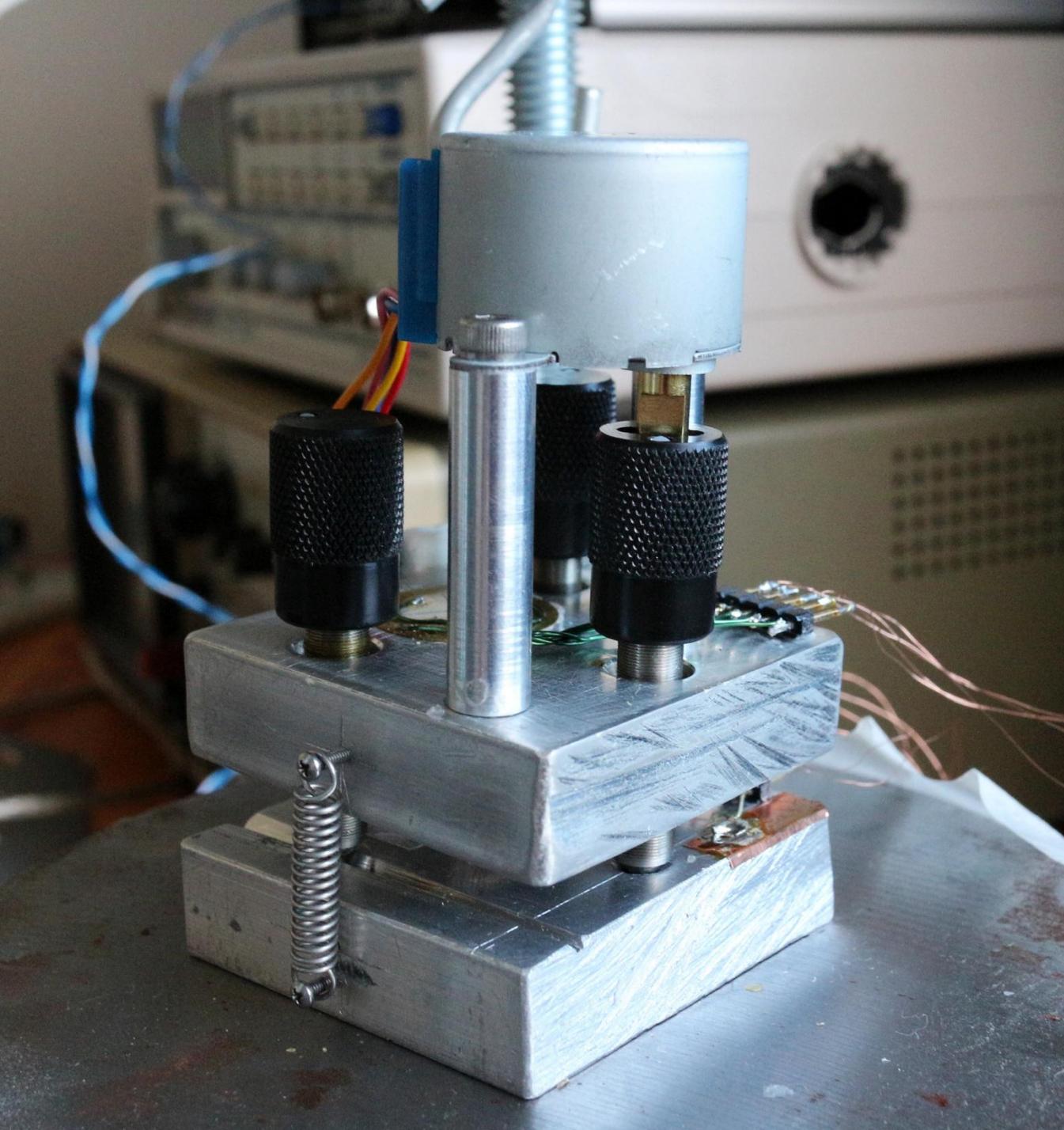


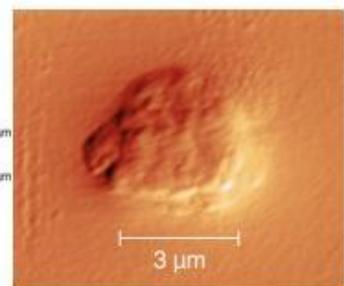
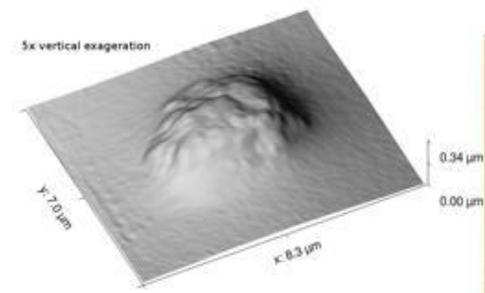
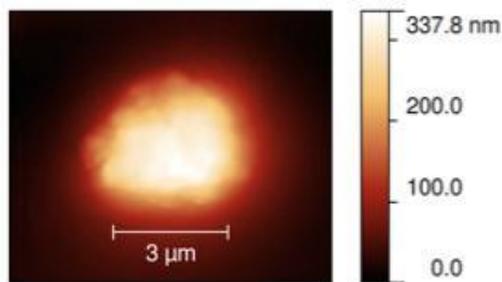
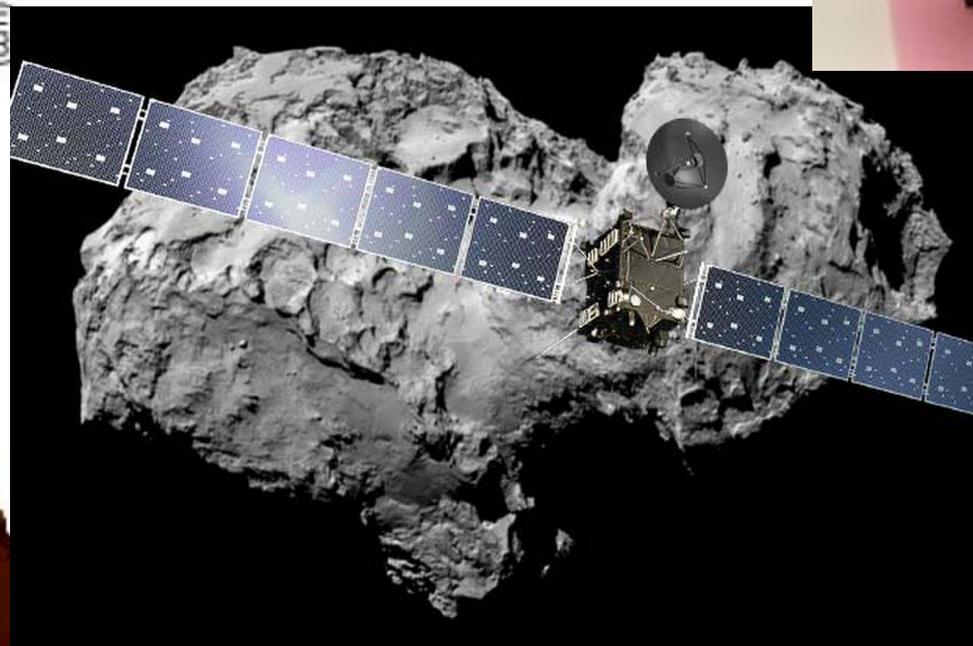
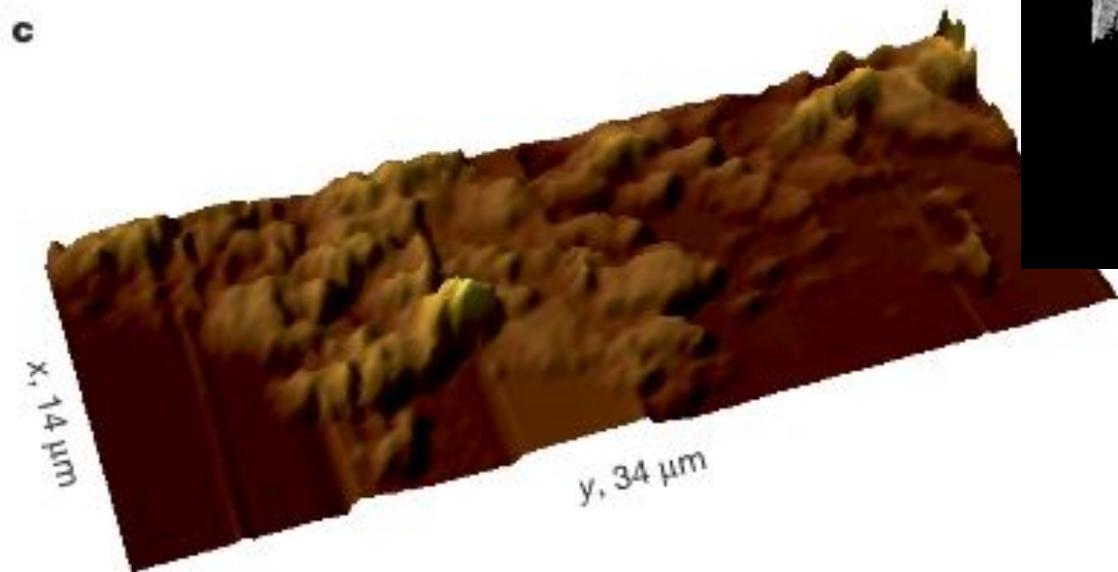
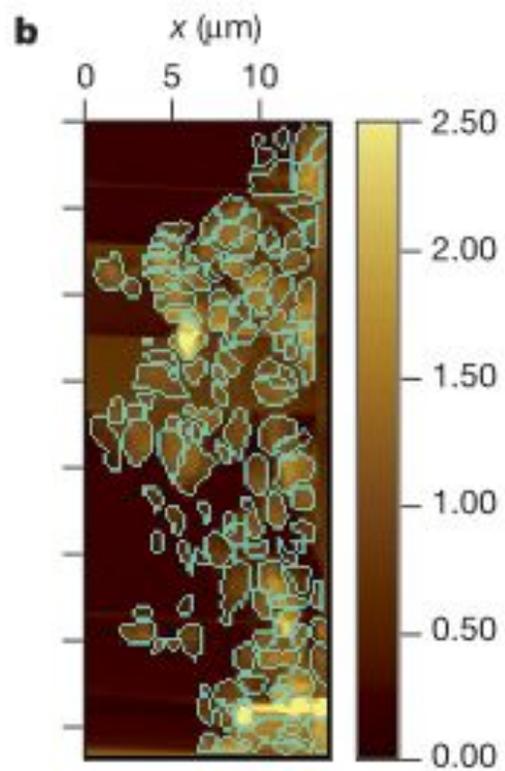
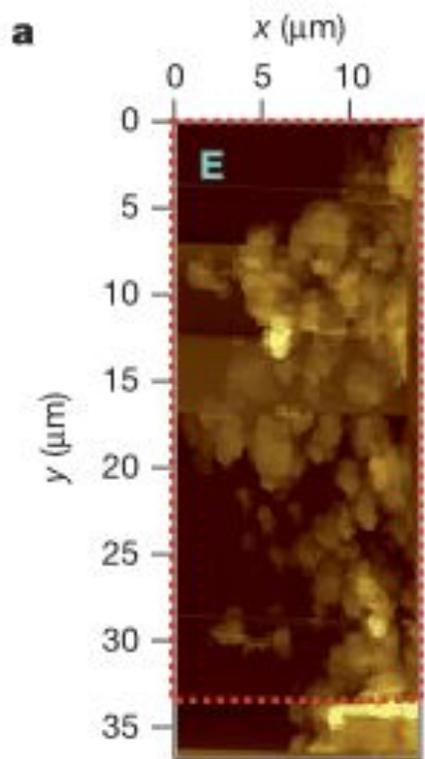
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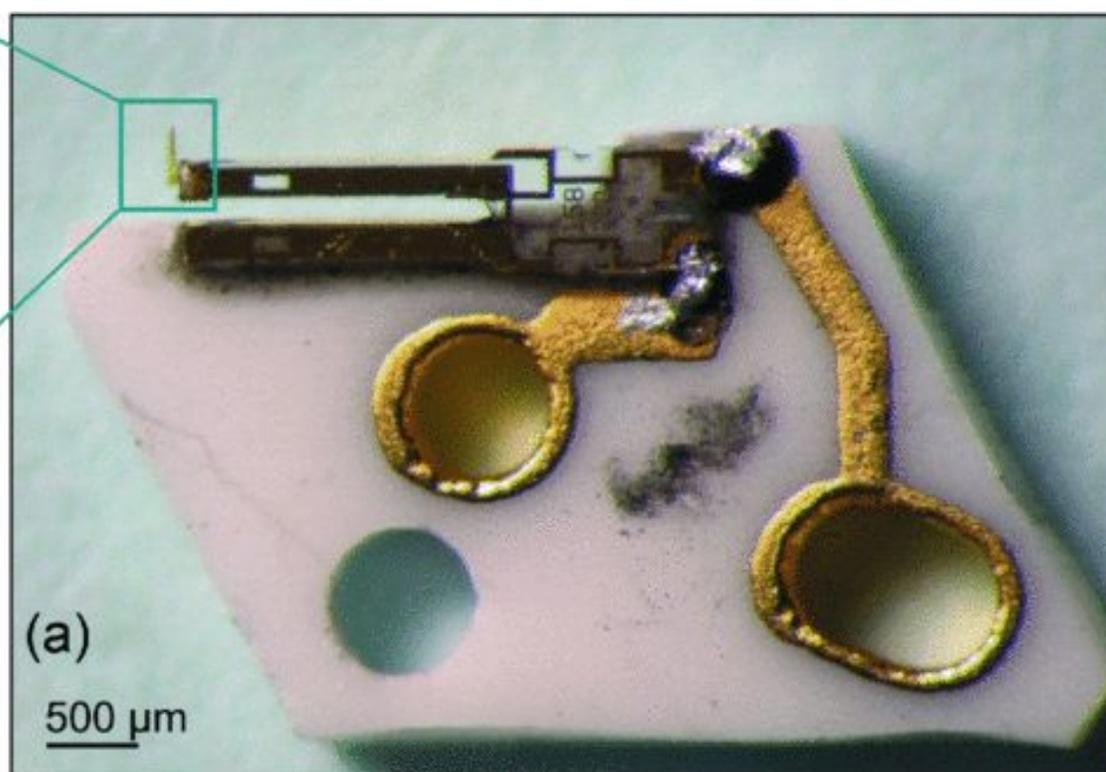
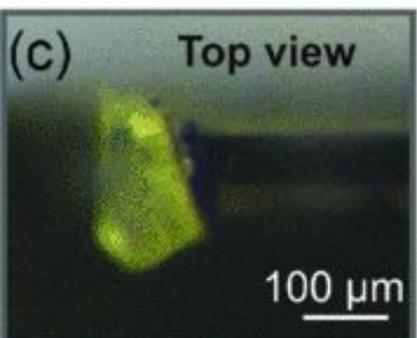
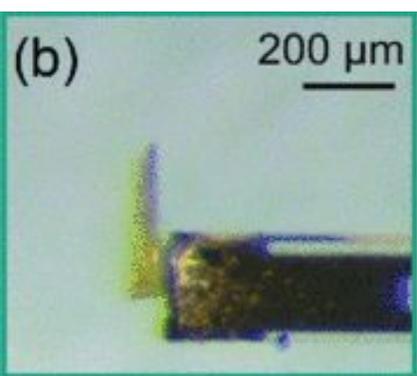
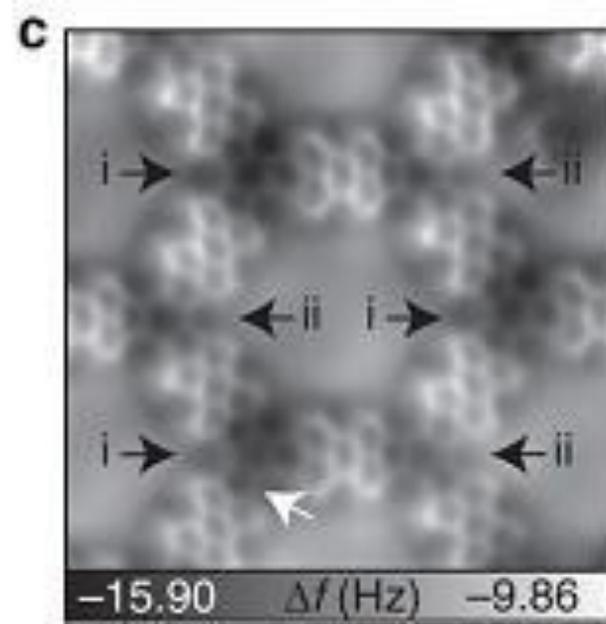
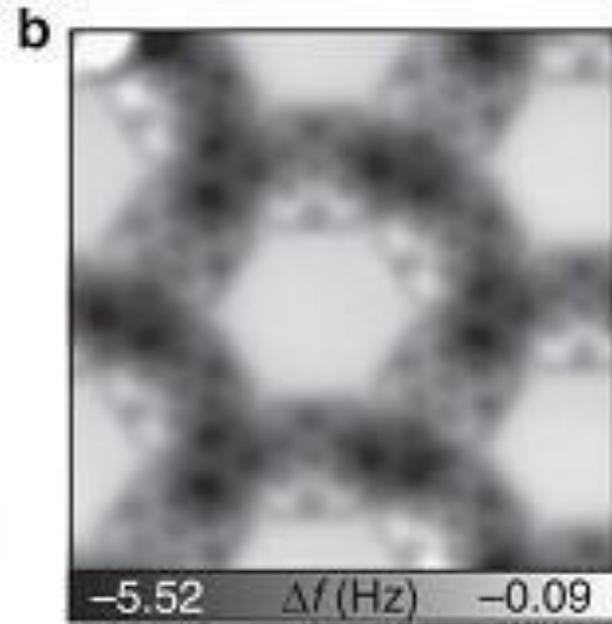
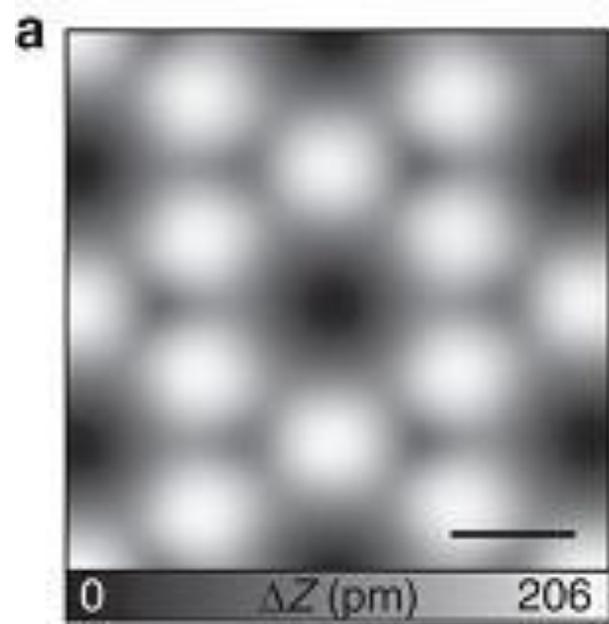


YouTube





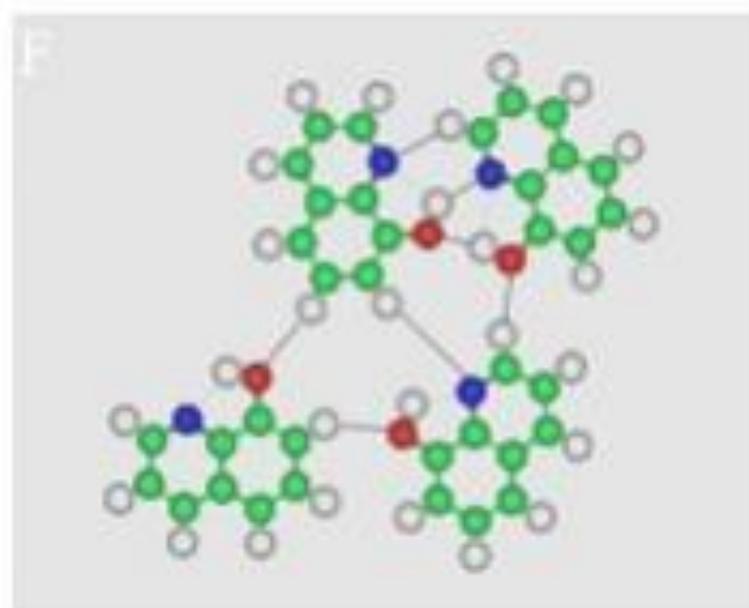
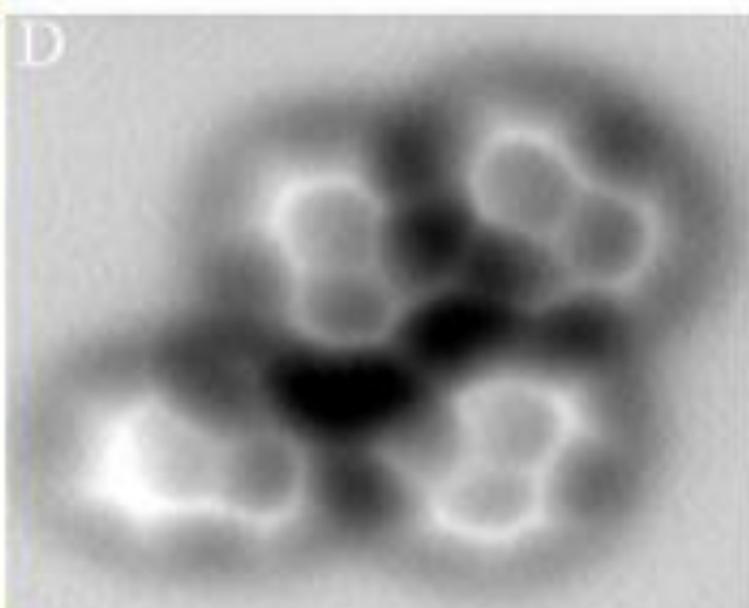
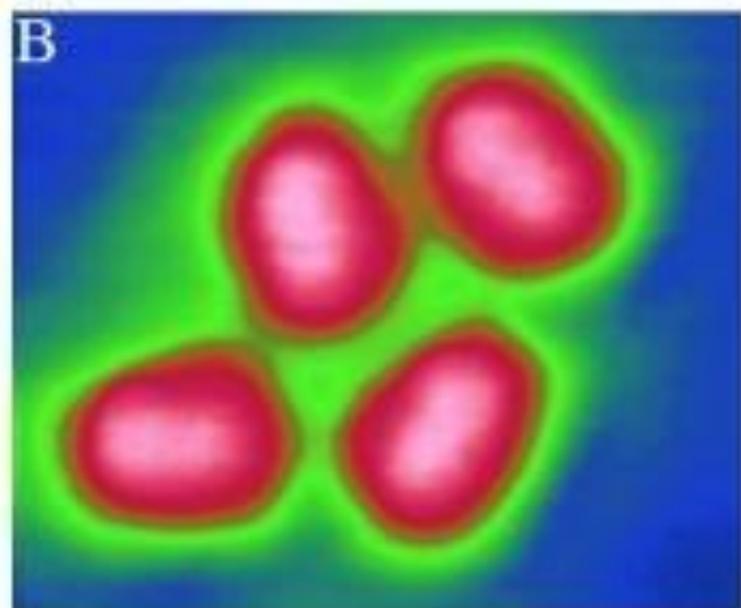
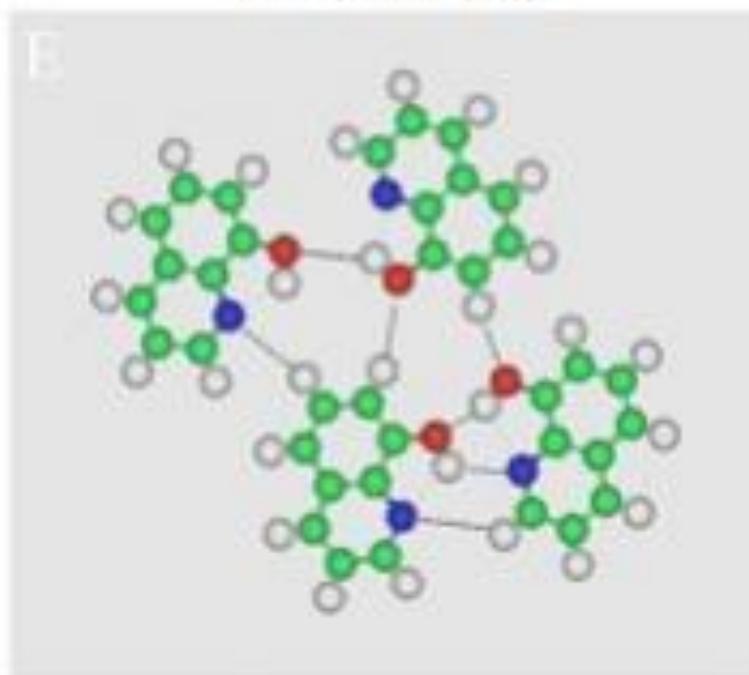
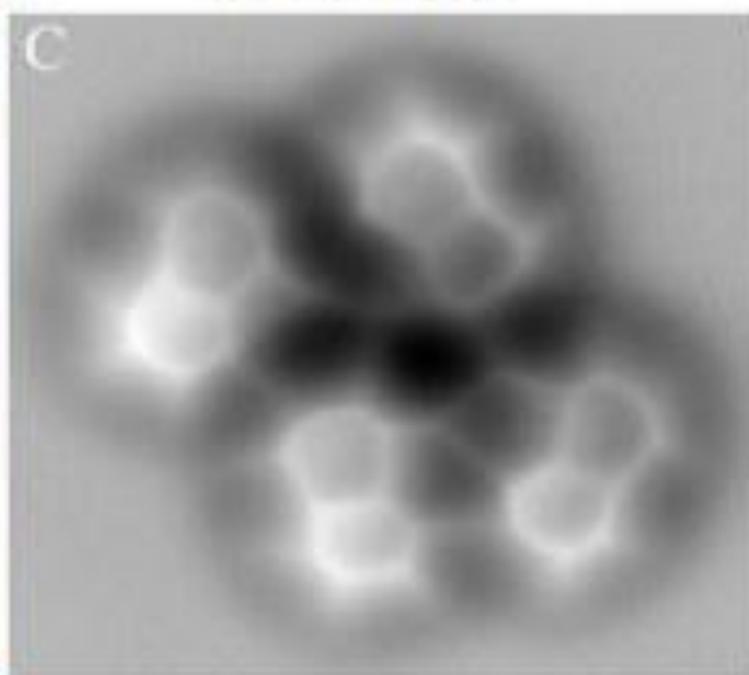
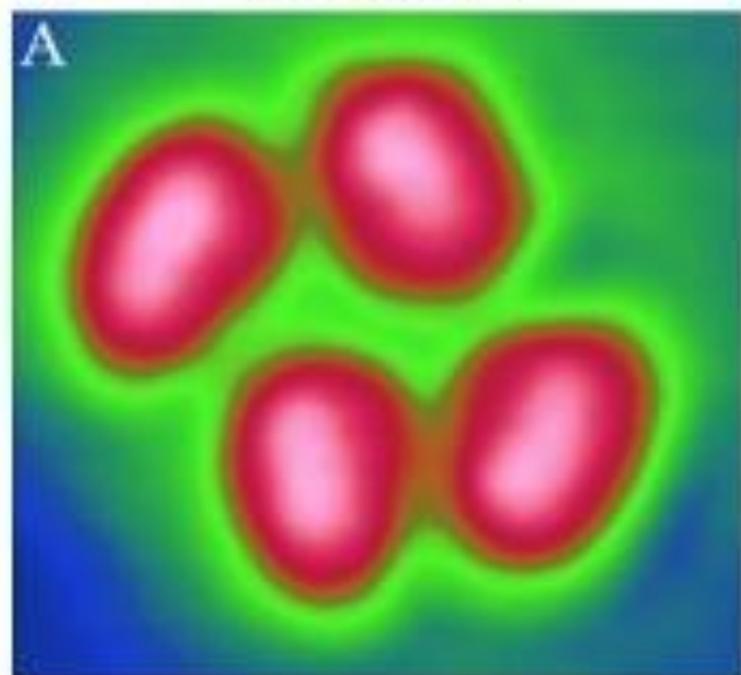


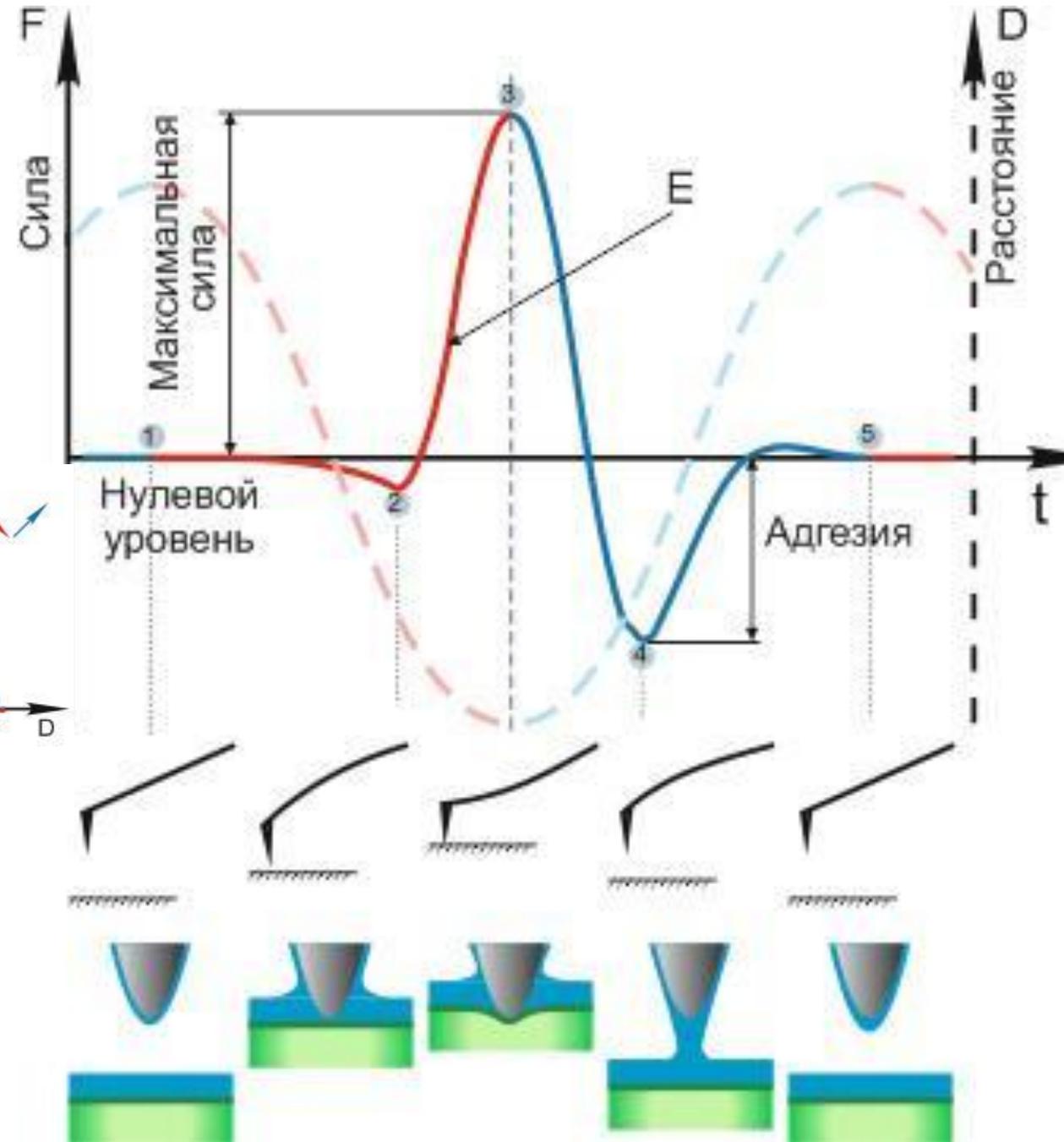
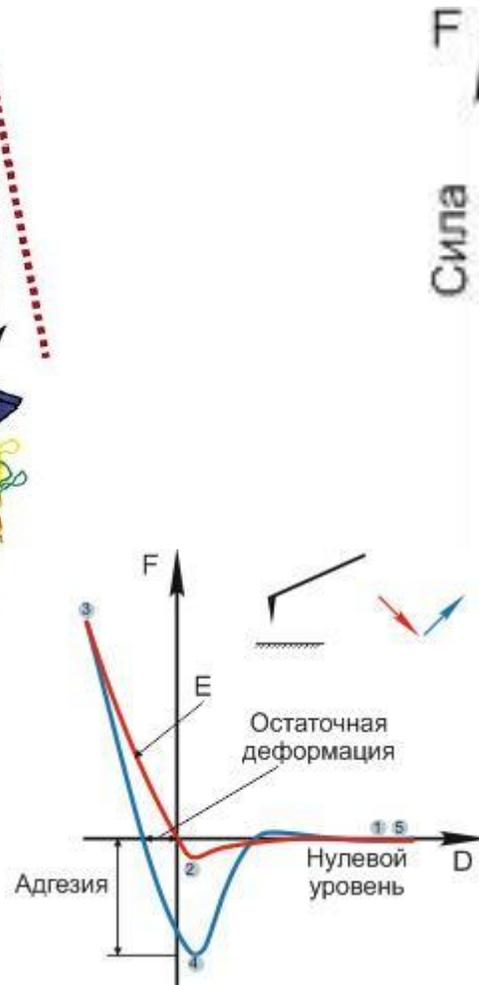
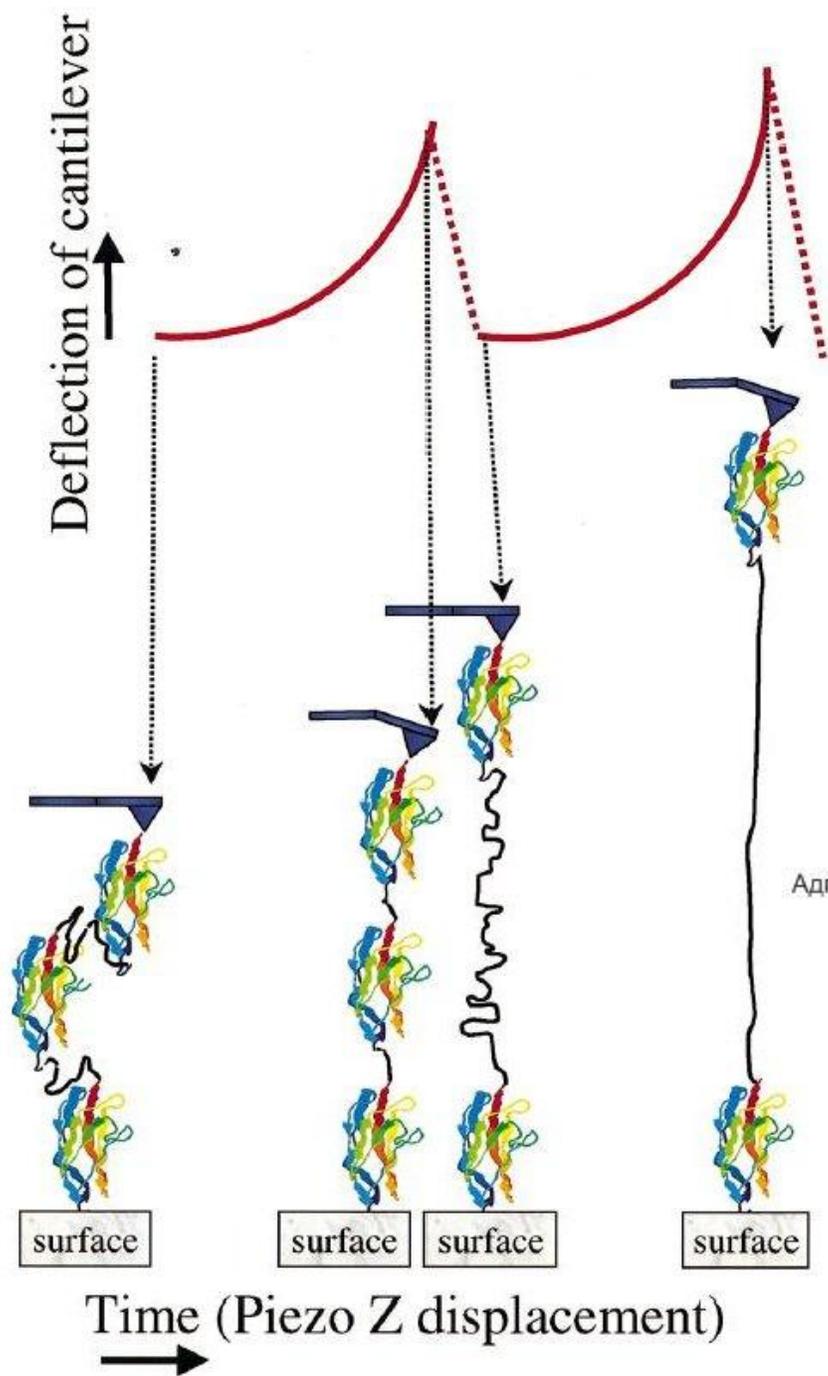


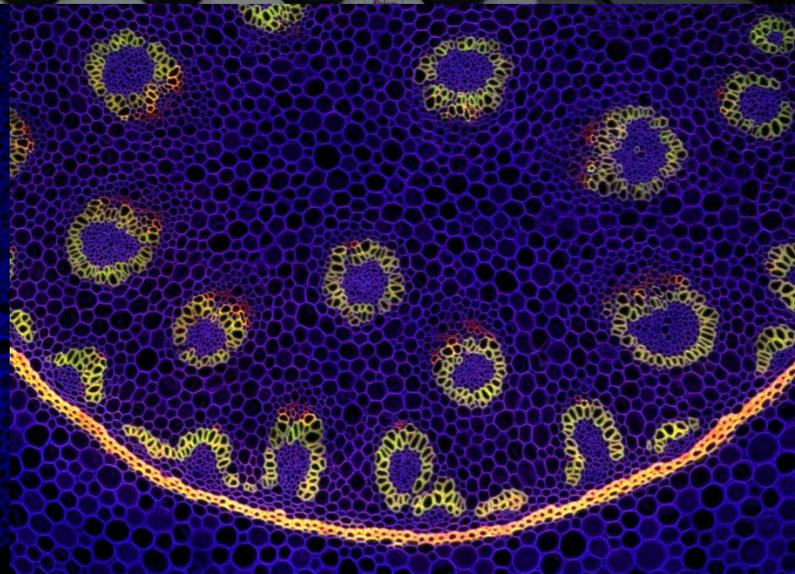
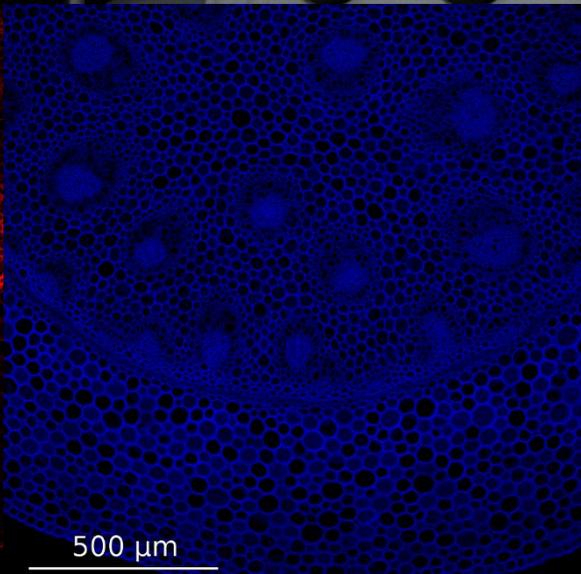
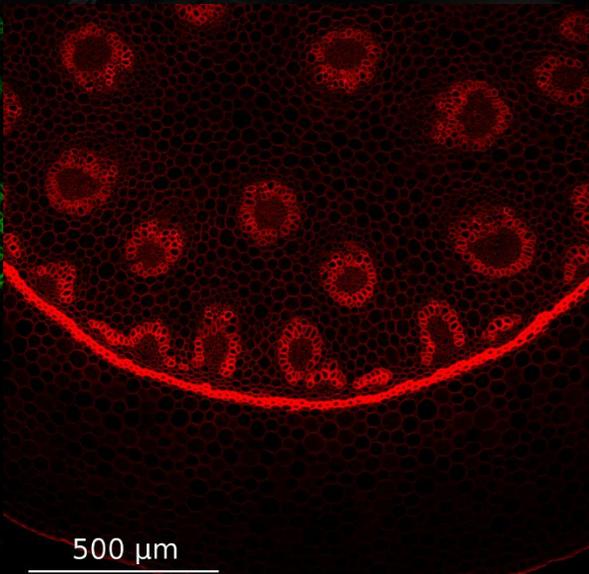
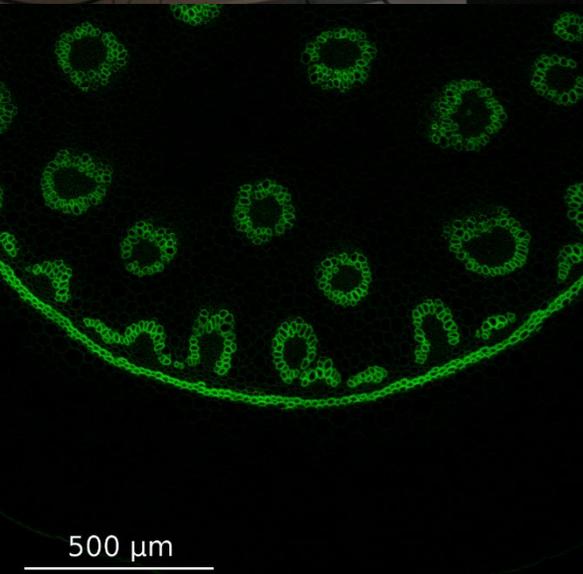
STM

AFM

Model



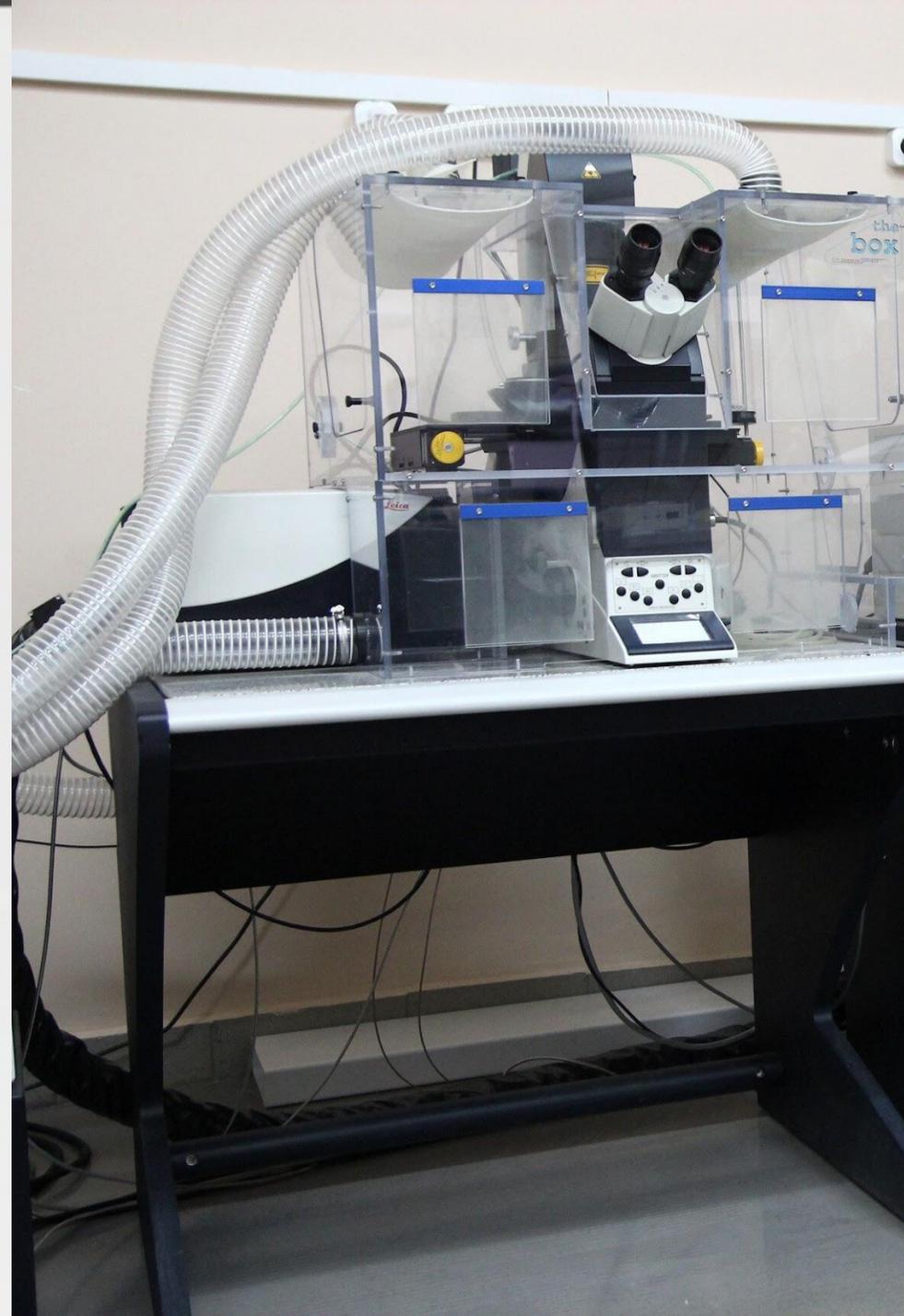
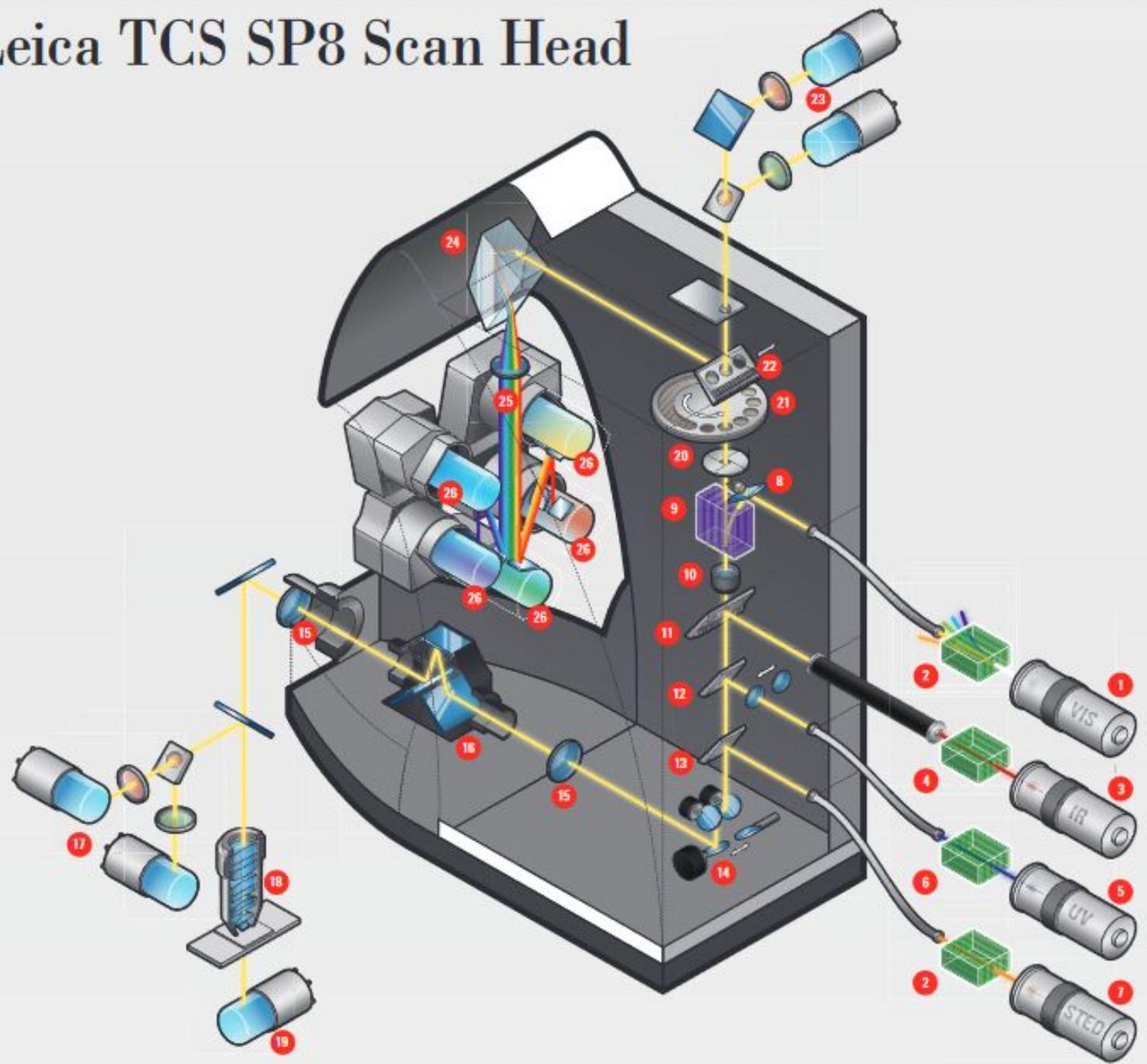


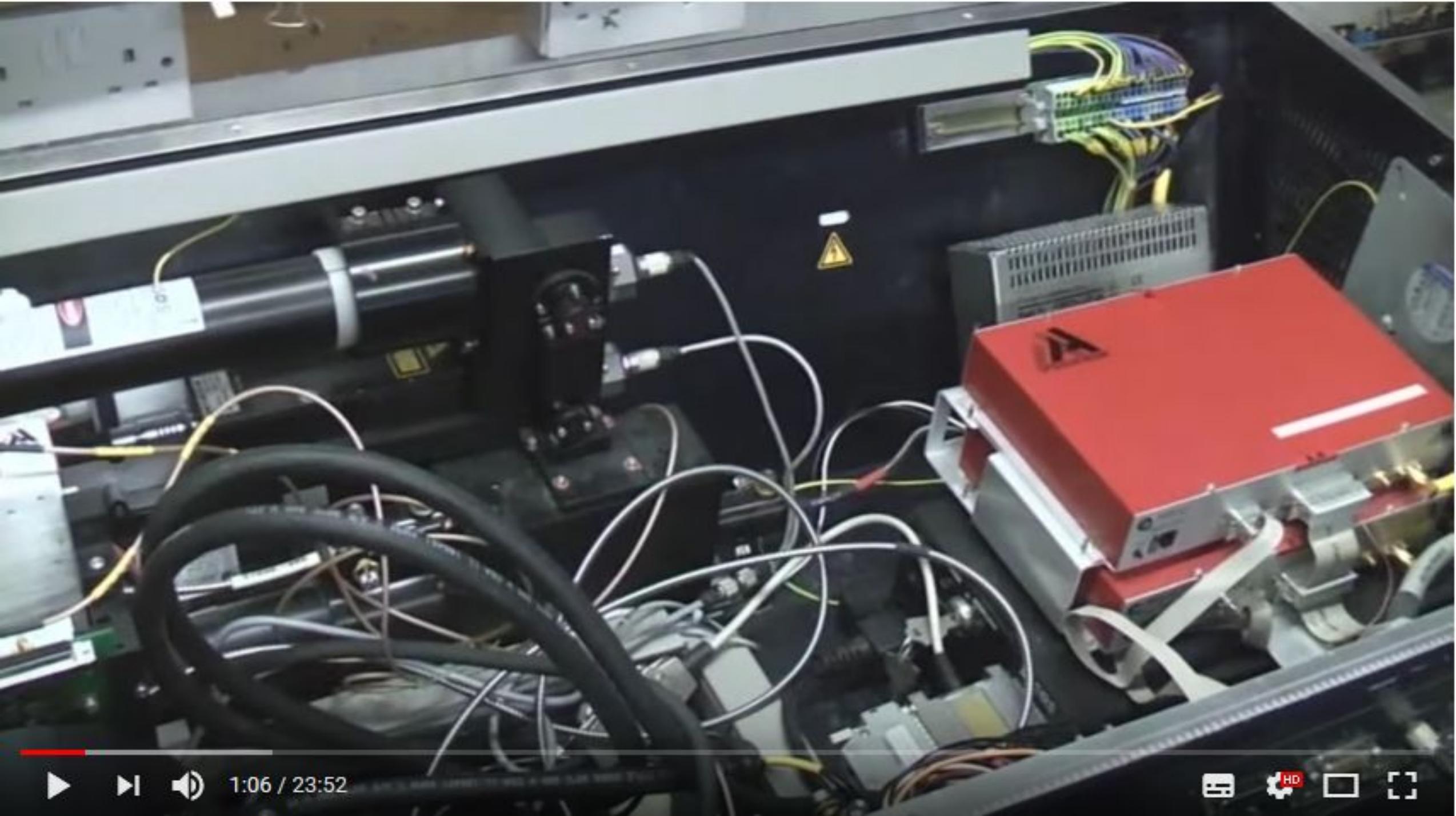




NIH3T3 cells
transduced with five
individual fluorescent
protein
(FP) vectors. FPs:
Cerulean, EGFP, Venus,
tdTomato and
mCherry. Each FP was
visible only in the cells
transduced with the
corresponding vector.
Courtesy of Daniela
Malide, NIH Bethesda,
MD USA

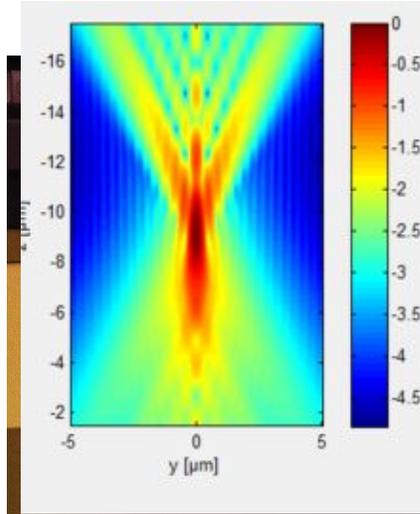
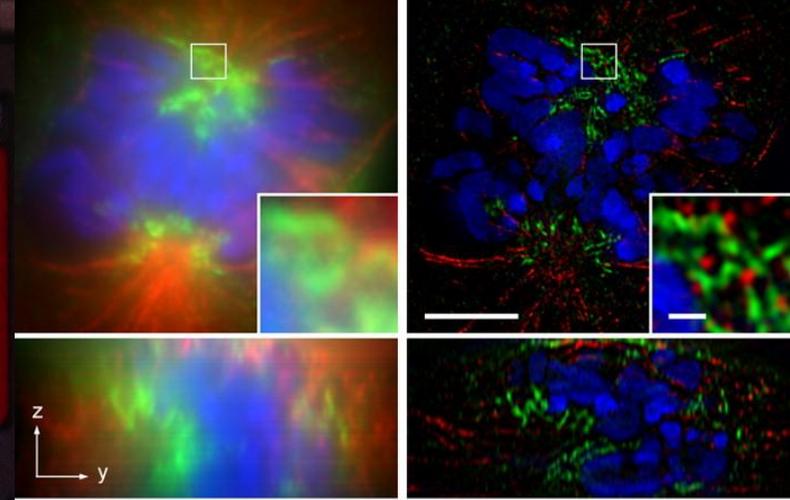
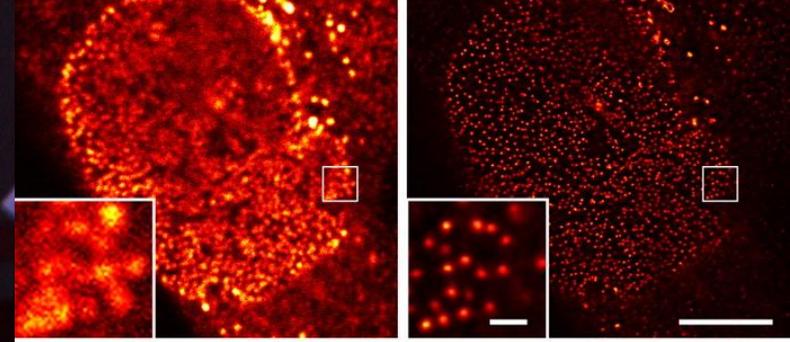
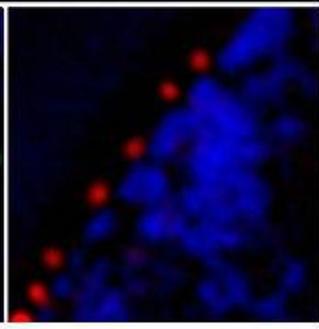
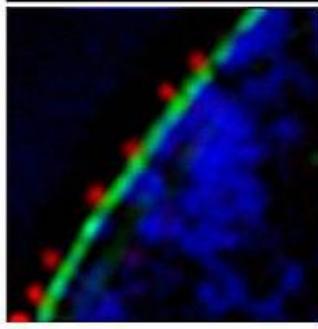
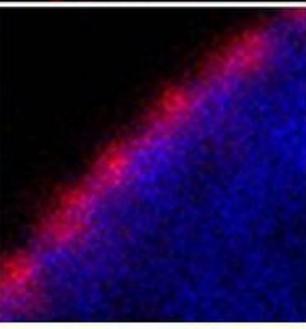
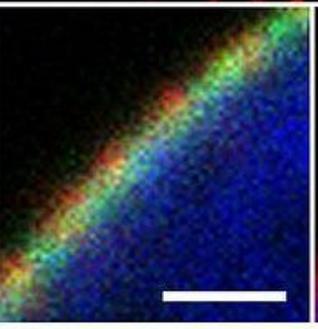
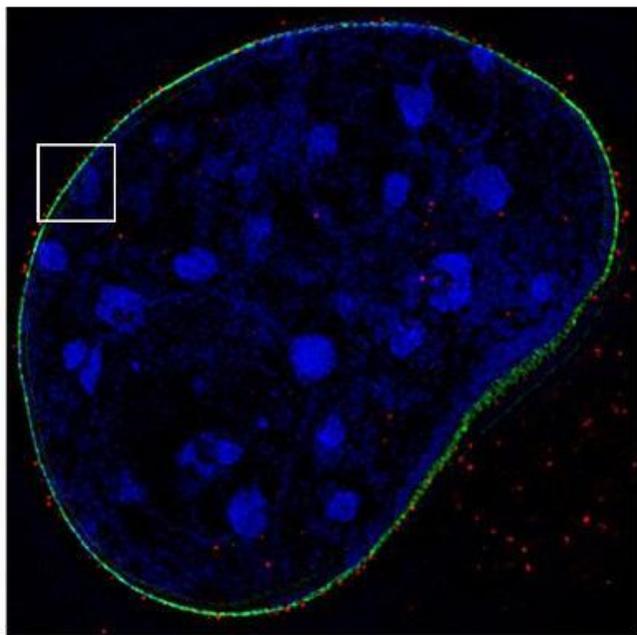
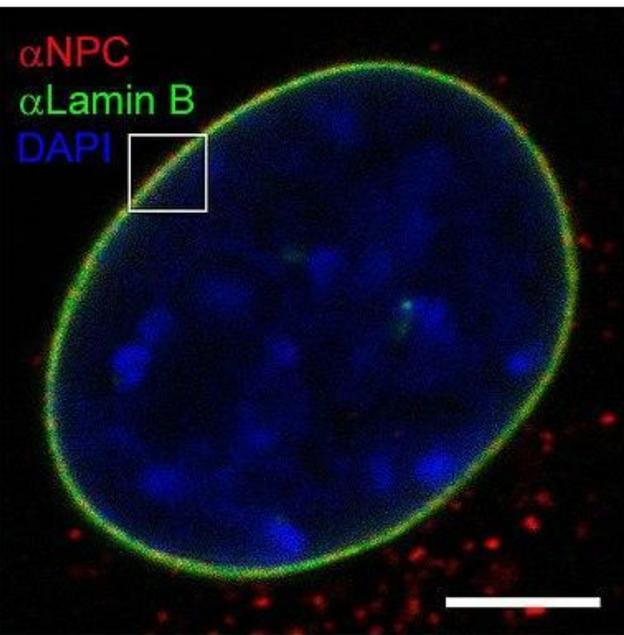
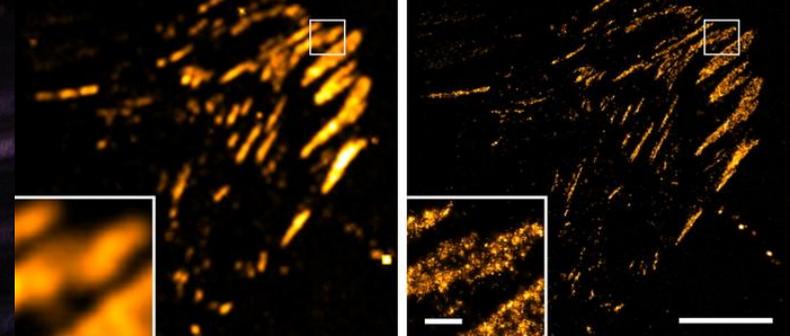
Leica TCS SP8 Scan Head

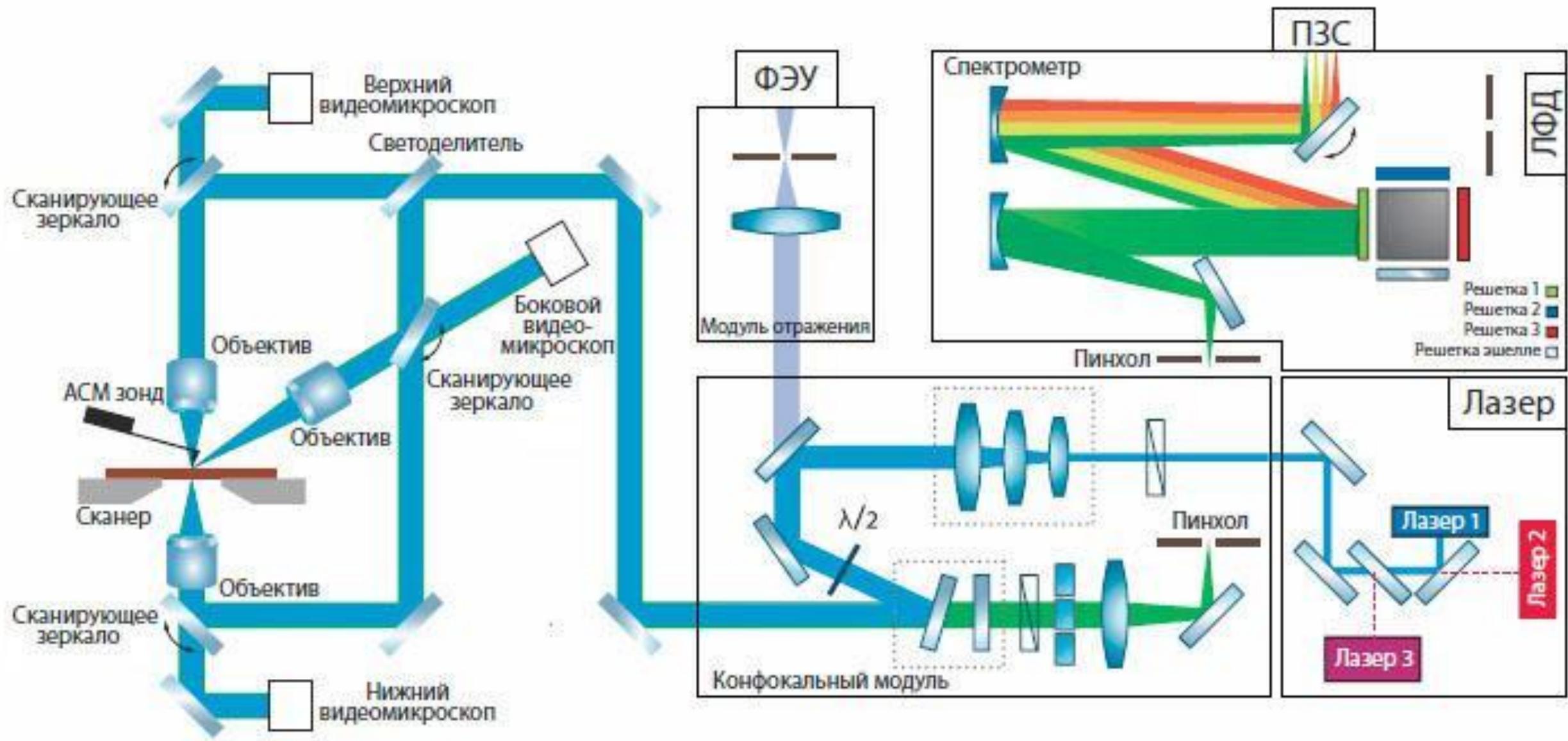


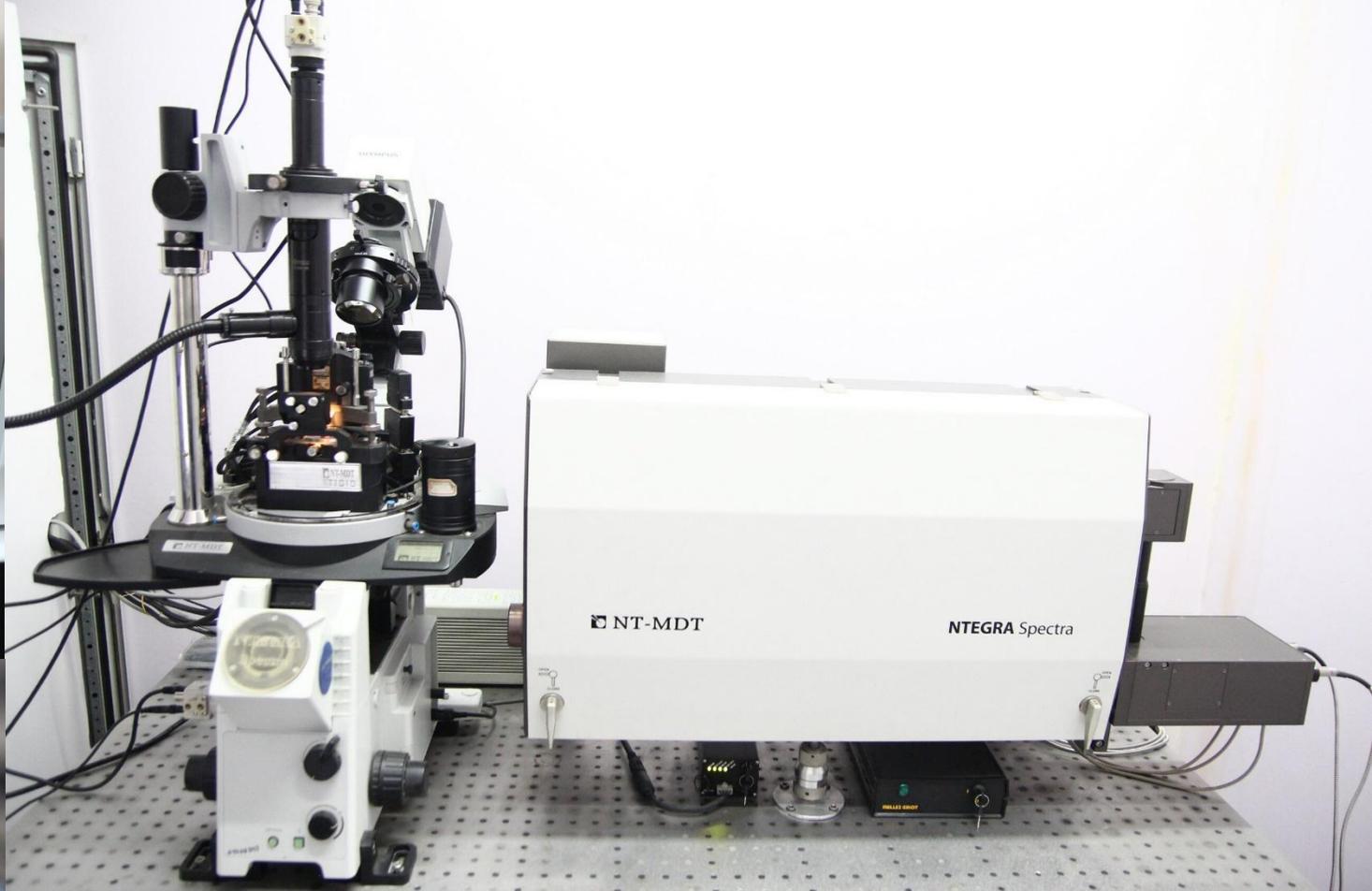
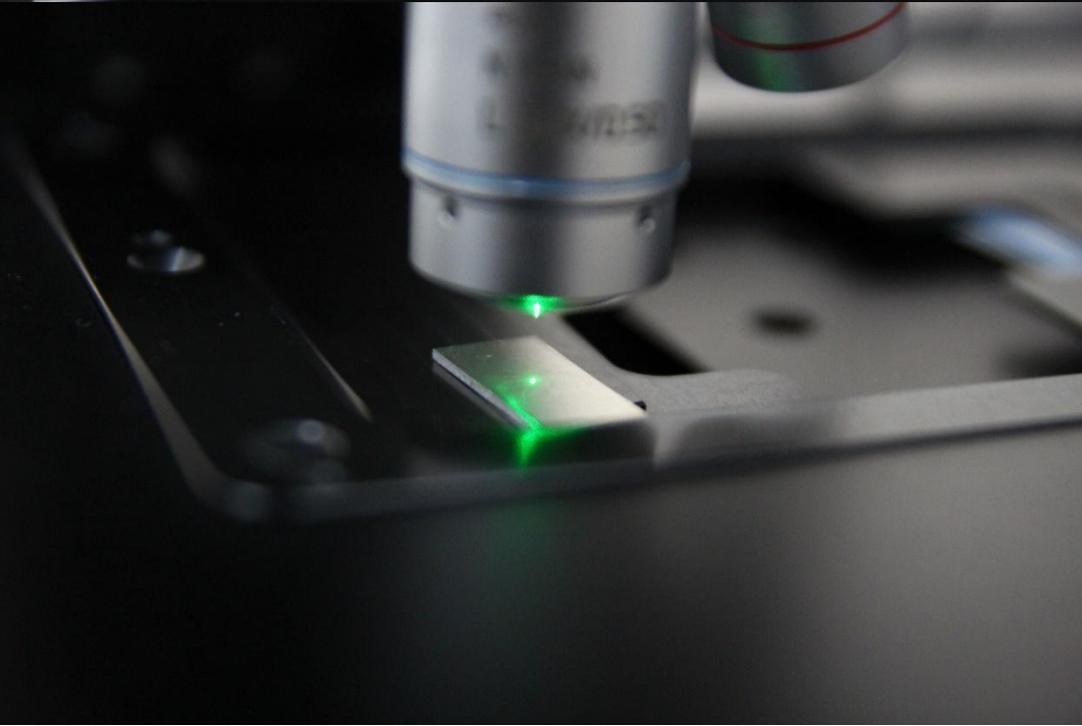
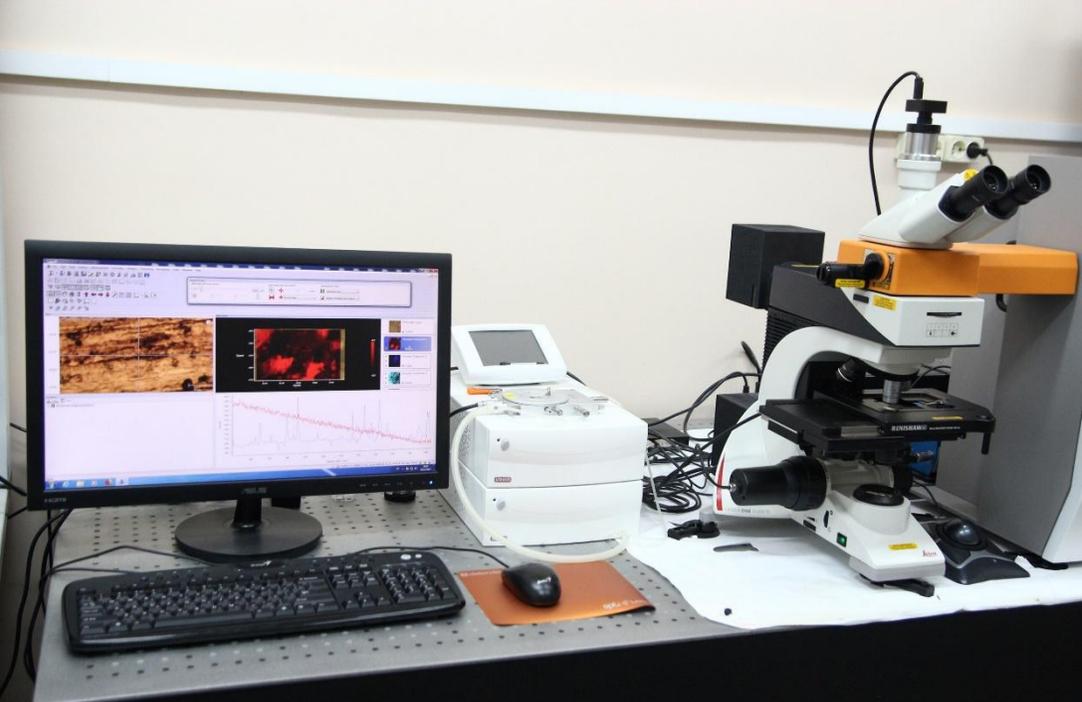


1:06 / 23:52



CLSM**3D-SIM****A****Wide-field****3D-SIM****B****CLSM****STED****C****Wide-field TIRF****PALM/STORM**





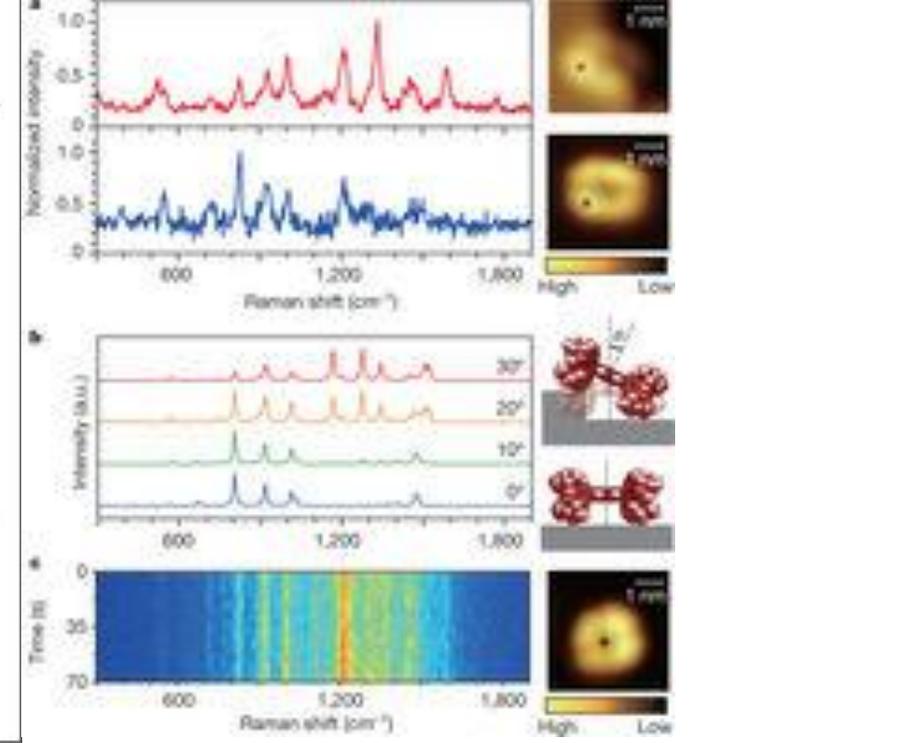
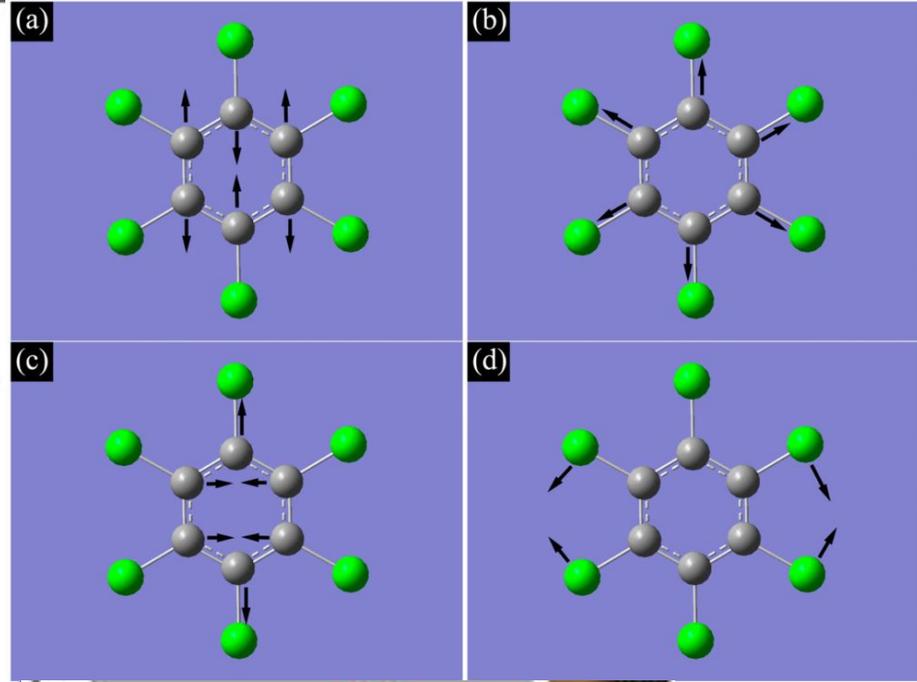
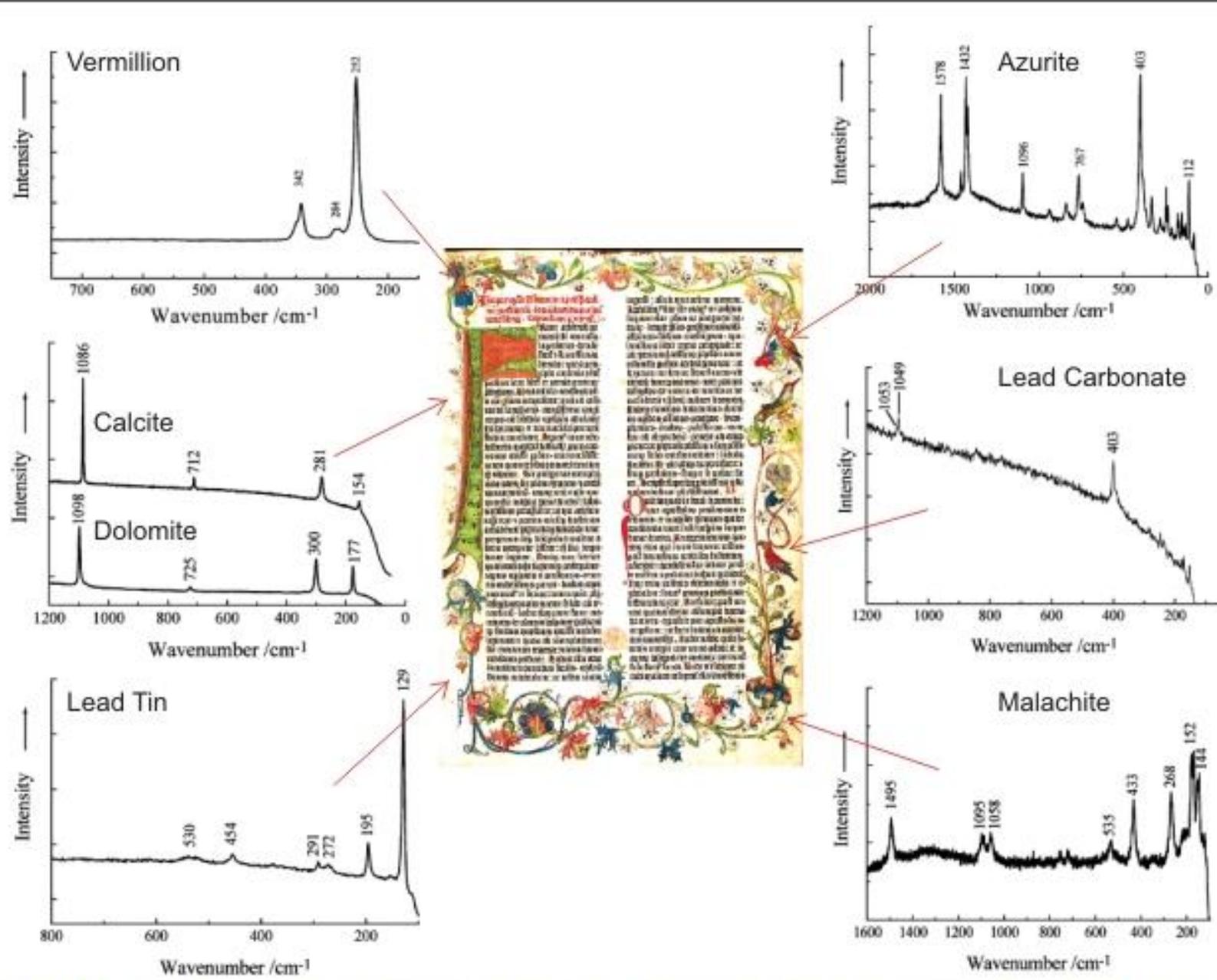


Fig. 4.1.8: Some Raman spectra of pigments used on a Gutenberg Bible (with permission, from *Anal. Chem.* 77 (2005) 3611).

Спасибо за внимание
Вопросы?
dn2010@gmail.com

