



LEHIGH

UNIVERSITY®

Research at Lehigh

Bruce E. Koel

*Interim Vice President and Associate Provost
for Research and Graduate Studies*

November 16, 2008



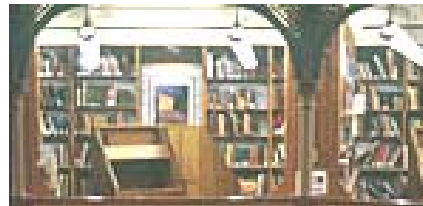
Lehigh University at a Glance

Dollars

- Budget:
\$387 Million
- Research Expenditures:
\$50 Million
(up 78% in 7ys.)
- Industry funded research 15%
(Nat'l avg. 7%)

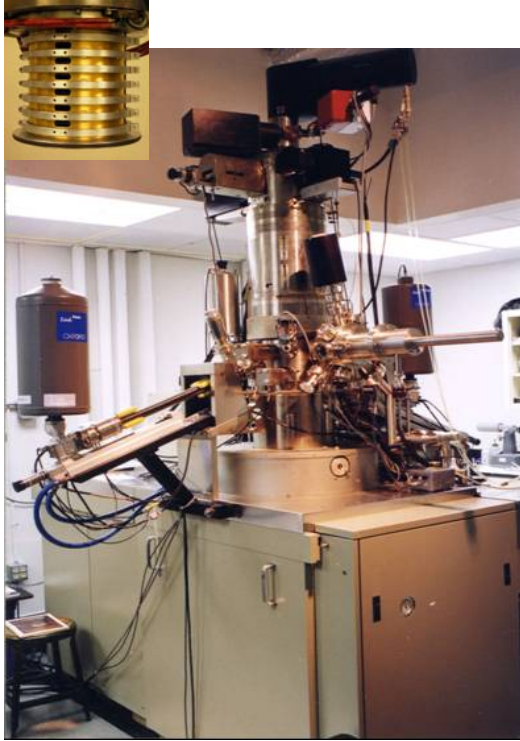
People

- 4876 undergraduate students
- 2118 graduate students
- 440 faculty members
- 1200 staff members



FACILITIES AT LEHIGH

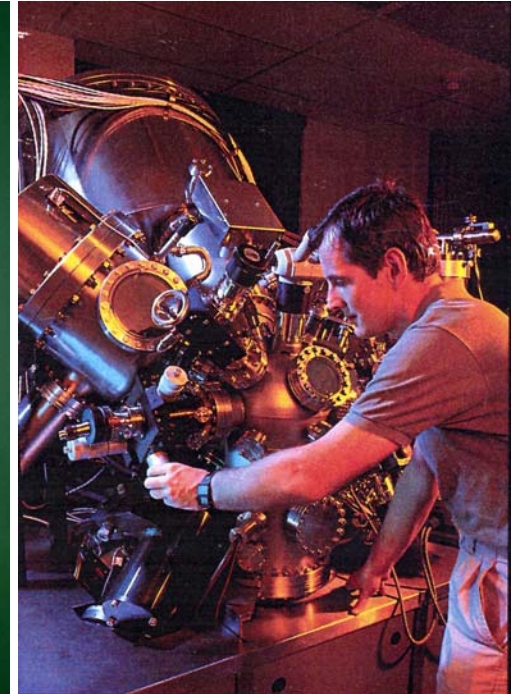
Electron Microscopy & Surface Science



**HB603 STEM with
Nion aberration
corrector**



**JEM 2200FS TEM with
energy filter and CEOS
aberration corrector**



**Scientia ESCA 300
instrument**

Unique Instruments at Lehigh University



Research Initiative in **Energy**

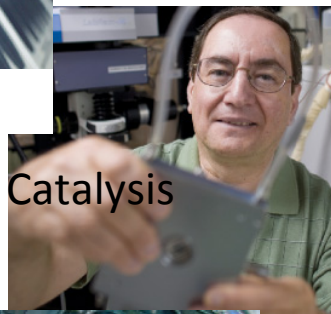
RESEARCH AREAS

organic photovoltaics



InGaN Solar Cells

coal/biomass gasification



Catalysis



Hydrogen from Methane



Fusion

photoelectrochemical hydrogen production



“Balancing Energy and the Environment” Workshop

70 Faculty from all 4 colleges

- Materials for Advanced Energy Applications
- Catalysis/Hydrogen Economy
- Photovoltaics, Solid State Lighting
- Environmental impacts and energy conservation

Funding

National Science Foundation
Department of Energy
Department of Defense
Environmental Protection Agency
Electric Power Research Institute
State of Pennsylvania
Industry





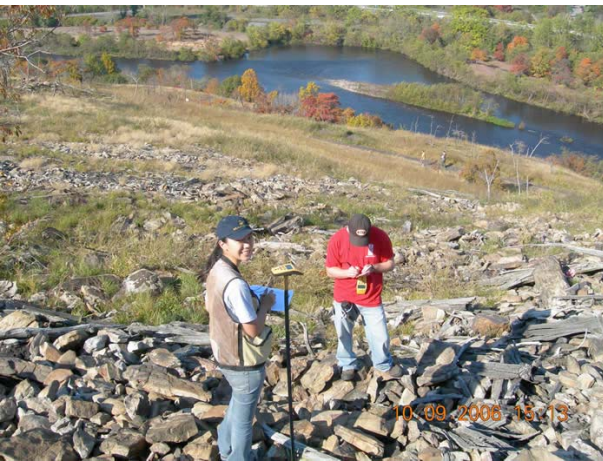
ENVIRONMENTAL INITIATIVE

at LEHIGH UNIVERSITY



Research

- El supports a variety of research projects across all 4 colleges
- Centered around the Earth and Environmental Sciences and Civil and Environmental Engineering departments



UNDERGRADUATE AND GRADUATE PROGRAMS



The Lehigh Earth Observatory (LEO) serves to provide a crucial link between scientific and societal research on the environment.



Energy Systems Engineering Institute



Working with the **Electric Power Research Institute (EPRI)**, Lehigh is establishing the **Energy Systems Engineering Institute (ESEI)**



Students

ESEI will offer an innovative, 10-month professional Master's degree program in energy systems engineering.

Industry

ESEI will provide direct mechanisms for energy firms to participate in targeted research projects guided by faculty and research staff, as well as technology transfer services ranging from concept validation, demonstrations, to on-site testing and implementation.



Center for Optical Technologies

Unique Facilities: MULTIDISCIPLINARY RESEARCH

Lehigh Center for Optical Technology:

- Over 30 faculty participants (+ 20 PSU); fully equipped individual labs – many with unique optics capability
- New faculty & facilities spanning materials, device, systems level studies
- New fiber draw tower, focus on novel material fibers
- *New III-V optoelectronics clean room – 2000 ft² + 1000 ft² epi, Emcore D125 InGaAlAsPN and P75 AlInGaN reactors*

Lehigh Center for Advanced Materials and Nanotechnology:

- Largest Electron Microscopy Capability in Nation
- Advanced Nano-indentation & MEMs

Sherman-Fairchild Microelectronics Center:

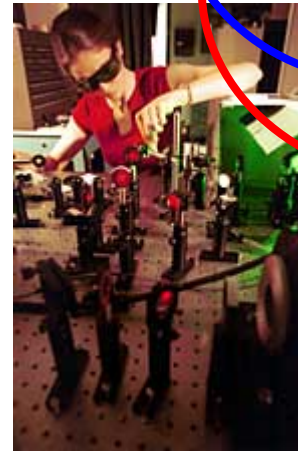
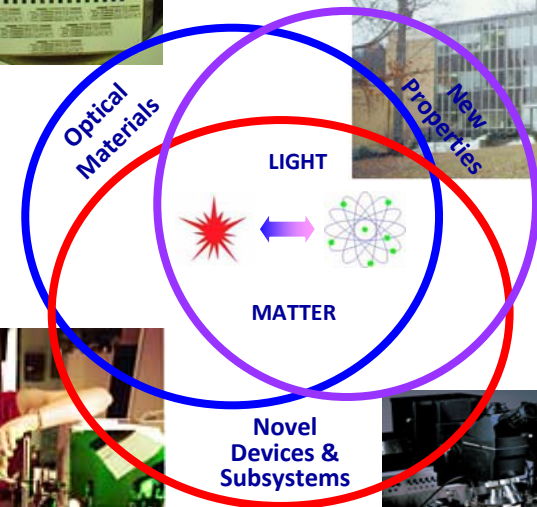
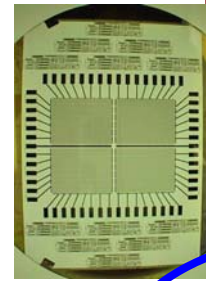
- Silicon; CMOS, non-volatile memory, biosensors

Lehigh Flat Panel Fab:

- Full backplane pixel/driver process capability

Packaging Materials Analysis Group

- Fundamental studies of material/process interactions; creep, long-term stability



Energy Research Center

Professor Edward K. Levy
Director

Fossil Fuels

- Coal Chemistry
- Coal Mineral Behavior
- Combustion
- Flue Gas Emissions Control

System for Field Testing New Low Temperature SCR Catalyst Developed at Lehigh

Industrial Energy Conservation

- Efficiency improvements
- Emissions reduction

ERC Overview:

75 Faculty, Professional Staff, and Graduate Students

Disciplines

Mechanical Engineering, Chemical Engineering, Metallurgy, Computer Science/Electrical Engineering, Physics, Chemistry,

Civil Engineering



Electric Power Generation

- Power plant efficiency improvements
- SO_x, NO_x and Hg control techniques
- Instrumentation and controls
- Process optimization using artificial intelligence
- Improved materials for power plant components
- Component life evaluation



NSF's International Materials Institute (IMI) for New *Functionality* in Glasses

Glassy meta-materials

Ionic functionality

Optical functionality

Biofunctionality

Functional coatings

Glasses engineered for strength



Mission

Int'l Network - Advisory Boards:

- US
- International
- Industry**

Focus, coordinate and promote educational and research activities across the globe to introduce new functionality in glass

Education:

- Internet courses
- Video modules
- Int'l school**
- Hands-on
- Demos

Research:

- Int'l exchanges
- Int'l Conf Travel Scholarship**
- Faculty sabbatical

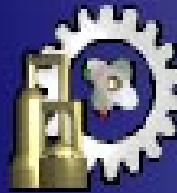
Functionality driven symposia & workshops:

- Key scientific issues**
- Strength
- Optical
- Cross-disciplinary





LEHIGH
UNIVERSITY



華東理工大學
East China University
of Science & Technology

Global Connections



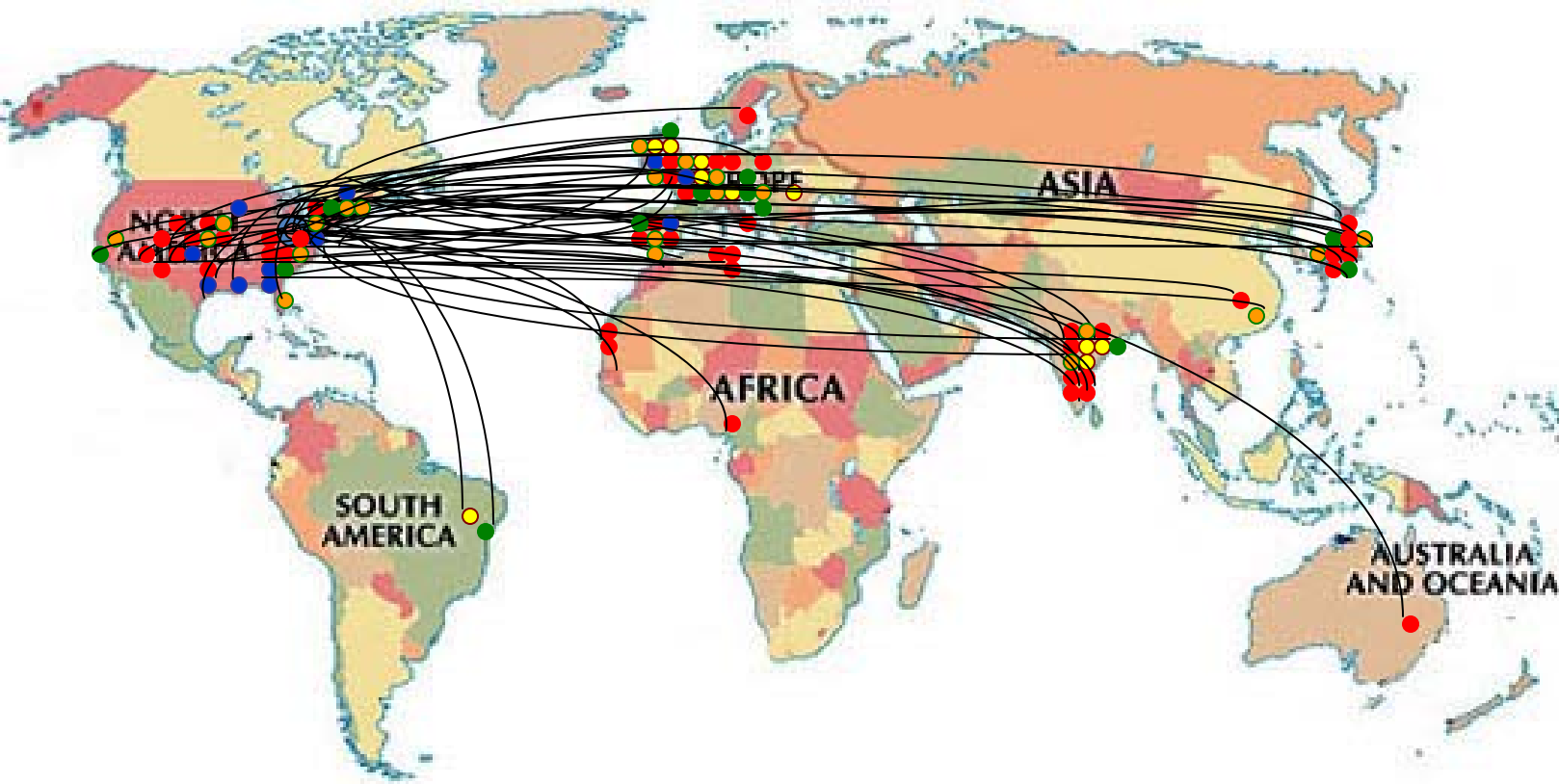
Glass Frits for Use in Ag Thick-film Pastes for Si Solar Cells

Yaping Zhang¹, Jianhua Zheng¹, Yunxia Yang¹, Guorong Chen¹, Himanshu Jain²

¹*Institute of Inorganic Materials, East China University of Science and Technology, 200237 Shanghai, China*

²*International Materials Institute for New Functionality in Glass, Lehigh University, Bethlehem, PA 18015, United States*

IMI-NFG's global network



- Research Exchanges
- International Conference Travel Scholarships
- Research Experience for Undergraduates
- Board of Advisors
- Tutorial Lecturers
- Lehigh University and Penn State University

USA+29 Countries

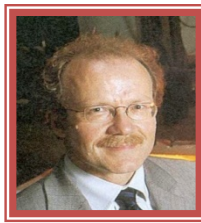


New Functionality thru Partnership with Industry

- ❖ Industry Advisory Board: Leaders of Glass Industry
- ❖ Support for international exchange of scholars



David Morse
Vice President, Corporate R & D
Corning Incorporated, USA



Herve Arribart
Scientific Director
Saint Gobain, France



Roland Langfeld
Vice President, Corporate R & D
Schott, Germany



Setsuro Ito
Senior Fellow
Asahi Glass Company,
Japan



Michael Greenman
Executive Director
Glass Manufacturing Industry Council,
USA



Mehran Arbab
Director, Glass R & D
PPG Industries, USA



Shigeru Yamamoto
Director & Senior Vice President
Nippon Electric Glass, Japan

