"A Brief Introduction of Two New TEM's at the BioCryo Core"

July 20, 2023
11:00 AM CST

Join us as
Dr. Reiner Bleher
BioCryo Facility Manager
presents a live Zoom talk!

Register Now

* Registrants will receive a Zoom link to access the talk via email.
New BioCryo TEM: JEOL 1400 Flash

- LaB₆ emitter
- 120 kV and lower acceleration voltage at 100V increments.
- High resolution (HR) mode imaging with 0.27 nm (lattice) and 0.38 nm point resolution at 120 kV.
- Suitable for RT imaging and for cryo-TEM of plunge frozen samples.
- Gatan model 626 and Elsa cryo transfer holder for cryo-TEM.
- Gatan OneView camera (15µm pixel size!).
- **Location: Silverman Hall B530A.**
- JEOL 1400 manual is available in [NUCore](https://nucore.northwestern.edu) under the Docs tab.
New BioCryo TEM: JEOL 1400 Flash

Benefits

- **4096 x 4096, 15 μm pixels**: Large, high-resolution field of view
- **CMOS sensor with built-in shutter**: Near 100% duty cycle data acquisition maximizes signal-to-noise and optimally uses specimen dose
- **25 full frames per second**: No need to compromise resolution for speed, always have a “live” experience at full resolution
- **In-line data processing**: Guarantee optimal image quality with real-time drift correction and outlier removal and extend dynamic range beyond 16-bits

Gatan OneView Camera
New BioCryo TEM: JEOL 1400 Flash

OneView Camera, Model 1095

Figure 1. Demonstrating the drift correction capabilities of the OneView camera, and the ability to capture high quality 16 megapixel still images and video. Image of zeolite sample captured with OneView camera; electron energy: 120 kV; TEM indicated magnification: 10 kx; image size: 4k x 4k; exposure time: 1 s; number of frames: 25. Sample courtesy of Chevron, zeolite SSZ-57.
New BioCryo TEM: JEOL 1400 Flash

0.3 nm lattice of calibration sample
New BioCryo TEM: JEOL 1400 Flash

Cryo-TEM image of a plunge frozen drug-carrier sample
New BioCryo TEM: JEOL 1400 Flash

Cryo-TEM image of plunge frozen NP aggregates
New BioCryo TEM: JEOL 1400 Flash

Construction of TEM room B530A in Silverman B530
New BioCryo TEM: JEOL 1400 Flash

1400 TEM in Silverman B530A

Bench with PC, Vitrobot, DPS and CTHs in B530
New BioCryo TEM: JEOL 1400 Flash

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- **Location: Silverman Hall B530A.**
- JEOL 1400 manual is available in NUCore under the Docs tab.
- **Contact: 1. Eric Roth, 2. Reiner Bleher**
New BioCryo TEM: JEOL 3200FS TEM

- FEG (Schottky)
- 300 kV acceleration voltage
- 0.22 nm TEM resolution
- In-column energy filter
- Gatan K2 Summit direct detector
- Gatan 626 cryo transfer holder
- Fischione dual tilt axis holder model 2040
- **Location:** Tech AB, room AG 78
- JEOL 3200FS manual is available in [NUCore](#) under the Docs tab
New BioCryo TEM: JEOL 3200FS TEM

AMETEK Gatan
K2 Summit Direct Electron Detector
New BioCryo TEM: JEOL 3200FS TEM

Gatan K2 imaging modes

1. Electron enters detector
2. Signal is scattered
3. Charge collects in each pixel
4. Events are reduced to the highest charge pixels

Linear mode
K2 Base: Charge Integration
Improved DQE at high Frequency

Counted mode
K2 Summit: Counting
Improved DQE at low AND high Frequency

Counted SR mode
K2 Summit: Super-Resolution
Improved DQE at low AND high Frequency and 7680 x 7424 pixels

Direct Electron Detector
New BioCryo TEM: JEOL 3200FS TEM

In-column energy filter (Ω Filter)

\[ E_{0} = E_{c} \]

\[ E_{0} = E_{c} - \Delta E \]

unscattered

elastically scattered

inelastically scattered

atomic nucleus

electron beam

\[ E_{c} = 300 \text{ keV} \]
New BioCryo TEM: JEOL 3200FS TEM

In-column energy filter (Ω Filter)

CBED patterns of cubic-BN [110]

Cryo-TEM of liposomes
New BioCryo TEM: JEOL 3200FS TEM

Cryo-TEM of lipoprotein nanoparticles

without energy filter

with energy filter (ZLP)
Part of a nucleus (nu) and cytoplasm (cyt) of a HeLa cell in a **500 nm thick** resin section. RB
Exploring Inner Space

New BioCryo TEM: JEOL 3200FS TEM

Ribosomes on rER of resin embedded pancreatic cell

unfiltered

ZLP image of rER in an unstained, resin embedded pancreatic cell. 50nm thick section.

Osmium tetroxide fixed, resin embedded pancreatic cell. 50nm thick section.

Image source - bio.libretexts.org
Credit DON W. FAWCETT / SCIENCE SOURCE / SCIENCE PHOTO LIBRARY
New BioCryo TEM: JEOL 3200FS TEM

Calibration sample

Au NP, atoms are visible. The diameter of a gold atom is approximately 0.16nm.
New BioCryo TEM: JEOL 3200FS TEM

Resin sections of cubic seed nanoparticles that are used to form crystals from Au NPs and DNA

Sample: Rachel Chan, Mirkin Lab, Institute for Nanotechnology.
New BioCryo TEM: JEOL 3200FS TEM

- 300kV Schottky FEG
- In-column energy filter (Omega type)
- Direct electron detector (Gatan K2 Summit)
- Suitable for:
  - Thicker samples (ET)
  - Cryo TEM
  - In situ TEM
  - Low contrast samples
- Dual axis tilt holder
- Cryo transfer holder

- **Location:** Tech AB, room AG78
- JEOL 3200FS manual is available in [NUCore](#) under the Docs tab
- **Contact:** 1. Reiner Bleher, 2. Eric Roth
Proper Handling of TEM Sample Holders

• Wear gloves

• **Always** bring the goniometer to the neutral position before removing or inserting a sample holder

• **Always** check the pin!!
  A lose pin will damage the airlock/goniometer

• **Always** move the sample holder along the horizontal axis of the goniometer

• Ask us if you need a refresher on the inserting/removal procedure
Thanks for your Attention!
Questions?

JEOL 1400

JEOL 3200FS
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