Materials Research Facilities Network (MRFN)

MRSEC Director's Meeting

June, 2010

MRFN INITIATIVES

Maximize usage of MRSECs

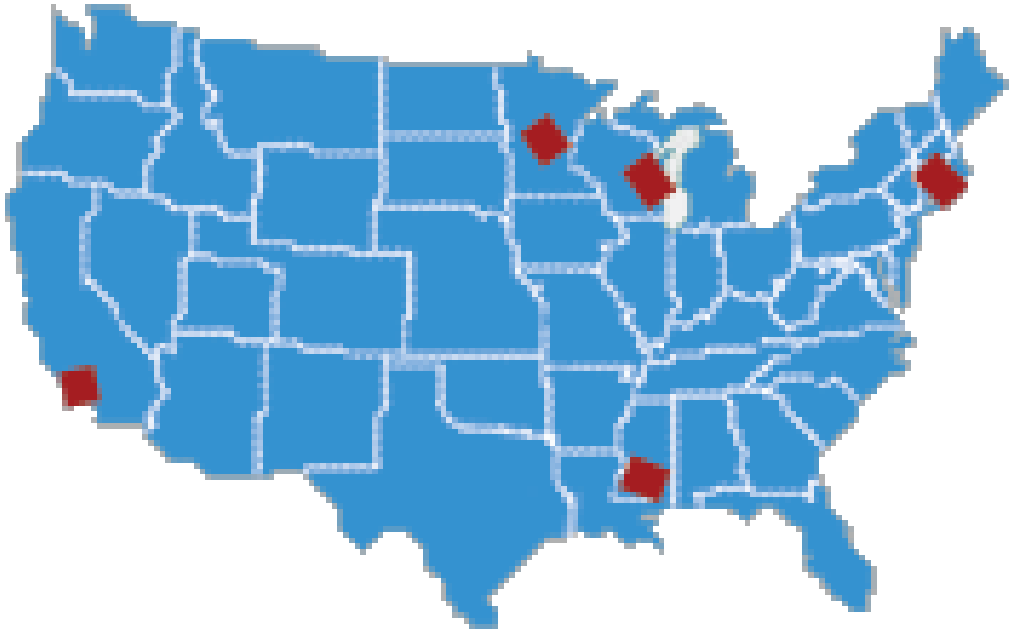
Provide access to small and large universities

Teach and train students - focus on non-Ph.D. and minority serving

Establish collaborations

Remote User Access

Materials Research Facilities Network – Initial Group



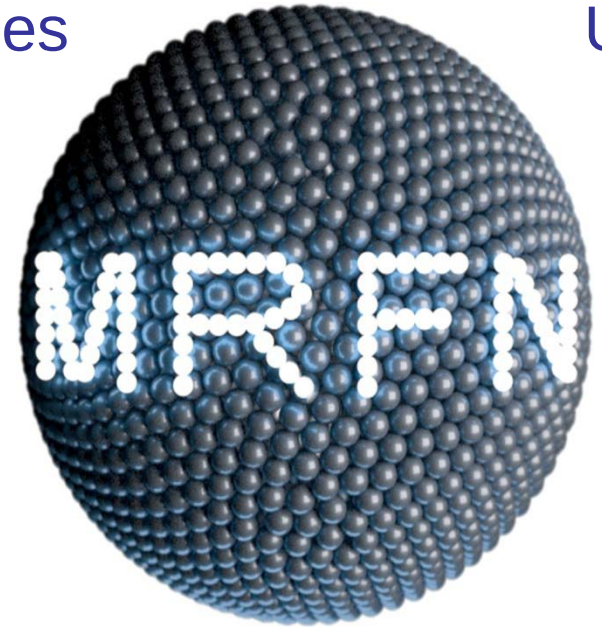
2007-2008

MRFN – Expanded Group

Colorado School of Mines

University of Maryland

Carnegie Mellon



Johns Hopkins

Brandeis

Brown

Penn State

Princeton

Northwestern

University of Nebraska- Lincoln

MIT

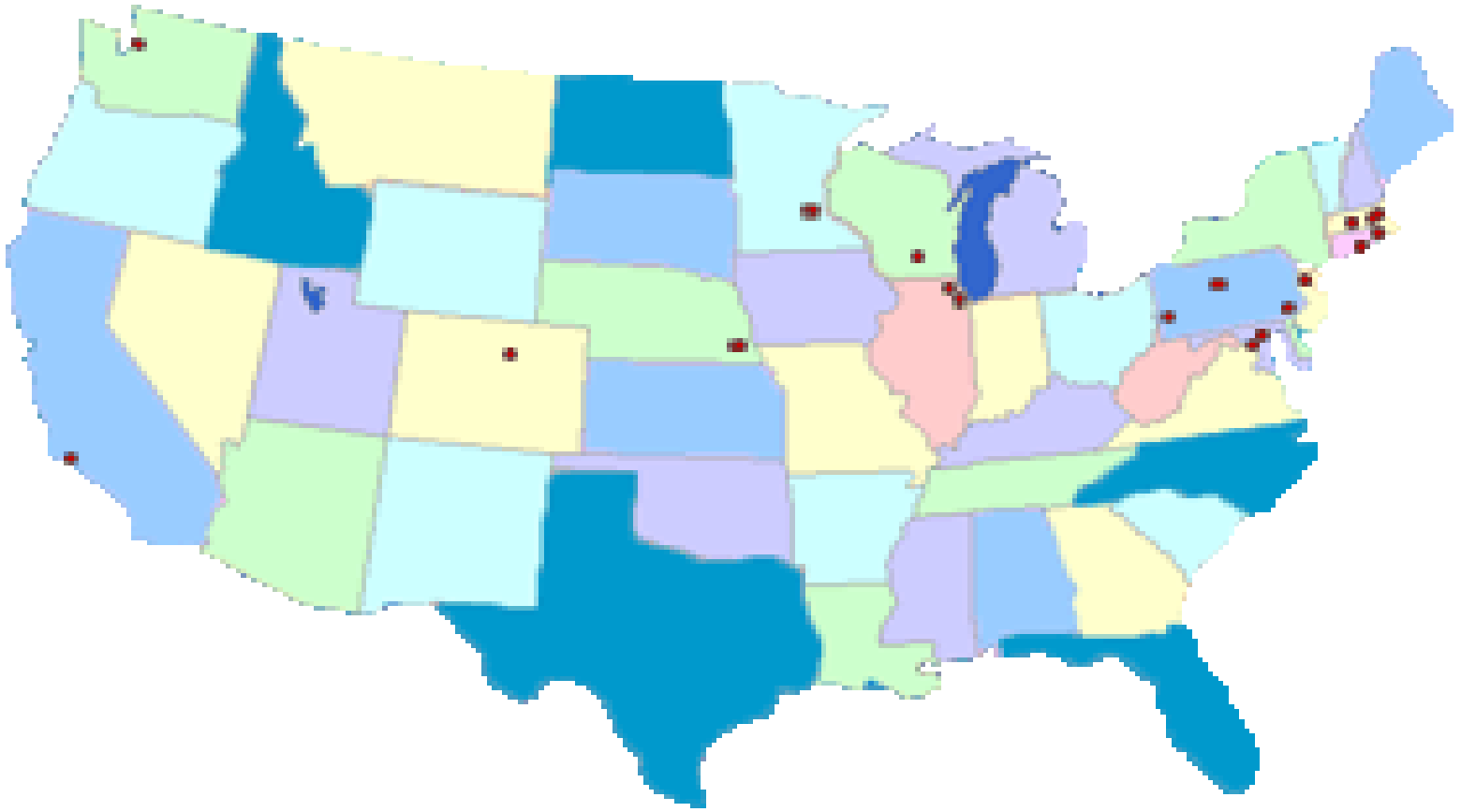
University of Chicago

University of Pennsylvania

Yale

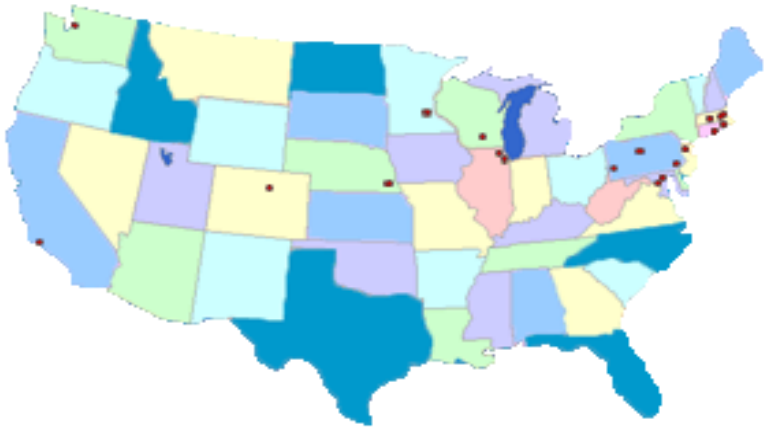
Washington University

Materials Research Facilities Network



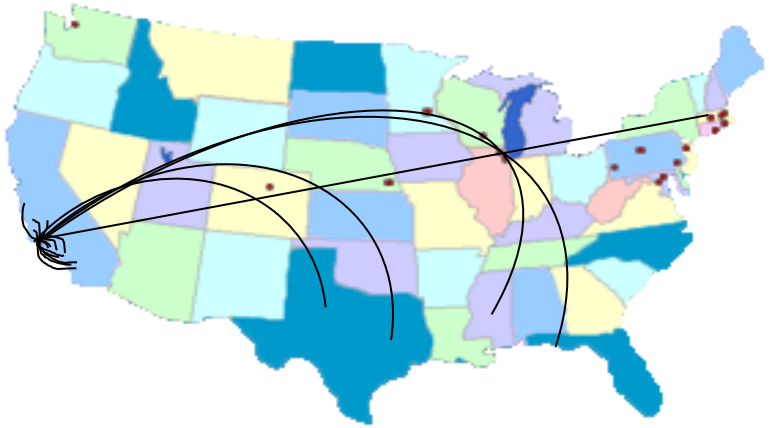
Distinguishing Features of the MRFN

- Advantages of MRSEC
- Support user facilities
  - Department of Energy (DOE)
  - National Nanotechnology Infrastructure Network (NNIN)
- Established co-ordination between centers
- Varied levels of assistance and collaboration
- Large established instrument base



Current Projects

- Designed a visitation program for Faculty and their students



- FAST (Faculty and Student Training) program
  - Housing
  - Travel
  - Stipend
  - Instrumentation and training

UCSB – FAMU
- Jackson State
- Trinity University

Current Projects

Collaboration with Cal Poly, San Luis Obispo Materials Engineering

Materials characterization

- Hands on Materials Analysis course
- Master's Degree project
- MS→ Ph.D. transition program

Collaborative Materials Teaching course

- Train-To-Teach (TTT) program
- Faculty partnership

Current Projects

Virtual Instruction Laboratories- SEM with Florida A&M and Jackson State Uni

Class can access manuals, laboratories, and view training videos at www.mrfn.org

Live question and answer dialogue

Real time sample analysis

Remote session through Skype

Current Projects

Virtual Instruction Laboratories- SIMS and XPS with CalPoly, SLO

"The first thing that I liked about this virtual experience was that every student was able to participate. I think the setup of the lab gave everyone a chance to see how XPS can be used to solve a relevant materials analysis problem." - CalPoly graduate student

MRFN Outreach Activities

Penn State MRSEC

Outreach to Regional Universities and Colleges

Bucknell University, Lewisburg, PA
Clarion University, Clarion, PA
Dickinson College, Carlisle, PA
Lock Haven University, Lock Haven, PA
Penn State DuBois, Du Bois, PA
Saint-Vincent College, Latrobe, PA

Students from Saint Vincent College visiting the Penn State Materials Characterization Lab, February 2010

MRFN Outreach Activities

Penn State MRSEC

MRFN Summer Visiting Faculty Interns

Neyda Abreu, Penn State Dubois
Peter Sak, Dickinson College
Sinisa Vukelic, Bucknell University

Neyda Abreu using the JEOL 2010F transmission electron microscope.

Three visiting faculty are conducting research at the Penn State University Park Campus during Summer 2010, accessing the Materials Characterization Laboratory and interacting with Penn State faculty and staff.

MRFN Outreach Activities

Penn State MRSEC

Materials Characterization Workshops and Short Courses for REU Students

- 3-hour introductory characterization course, taught by MRSEC faculty Beth Dickey, integrated in the MRSEC, Physics and Materials Science summer REU programs
- REU students provided with free tuition for more in-depth one-day characterization courses

Materials Research Facilities Network (MRFN)

- Mission - to increase the visibility and usage of Center facilities within the materials, engineering, and greater scientific community
- Supports researcher exchange and materials characterization activities in the UMass MRSEC

2009/2010 activities

U.C. Santa Barbara (SIMS measurements)
U Chicago (Langmuir-Blodgett techniques for polymer/nanoparticle films at air-water interface)

Western New England College (MA)
(NMR facility > visiting faculty researcher)

U South Carolina (nanocage characterization techniques)
Tulane University (cyclic polymers – molecular weight characterization)

The Scripps Institute (bionanoparticle/polymer photovoltaics)

U Texas Austin (electron microscopy on polymer-coated membranes)

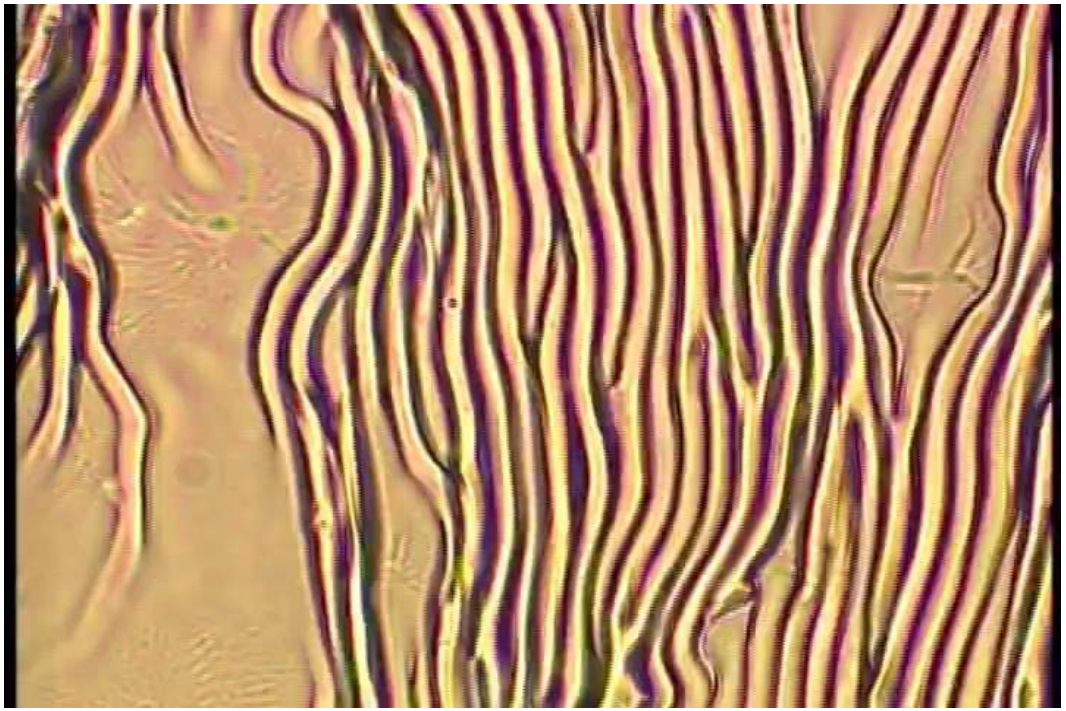
UMASS MRSEC on POLYMERS

U Mass / U Chicago

Inter-MRSEC activity

Interface characterization facilities for nanoparticle-polymer composites

MRFN provided a link to research efforts in nanomaterials at interfaces (assemblies and surface instabilities)



Ka Yee Lee, U Chicago

UMASS MRSEC on POLYMERS

U Mass / Scripps Research Institute

Use of UMass MRSEC facilities for

materials characterization by Scripps researchers

Photovoltaic shared experimental facility at UMass

MBraun inert atmosphere tirple-glovebox series containing:

Fabrication system:

-spin coater

-metal deposition

Solar cell characterization:

-Keithley 2400 sourcemeter with 1.5G-filtered irradiation (100 mW-cm^2) from a 1kW Oriel Solar Simulator

MRFN provided travel support and facility use for studying

self-assembled nanoparticle and bionanoparticle thin film solar cell active layers

Kurt Breitenkamp of M.G. Finn laboratories

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U Mass / Western New England College

Use of UMass MRSEC facilities to support NMR characterization

of organic materials research at Western New England College (Springfield, MA)

Western New England College, Springfield, MA

~5,000 student body,

primarily undergraduate,

teaching mission

MRFN provides research

facility outlet to nearby

undergraduate institutions

MRFN provided NMR facility use.

Resulted in visiting scholar appointment for

WNEC Assistant Professor Angela Sauers

in MRSEC research on polymer synthesis (Summer 2010)

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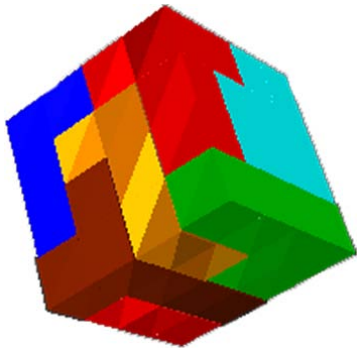
Materials Research Science and Engineering Center



MRFN at Minnesota

- ★ 33 research groups have utilized Shared Facilities at Minnesota via MRFN
- ★ 26 Institutions and over 50 graduate students and postdocs

Participating Institutions

- ★ Minnesota: Augsburg College, Carleton College, College of St. Scholastica, Hamline University, Macalester College, Minnesota State University-Mankato, St. Cloud State University, University of St. Thomas

- ★ Neighboring States: Iowa State University, Luther College, North Dakota State University, Northland College, South Dakota School of Mines & Technology, South Dakota State University, University of South Dakota, University of Wisconsin

- ★ National: Clemson University, Colorado State University, Emory University, Kansas State University, Pacific Lutheran University, Rice University, University of California Santa Barbara, University of Southern Mississippi, University of Tennessee, Wayne State University

Shared Facilities

Institute of Technology

- Characterization Facility
- Nanofabrication Center

University

- Minnesota Supercomputer Institute

Focused Facilities

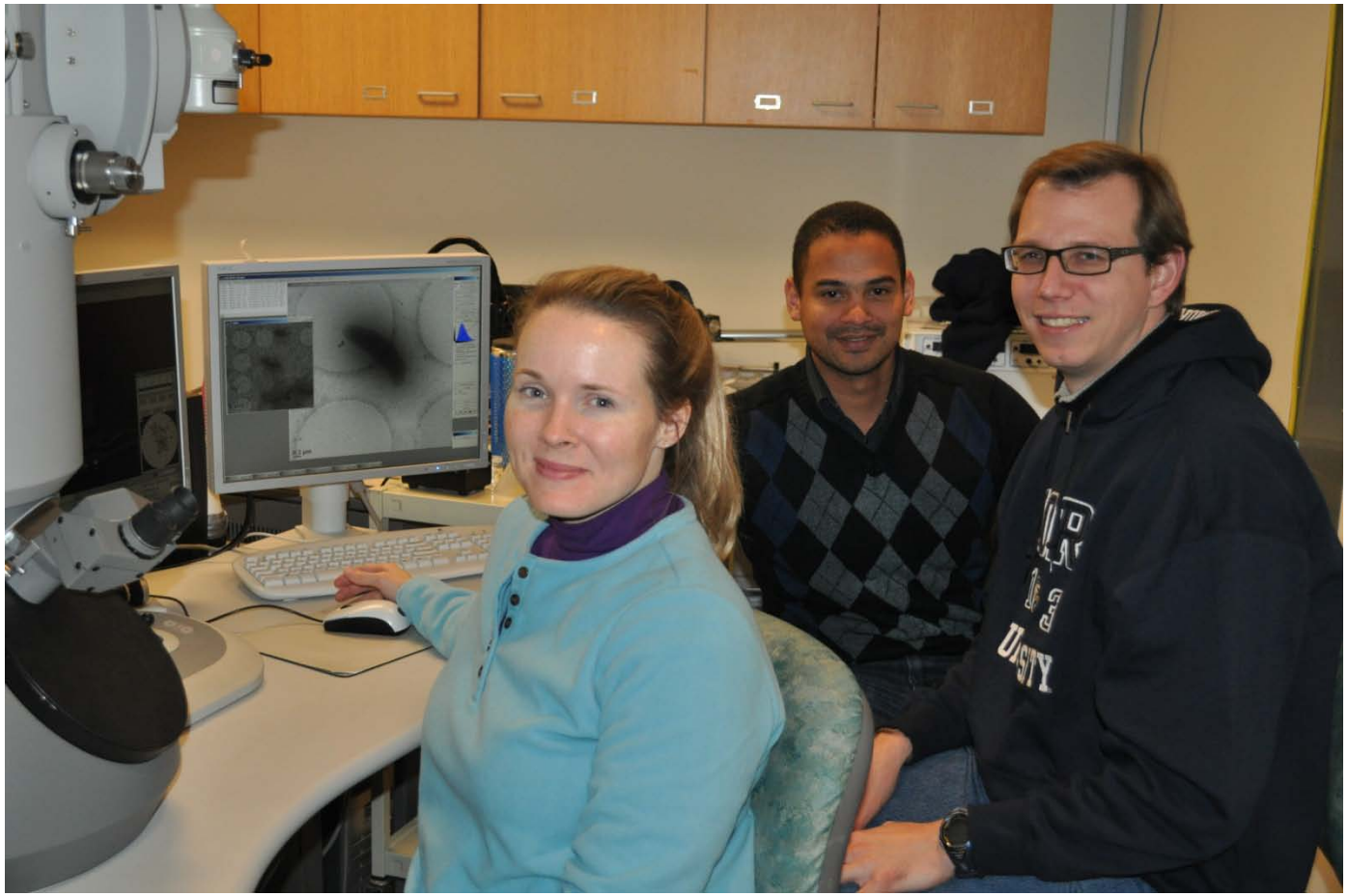
- Magnetic Microscopy Center
- Molecular Beam Epitaxy Facilities
- Molecular Characterization Facilities
- Polymer Characterization Facility
- Polymer Synthesis Facility

Principles

- *Instruments housed in well-staffed user facilities*
- *Maximize use and access*
- *Foster hands-on training, access to in-house expertise*
- *Competitive pricing structure to encourage use, while sustaining operating costs and staff compensation*

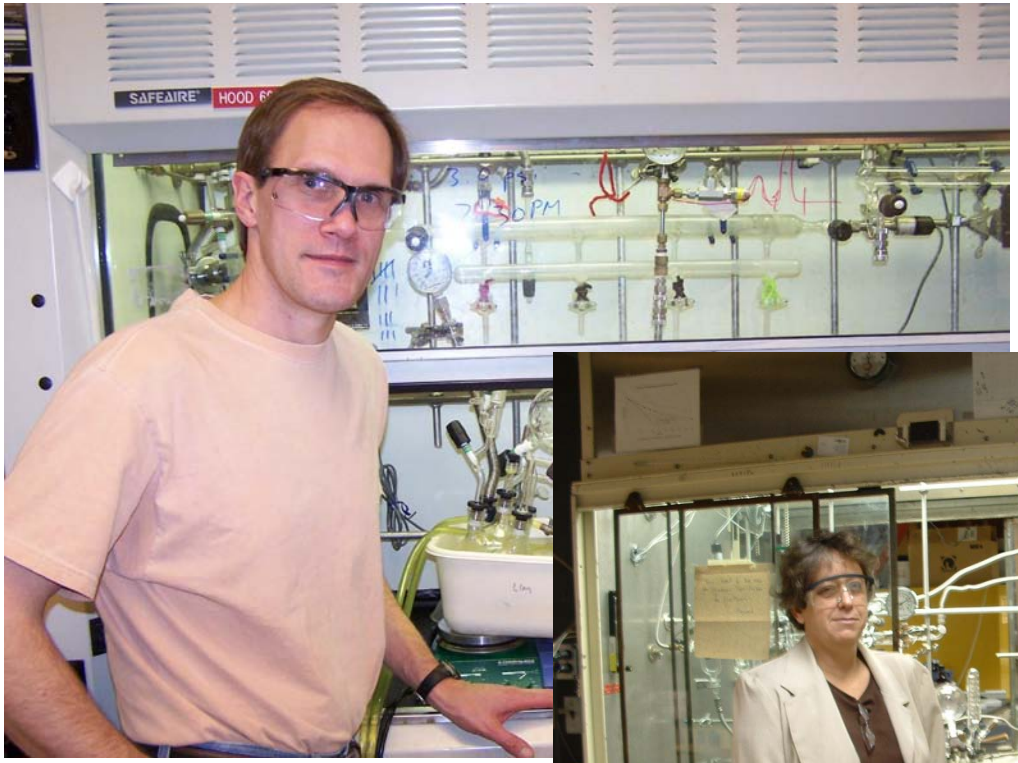
UMASS on POLYMERS

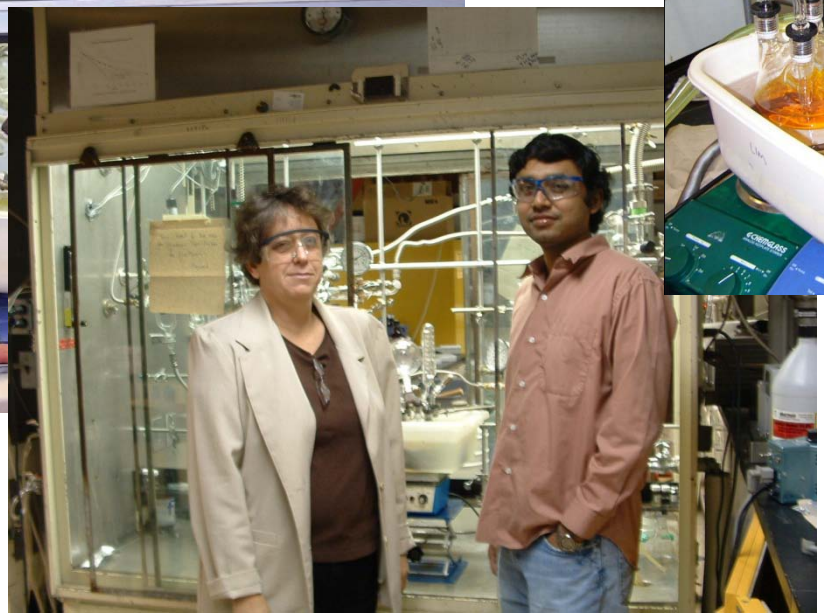
Cryogenic Transmission Electron Microscopy

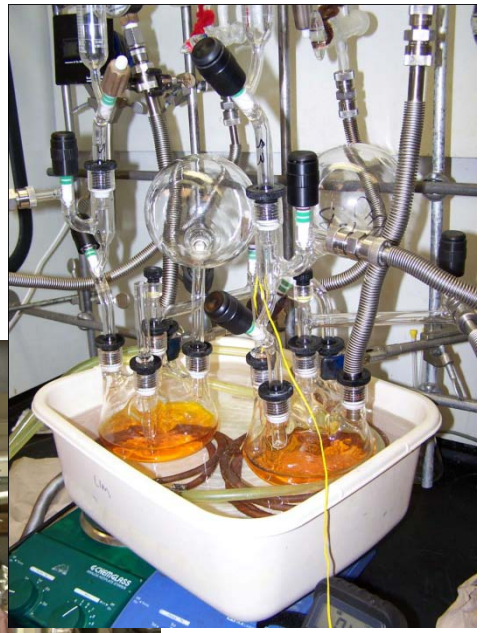


Assistant Professor Elizabeth Wright, Dr. Ricardo Guerro-Ferreira, Dr. Jens Holl, Emory University

Polymer Synthesis Facility







Dean Waldow, Pacific Lutheran, and Dvora Perahia, Clemson, practice anionic polymerization with Sayeed Abbas, UMN graduate student

UMASS on POLYMERS

Sample Testimonials

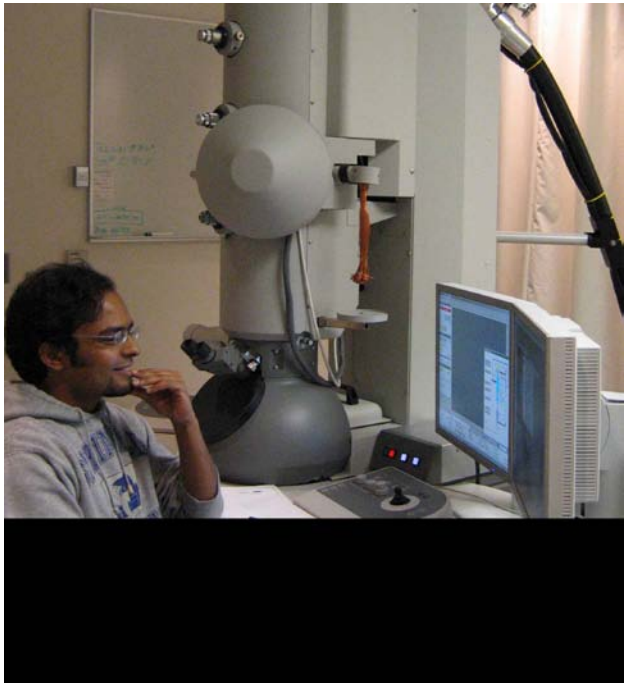
★ "*Thank you for your support...my undergraduate program could not continue without it*" – Bill Ojala, University of St. Thomas

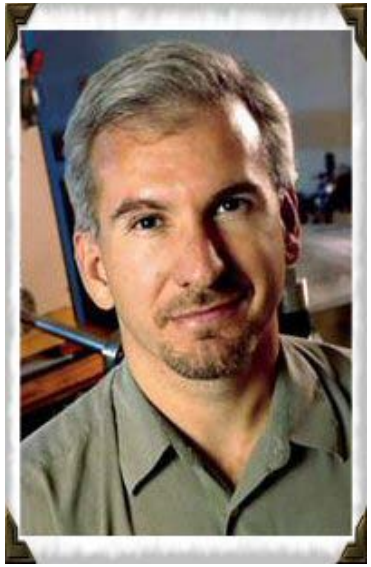
★ "*The student who has worked with me using these funds has completed an honors thesis and presented the research at two speaking competitions (and actually won both!)"* – Bruce Bolon, Hamline

★ "*...the ability to access the instrumentation for cryo-TEM, as well as the expertise of the MRSEC staff at U.Minn. was critical for us to fully understand these systems. The images that we recently received are GREAT and is simply something that we could not have obtained at UCSB or through other means."* – Benjamin Taft, UCSB

CharFac

- Staffing of 16 (11 FTEs)
- 11 Ph.D. scientists
- 80% of costs covered by user fees
- > 600 individual users per year





Dr. Greg Haugstad

Director

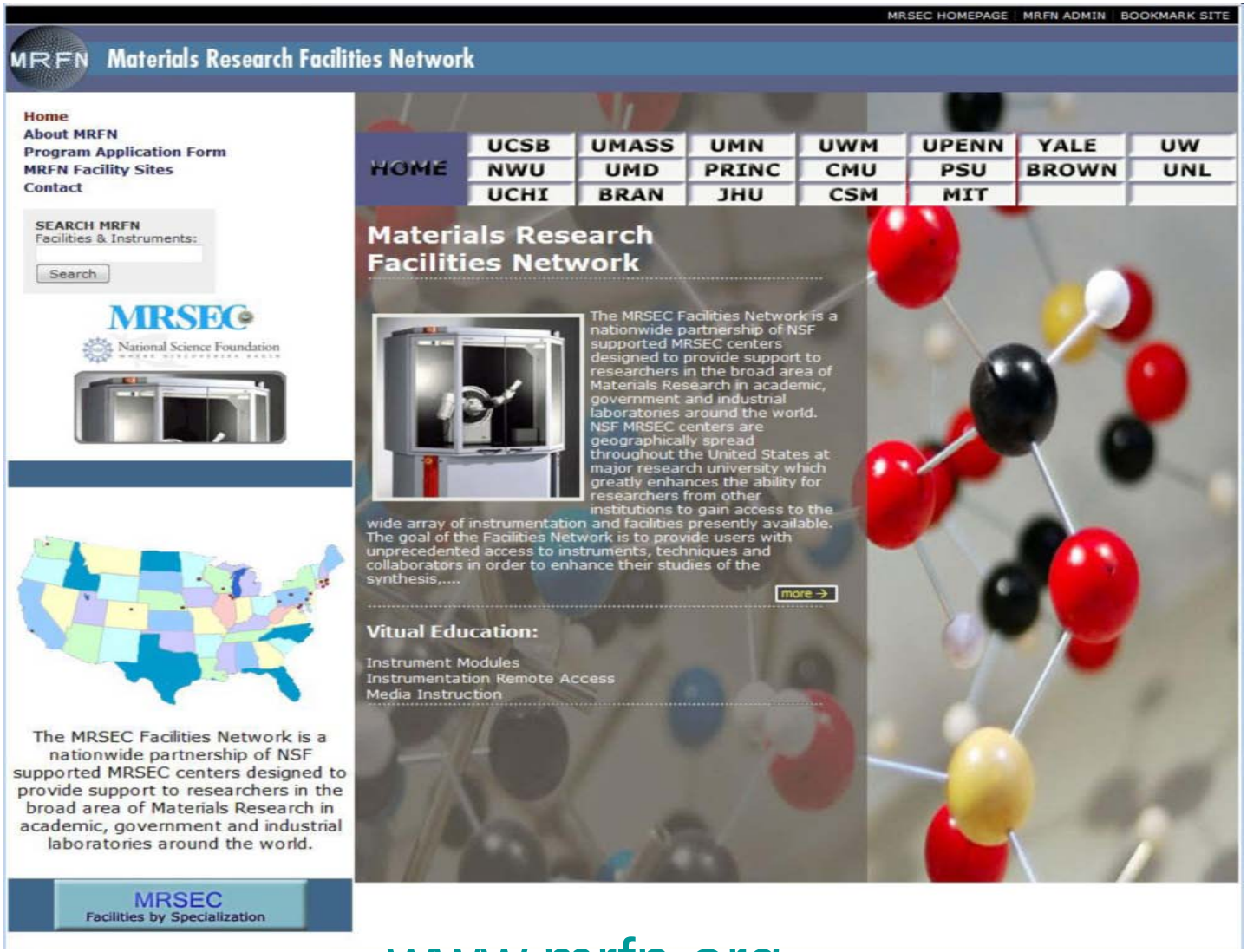
http://www.charfac.umn.edu/

Major instrument groups

- 10 X-ray instruments
- 10 electron microscopes
- 8 proximal probes (AFM, SPM, nanoindenters)
- Ion beam analysis (RBS, FRES, PIXE, NRA)
- Optical and infrared spectroscopy and microscopy

UMASS on POLYMERS

Program Promotion



www.mrfn.org

Program Promotion

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Digital Briefs

New software and Websites for the Chemical Enterprise

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Websites

The Materials Research Facilities Network (MRFN) is a National Science Foundation-supported organization established to provide scientists access to advanced instrumentation and research facilities across the U.S. Nineteen Materials Research Science & Engineering Centers (MRSECs) from California to Massachusetts currently belong to the network (www.mrsec.org). Potential users at schools near MRSECs, especially undergraduate and minority-serving institutions, can submit short proposals on MRFN's website requesting the use of state-of-the-art instruments and training from skilled staff at one of the facilities. For instance, researchers seeking to characterize newly synthesized materials can apply to operate a transmission electron microscope or an imaging X-ray photoelectron spectrometer at the University of California, Santa Barbara, and to collaborate with others at that site. Some financial support could be awarded to help defray the costs of instrument fees and travel to and from each research center. MRFN, www.mrfn.org

Launched in August, **PharmaValet** is a subscription-based website that enables pharmaceutical companies to search, analyze, and monitor approved drugs from both the U.S. and Canada. Including drugs and patents from FDA's Orange Book and Health Canada's Patent Register, the PharmaValet database allows users to evaluate a drug's worldwide patent position and to monitor a competitor's portfolio. Pharma users also have access to supplemental data and chemical structures associated with a drug and can carry out searches on a patent's full text, as well as look for publication, approval, and expiration dates. PharmaValet was codeveloped by consulting firm Chemvalet and Multimus Information Technologies, both based in Montreal. www.pharmavalet.com

Software

Powered by NetBase technology originally developed in MIT's Media Lab, **Illumin8** is a Web-based research tool for innovation professionals "that does the reading for you," says Elsevier, the software's producer. Corporate customers can use Illumin8, which searches the semantic structures of sentences and other unstructured text, to turn information overload into an asset and identify solutions to specific research problems. To begin, users enter any topic, problem, or desired benefit. The software then searches 8 billion Web

Topics Covered

MRFN, PharmaValet, Illumin8, ADF2009, SCM, Odyssey v3.2, Wavefunction

Scientific Computing & Modelling

ADF2009 SOFTWARE The updated software allows the study of highly coordinated heavy-metal compounds.

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Ask for acknowledgement in publications:

Parts of this work were carried out at the University of California, Santa Barbara Central Facilities; a member of the NSF-funded Materials Research Facilities Network (www.mrfn.org).

YouTube videos (metric – downloads)

Thank You

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