

NATIONAL NANOTECHNOLOGY COORDINATED INFRASTRUCTURE



# Nebraska Nanoscale Facility: NNF

David J. Sellmyer, Christian Binek, Terese Janovec

## Nebraska Center for Materials & Nanoscience

NNCI Annual Conference  
Georgia Institute of Technology  
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# Vision of NNF

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## \* General Goal:

To be an internationally recognized center of excellence for nanoscale science and technology as part of NNCI.

## \* Specific Aims:

- Assist NNCI to strengthen research and applications of materials and nanotechnology in U.S.
- Engage new university and industry users in our region in fabrication and characterization.
- Provide critical assistance to companies and start-ups to benefit commercialization.
- Stimulate more and diverse students to enter engineering and science careers.



# Core Strengths

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- \* **Nebraska Center for Materials and Nanoscience (NCMN)**  
Supported by Nebraska Research Initiative since 1988,  
and by Program of Excellence since 2002.
- \* **More than 80 faculty in 3 colleges.**
- \* **Annual research expenditures ~\$20 M.**
- \* **New Building (2012): Voelte-Keegan Nanoscience  
Research Center**



- \* **NIST ARRA Competition**
- \* **32,000 square feet**



# Research Focus Areas

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- \* **NSF-MRSEC: Polarization and Spin Phenomena in Nanoscale Structures**
- \* **DOE-Nanomagnetism: High-Energy Magnets, Earth-Abundant Materials, Spintronics Devices**
- \* **NIST-SRC: Center for Nanoferroic Devices**
- \* **DOD-National Security Research Institute (NSRI):  
A UARC focusing on Chemical and Biological Weapons Research**
- \* **NSF/DOD: Laser processing, catalysts, solar cells**



# NNF Staff



**Technical Staff: 10; Administrative Staff: 5**



# Facilities: New Instruments

## Specialists

## Facilities

## New Instruments



Nanofabrication Cleanroom

Nanomaterials and Thin Films

Nanoengineered Materials  
and Structures

Electron Nanoscopy  
Instrumentation

X-Ray Structural  
Characterization

Surface and Materials  
Characterization

Cryogenics Instrumentation

- Hex Deposition
- Surface Area/Porosity
- Quantum Design MPMS
- FEI Helios Nano Lab
- AJA Sputtering
- Intlvac Ion-Beam Etching System
- Bruker Quantax XRF
- 4.5 T Annealing Furnace

**Total Cost ≈ \$2.0 M**



# NNF External Users

Universities (14)	Companies (14)
Kansas State University	Molex, LLC
University of Nebraska Medical Center	Stanley Healthcare
Creighton University	BioTarget, LLC
Iowa State University	Agility Fuel Solutions
University of Nebraska at Omaha	J.A. Woollam Co., Inc.
University of Tennessee Health Science Center	Rare Earth Salts
North Carolina A & T State University	Argonide Corporation
South Dakota State University	LI-COR Biosciences
University of Texas at San Antonio	ConAgra Foods
University of Missouri-Kansas City	Hughes Brothers
University of Rochester	Crosslink Technologies
University of Iowa	Legg Family Farms
South Dakota School of Mines and Technology	Intlvac Thin Film
University of Kansas	Aegis Technologies



# Monolith Materials: Startup Company

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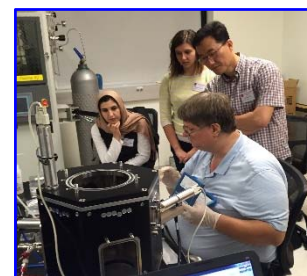
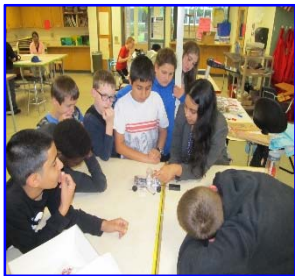
- \* **Monolith will partner with Nebraska Public Power to replace 1 of 2 coal-fired power plants with a 125 MWatt, \$50M hydrogen-burning one. CO<sub>2</sub> emissions will be reduced by 1.1 M tons/yr.**
- \* **Monolith's technology will produce hydrogen from natural gas while producing carbon nanoparticles, useful for inks, paints, UV absorbers, electronics.**
- \* **NNF will partner with Monolith to characterize the nanocarbon with HRTEM.**



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# NNF's Diverse Education/Outreach

- **Traveling Nanoscience Exhibit:**  
Four Nebraska museums throughout state, targeting rural and minority children.  
25,000 attended
- **After School Nano Program:**  
For Title I middle school, 8 weeks/semester.  
12 students
- **Industry/Academic Workshop:**  
65 company and university reps attended .
- **Nano Days:**  
At local mall for general public.  
400 attended
- **College Prep Academy Program:**  
For 1<sup>st</sup> generation high school students. 2-day Nano Camp.  
45 students
- **Nanotech Minicourses:**  
3 day facility introductions for new users.  
40 attended





# Plans, Metrics, Assessment

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## \* **Grow User Base**

- Complete database of potential regional company and university users.
- Advertise and host Second Annual Workshop and Second Annual set of Minicourses.
- Visit regional companies and universities to increase hourly usage by 30% in 3 years.

## \* **Add Instruments**

- NSF-MRI proposal submitted
- Develop next equipment-proposal idea

## \* **Educational Outreach**

- Host Diverse REU students and Professor/Student Pairs.
- Organize NanoDays, College Prep Academy, Traveling Nanoscience Exhibit, After School Program.

## \* **Assessment**

- Perform survey of internal and external users and improve favorable rating to > 85%.