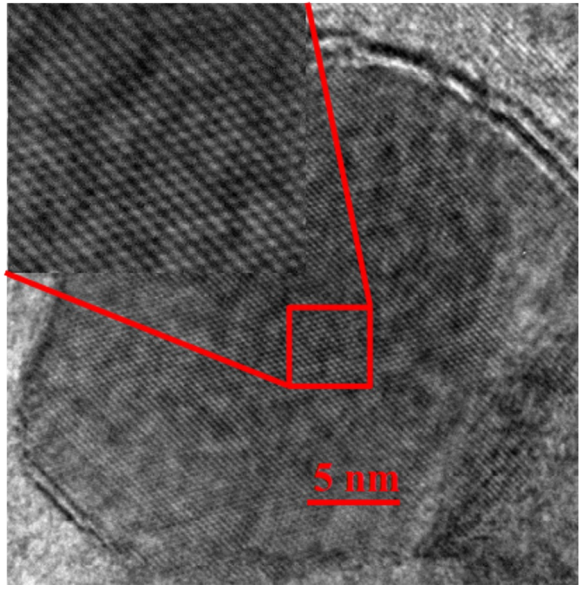
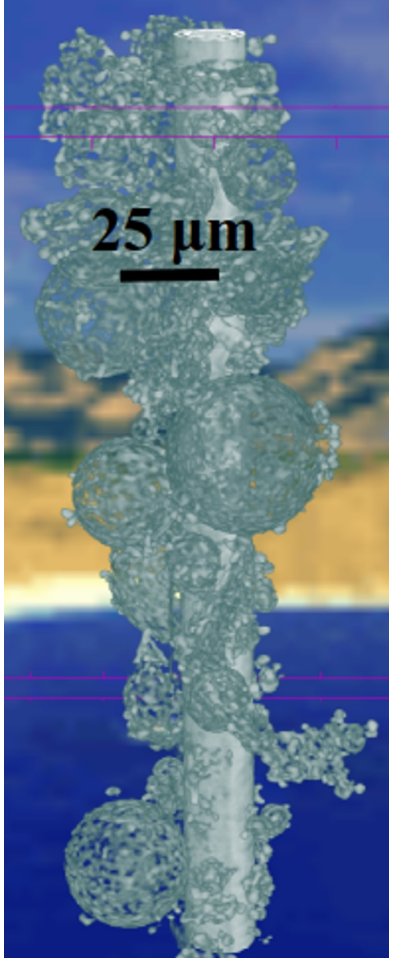
Nanomaterials Characterization Core Facility (NCC)



Transmission electron microscopy.
Atomic resolution in a ZnO nanoparticle.

Personnel:

- Massimo (Max) Bertino (Director)
- Professor of Physics, 110 pubs, $2.5M funding
- Dr. Dmitry Pestov (Senior Technician)
- Dr. Carl Meyer (Technician)



Nano-CT,
microspheres
for drug delivery.
Resolution 150 nm.

At a glance

14 Major Instruments (~$12M)

- 3 Electron Microscopes
- 3 Optical Microscopes
- 2 CT scanners (micro- and nano-CT)
- 2 Magnetometers
- X-Ray Diffractometer
- AFM
- X-Ray Photoelectron Spectroscopy
- Ellipsometer

Impact:

- 80 PIs/year (major users ~ 40)
- 50 new students trained EACH YEAR
- 5,000 hours/year student usage
- 50 publications/year
- 5-7 new grants/year
- 5 NSF-MRI grants in 10 years (Bertino PI on 2, 2 co-PI) .
- $130k/year user fees.
- 60% cost recovery (other cores ~40%)
  - 55% COE, 25% CHS, 7% SOM
  - 10% industrial users.
  - 3% external academic units

Comparisons

- Many other Universities have comparable equipment.

–Split over multiple core facilities.

–More staffed

•VCU:	14 instruments.	2 Staff + Director.
•VA Tech:	8 instruments	5 Staff + Director.
•UVA:	10 instruments	4 Staff + Director.
•Dayton:	5 instruments	2 Staff + Director.
•MS&T:	5 instruments	4 Staff + Director.

Why are we so efficient?

- Excellent, versatile team. Can deal with optics, vacuum, sources, detectors.
- DIY maintenance, repairs save ~25k/year. Saved $200k in 2019. Not making figures up.

–AFM: Pestov.

–TEM: Meyer, Bertino

–SEM, XRD, XPS, CT, LSM, FIB: Pestov, Meyer

–Raman: Bertino, Pestov

–Admin: Pestov, Bertino

–Vacuum, Gas & Plumbing: Bertino

–Mechanics: Meyer

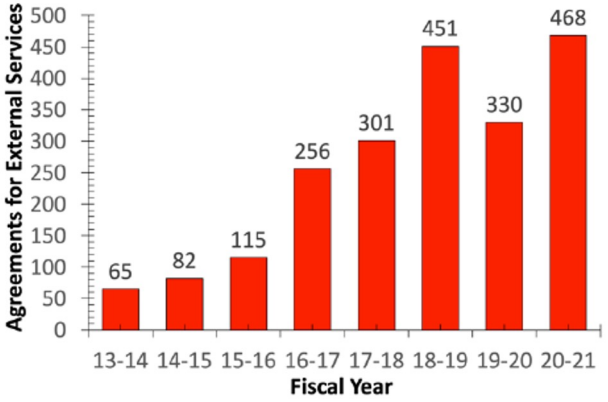
Current staffing level is adequate. No additional personnel needed.

Aspirational goal: NCSU

- 18 major instruments (8 EM, 1 C_s-corrected).
- 13 staff + 2 directors.
- $1.46M/year expenditures ($580k maintenance contracts).
- $750k/year user fees. (~50% recovery)
- 150 publications/year.
- Dozens of industrial users.

NCSU Model

- 2014 ~ 2 x NCC.
- 2021: 8 times NCC.
- **Became unique** by adding Cs-corrected TEM (>$2M) in 2013 + extensive renovations. Can do, and without major investments.
- 2015: **Consortium** with Duke, other universities, companies in the area, large NSF grant. Can do.
- **Different legal framework** (tied to NC State Economic Development Authority). Higher number of local companies. Harder to do.



How can we expand and attain national prominence?

- SOM: increase usage by raising awareness about capabilities.
- Existing users: raise awareness about advanced characterization t
- Identify, nurture areas of excellence to leverage large grants.
- Improve relationship with industry: NCC can save them money, t

Action plan: Focus on strengths.

- Organize brief event to showcase facilities/capabilities. **(Spring break 22)**

- Identify focal areas (2 max.) that relies heavily on NCC and gives us visibility **(end of SP22)**. **Goal: achieve national prominence in that specific area.**

–Small groups, ~ 5 people, <u>from different schools.</u>

- "Feed" that strength with a "grant" to let users gather preliminary data. **End 2022.**

- "Feed" 1-2 instrument classes by offering hands-on training on advanced techniques. Can be part of courses. **2022-2023**. <u>Training must be tied to new/expanded grant activities.</u>

- Apply for grants following training, preliminary data. **2023.** REU, NSF-MRI low-hanging fruits.

- Once national prominence is achieved, build network with other universities, apply for multi-university grants. Key is focus. **2023-2024**

- Build relationship with companies, convince them that work with us saves time, money. **2023. This is where help is needed.**