

Introduction to the  
Materials Science and Engineering  
Department at Northwestern  
University

Peter W. Voorhees  
Chair

In the beginning ...



ca. 1888

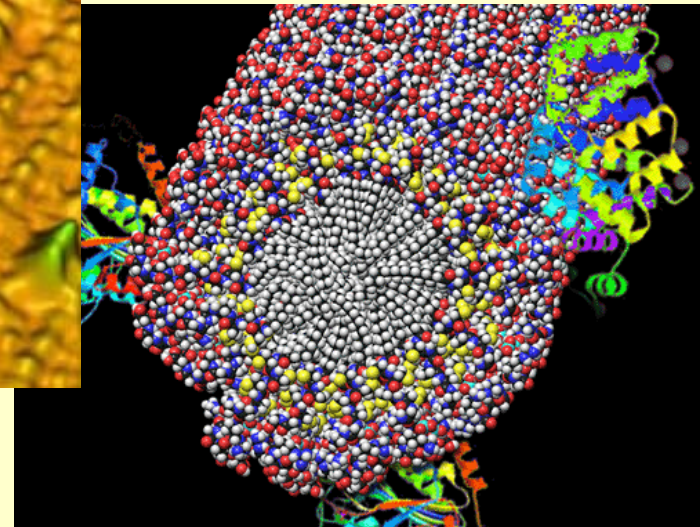
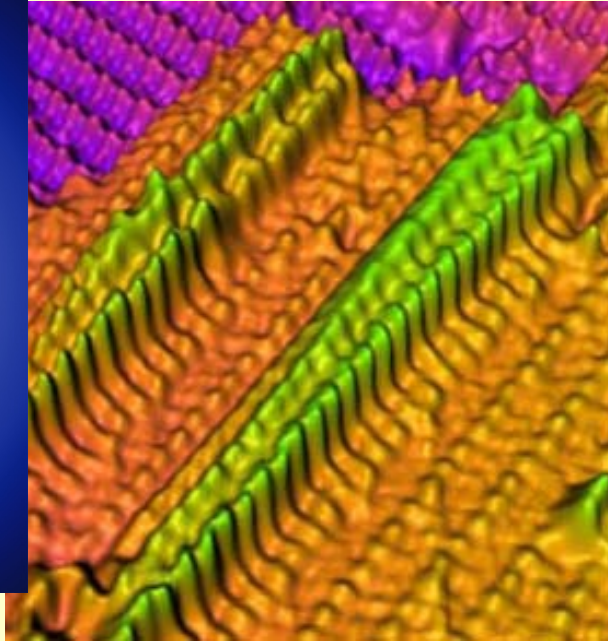
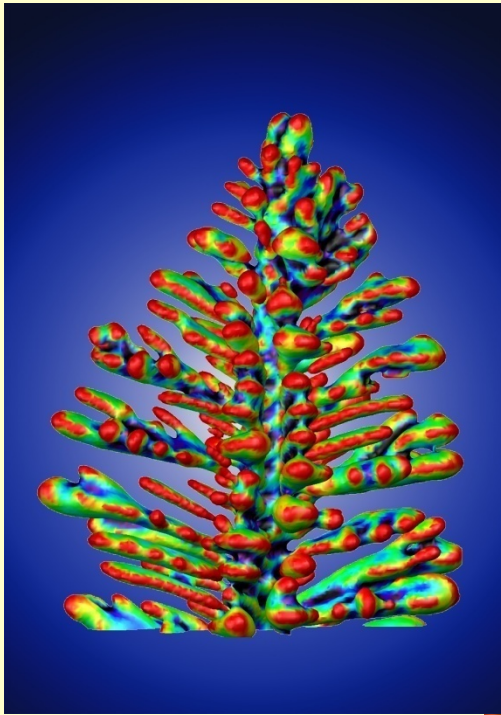
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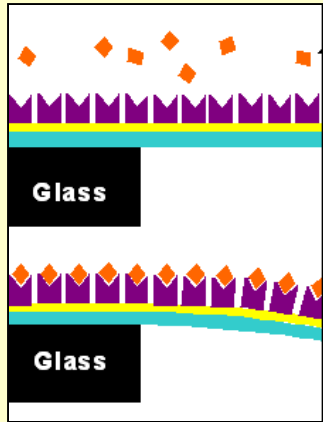


ca. 1944

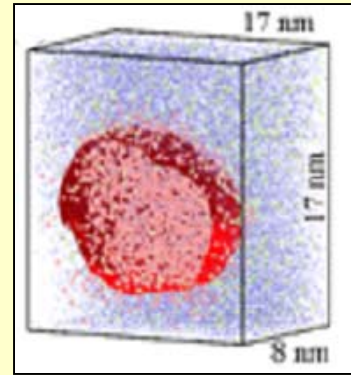


# Materials Science and Engineering: Building on a History of Excellence to Define the Field in the Future





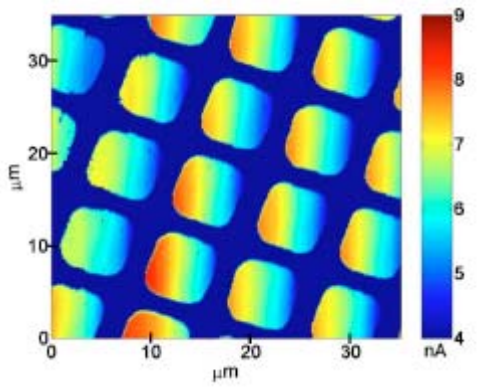
Biomaterials



Metals



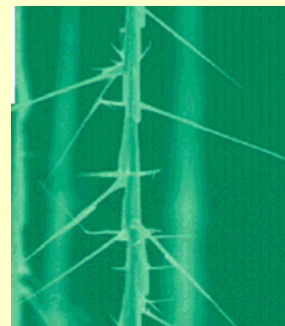
Polymers



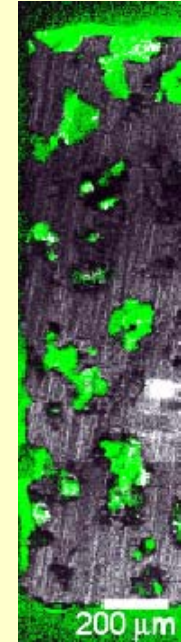
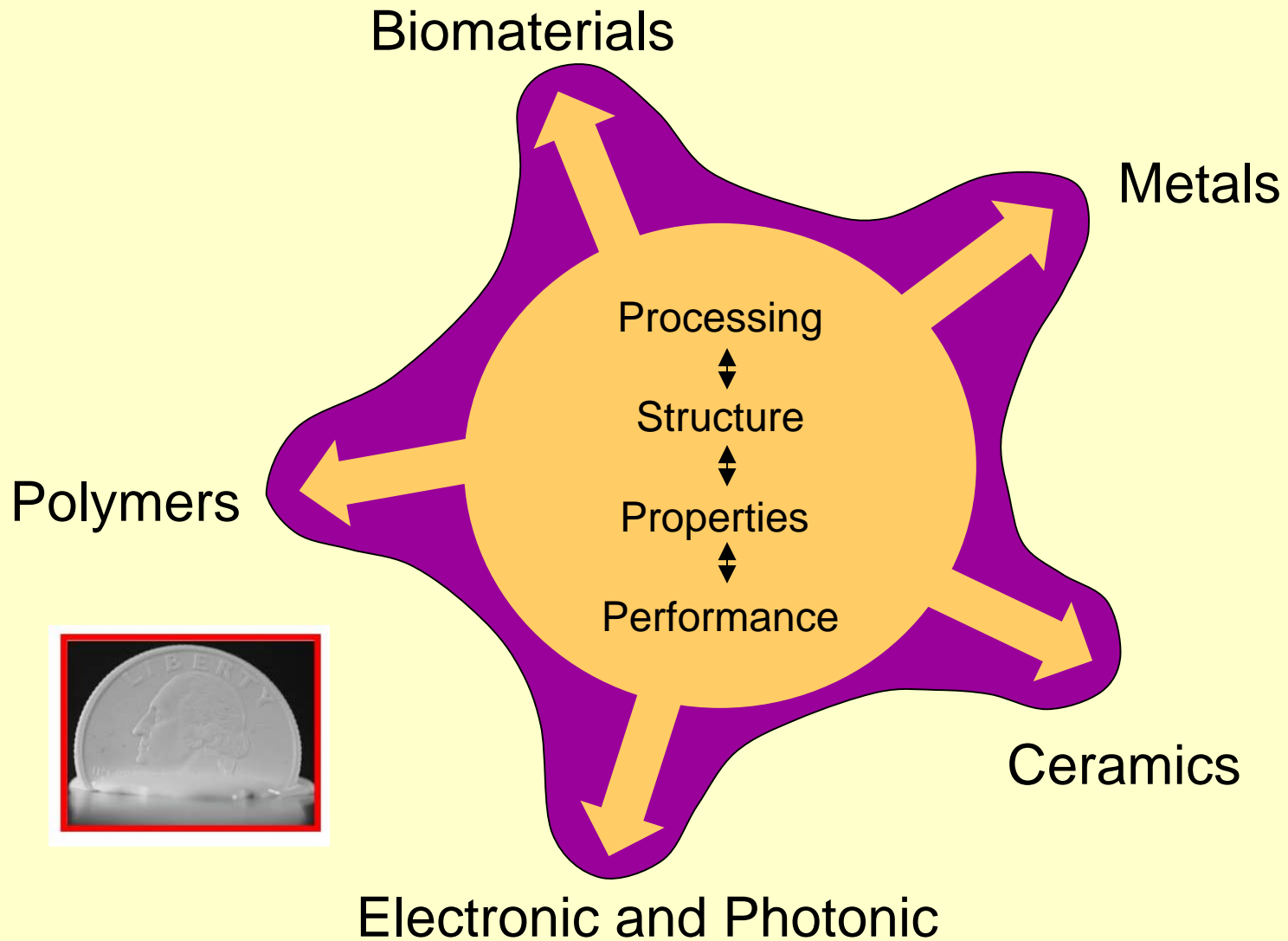
Processing  
↕  
Structure  
↕  
Properties  
↕  
Performance

Ceramics

Electronic and Photonic  
Materials



# Distribution of Research Interests



# Department of Materials Science and Engineering

- First materials science and engineering program in U.S., recently celebrated our 50<sup>th</sup> anniversary last October
- Ranked one of top two MS&E departments nationwide by the National Research Council, Gourman Report and USN&WR (#2, 2005)
- \$16 million in research expenditures in 2006-2007
- Collaborative research is a hallmark

# Department of Materials Science and Engineering

- 35 faculty (with courtesy & emeritus members), including
  - 4 members of the National Academy of Engineering, 2 members of the National Academy of Science
  - 13 National Science Foundation PYI's, NYI's, Career Awards
- 161 graduate students
- 76 undergraduates
- 35 postdoctoral fellows, research associates, and visiting scholars
- Annual Eshbach Visiting Scholars

# Department of Materials Science and Engineering Facts and Figures

- Demographics:
  - 25% women
  - 5% under-represented minorities
  - 33% international students
- More than 20% awarded external fellowships
- Average time to Ph.D.: **Under 5 years** (Median number of years registered as a graduate student: 6.8 years for all engineering Ph.D's across US)

# Ph.D. Program in Materials Science and Engineering

- Fifteen courses over five or six quarters, including five core courses
- **No comprehensive exam!**
- Preliminary Exam, Qualifying Exam, Final Defense
- Opportunities abound for collaborative research
- 3M nanotechnology graduate fellowship
- Ryan family nanotechnology fellowships
- Crown Family Graduate Internship Program
- Additional opportunities: Advanced Photon Source, Argonne National Laboratory

# Materials Science and Engineering Facilities

- Center for Atom-Probe Tomography
- Ceramics and Metals Processing Facility
- Electron and Photonic Materials Characterization Laboratory
- Materials Processing and Crystal Growth
- Mechanical Properties & Fatigue Facility
- *NUANCE*: NU Atomic and Nanoscale Characterization Experimental User Facility: electron probe, scanning probe and surface science
- Optical Microscopy and Metallography Facility
- J. B. Cohen X-ray Diffraction Facility

# A Collaborative University: Research Centers and Institutes

- Materials Research Center
- Nanoscale Science and Engineering Center
- Center for Energy Efficient Transportation
- Argonne-Northwestern Solar Energy Research Center
- Institute for Environmental Catalysis
- Center for Tribology
- DND-CAT Synchrotron Research Center
- Institute for Bioengineering and Nanoscience in Advanced Medicine
- National Center for Learning and Teaching in Nanoscale Science and Engineering

# Alumni and Alumnae at Universities

## Universities in the United States:

- *Alfred University*, Doreen Edwards
- *Boise State University*, Megan Frary
- *Columbia University*, I. Cev Noyan
- *Carnegie Mellon University*, Paul Salvadore
- *Cornell University*, Steven Sass
- *Iowa State University*, Kristen Constant
- *Lawrence Institute of Technology*, Laura Lisiecki
- *Massachusetts Institute of Technology*, Lynn Hobbs, Ann Mayes, John Van der Sande, Christopher Schuh
- *Northwestern University*, Samuel Stupp, James Conley, Mike Meshii
- *Ohio State*, Glenn Daehn
- *Pennsylvania State University*, Elizabeth Dickey
- *Rensselaer Polytechnic Institute*, Pulickel Ajayan

# Alumni and Alumnae at Universities

- *State University of New York at Stony Brook*, Herbert Hermann, Dilip Gersappe
- *University of Nebraska*, Suzanne Rohde, R. J. DeAngelis
- *University of Missouri-Columbia*, Aaron Krawitz
- *University of California, Berkeley*, Didier DeFontaine
- *University of California, Irvine*, Daniel Mumm
- *University of California, Los Angeles*, Kanji Ono
- *University of California, San Diego*, Joanna McKettrick
- *University of California, San Francisco*, William and Sally Marshall
- *University of Illinois at Urbana Champaign*, Harry Cook
- *University of Maine*, Terry Hughes
- *University of Massachusetts*, Albert Crosby
- *University of Missouri*, A. Winholtz
- *University of Michigan*, Joanna Merecki-Millunchick
- *University of Pennsylvania*, David Luzzi
- *University of Tennessee*, Peter Liaw
- *University of Southern California*, Mike Kassner (Dept. Chair)
- *University of Virginia*, Shawn Agnew

# Alumni and Alumnae at Universities

## A Selection of Universities outside the United States:

- *Chinese University of Hong Kong*, Quan LI,
- *Hongik University, S. Korea*, Jinha Hwang
- *Instituto Politecnico Nacional, Mexico*, Jose Cabanas, Hector Calderon,
- *IIT Kharagpur, India*, Rhaul Mitra
- *KAIST, S. Korea*, Won-Jong Lee, Sang-Hee Suh
- *Kyoto University, Japan*, Paul Hideo Shingu,
- *National Taiwan University, Tiawan*, Ching-I Huang
- *Nagoya University, Japan*, Masahiko Moringa
- *Pohang University, S. Korea*, Y.M. Koo,
- *Tsing-Hua University, Taiwan*, Tai-Bor Wu
- *Tohoku University, Japan*, Eiichiro Matsubara
- *Toyohashi University of Technology, Japan*, Koichi Tsuchiya
- *Tunghai University, Taiwan*, Haydn Chen (President)
- *Universite Lyon, France*, Vitali Volpert
- *Yeungnam University, S. Korea*, Sangtae Kim

# “Captains of Industry”

- Teruaki Aoki, Sony Corporation
- George Bodeen, retired CEO, Lindberg Corporation
- Tommy George, recent President, Motorola Semiconductors
- Bill Harrod, VP, Lucent Technologies
- Y. H. Kim, Senior VP, Lockheed Martin
- Bill Kroll, President, Matheson Trigas
- Charles Kuehmann, President, QuesTek Innovations LLC
- Mary Quin, former VP & General Manager, Xerox Corp.

# Opportunities for Outreach

- HANDS: Program with Haven middle school in Evanston and MSE graduate students



## Top 10 Reasons to Attend Northwestern

10. Graduate industrial internships abound
9. The beach – 5 minutes from lab to sand
8. The 35 faculty members, representing a diverse array of research interests
7. MSE intramural teams, esp. football and floor hockey
6. MSE's exceptional reputation and national ranking
5. SPAC (Sports Pavilion and Aquatic Center)
4. Proximity to the Advanced Photon Source, ANL
3. Chicago
2. Excellent facilities
1. Free cookies, 4:00 PM, every Thursday!