

# What Can You Do With a Degree in Polymer Science?



# Diversity of Careers in Polymer Science

**Research**

**Technical  
Management**

**Business**

**Academics**



# **Work for a Major Industry**

**Chemical  
Pharmaceutical  
Biomedical  
Cosmetics  
Plastics  
Petroleum  
Coatings**



# Our Partners

Procter & Gamble



General Electric Company

National Institute of Standards and Technology

NIST

...working with industry to develop and apply technology, measurements and standards



Chevron



ALBEMARLE<sup>®</sup>  
CORPORATION



Bayer Polymers

3M Drug Delivery Systems

EASTMAN

The Chemistry of New Ideas



TOXIN alert  
Protecting Your Health™

BASF

Armstrong

Your ideas become reality.



Better things for better



ZEON CHEMICALS L.P.

GeTtex  
PHARMACEUTICALS, INC.  
A Genzyme General Business

Georgia Gulf



energy.gov  
U.S. DEPARTMENT OF ENERGY

noveon

The Specialty Chemicals Innovator



UNITED STATES DEPARTMENT OF AGRICULTURE

# **And, Our Graduates Go To:**

**Government Laboratories**

**Independent Laboratories**

**Small start-ups, entrepreneurial  
ventures**

**Universities, Colleges,  
Junior Colleges, High Schools**



# Polymer Research is . . .



**Synthesis**



**Characterization**



# Polymer Research is . . .

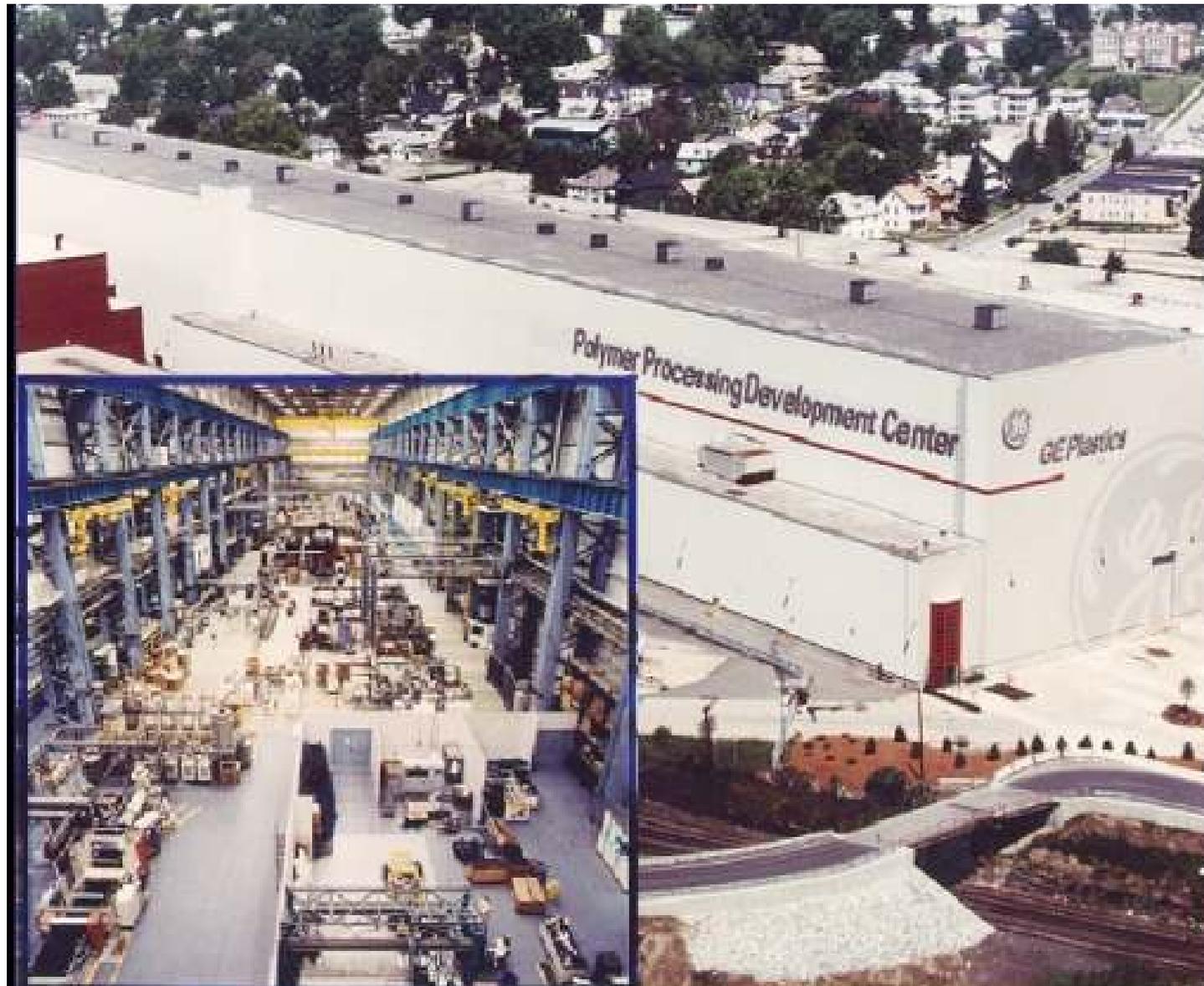


**Formulation**

**Testing**

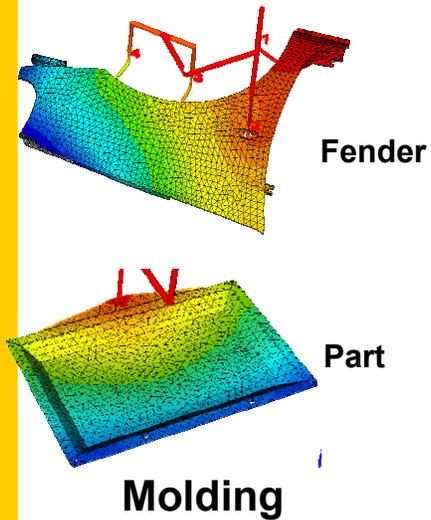


# Polymer Research is . . . Polymer Processing



# Polymer Research is . . .

## Design



## Scale-up



## Testing

Impact



Dimensions



Verification

GE Large Exterior Body Panel Development process



# Polymer Research is . . . Product Development



# Polymer Research is . . .

## Application Development



# Polymer Applications

- Coatings
- Fibers
- Plastics
- Composites
- Adhesives
- Cosmetics
- Rubber
- Paper
- Textiles/Clothing
- Water Treatment
- Biomedical
- Pharmaceutical
- Automotive
- Oil Industry



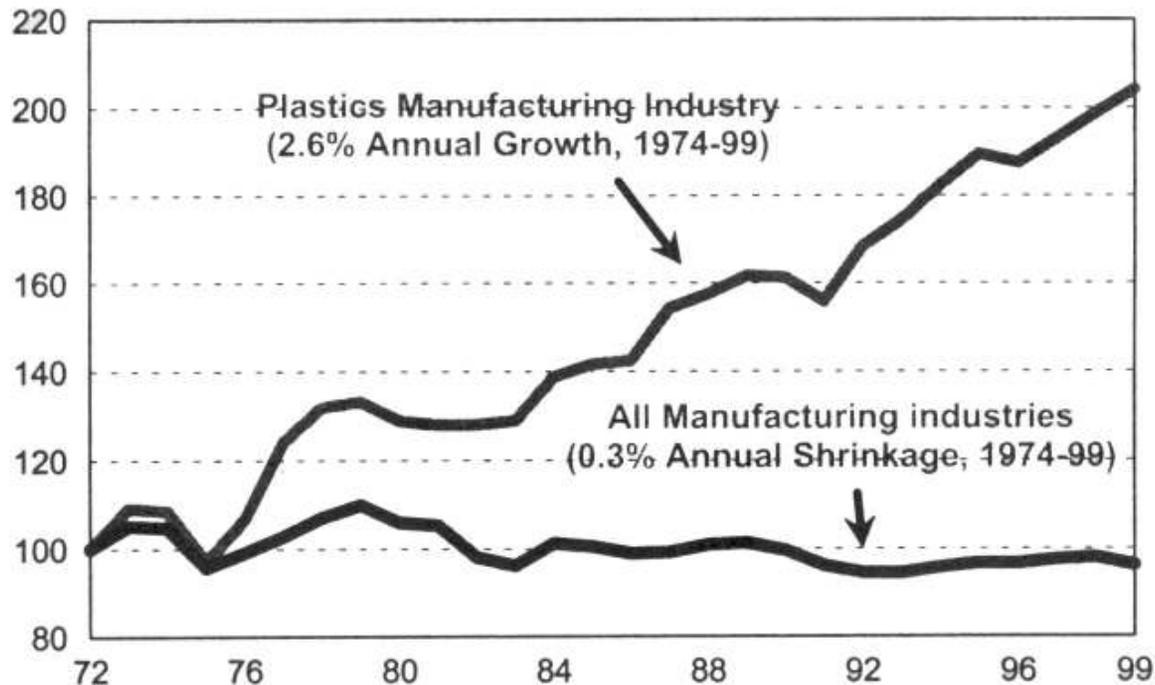
# Importance of Polymers

- Pervasiveness
  - Food
  - Clothing
  - Housing
  - Health needs
- Work Force
  - Over 1 million people work directly or indirectly with polymers
  - One-half of all chemists and chemical engineers are engaged in polymer science and technology
  - Annual payroll of \$25 billion

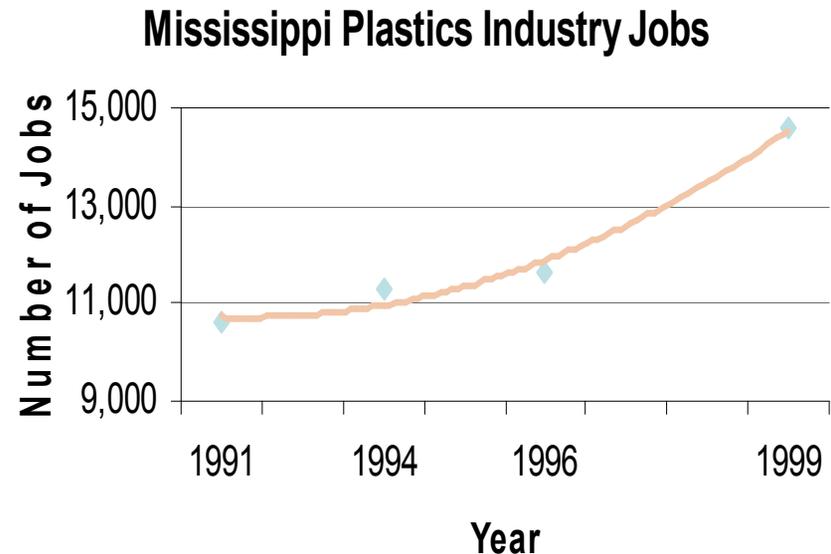


# Job Market for Polymer Science Majors

**EMPLOYMENT**  
(INDEXES, 1972 = 100)



# Job Industry in Mississippi



- Employment in Manufacturing since 1994
  - Total Manufacturing - 10.4% *decrease*
  - Plastics Industry - 24% *increase*



# Career Opportunities in Polymer Science: Research

- Polymer Development Engineer
- Surface Coatings Chemist
- Polymer Chemist
- Polymer Physicist
- Polymer Processing Engineer
- Polymer Design Engineer
- Application Development Engineer
- Basic Research



# Career Opportunities in Polymer Science: Management

## Our Graduates Are:

- ◆ **Technical Directors**
- ◆ **Research Managers**
- ◆ **Group Leaders**
- ◆ **General Managers**
- ◆ **Business Development Leaders**



# Career Opportunities in Polymer Science: Business

**Our Graduates Work in:**

- ◆ **Marketing**
- ◆ **Sales**
- ◆ **Customer Service**
- ◆ **Technical Service**
- ◆ **Quality**
- ◆ **Manufacturing**
- ◆ **Sourcing**
- ◆ **Global Business Development**
- ◆ **Finance**



# Career Opportunities in Polymer Science: Academics

## Our Graduates Are:

- ◆ Professors
- ◆ Instructors
- ◆ Teachers
- ◆ Medical Researchers
- ◆ Dental Researchers



# Where Do Our Undergraduates Go?

- 50% - Industry
- 50% - Graduate School
  - Dental School
  - Law School
  - Medical School
  - Pharmacy School
  - Polymer Science
- California Institute of Technology
- Cambridge University
- Emory University
- Louisiana State University
- Max-Planck Institute
- The University of Southern Mississippi
- University of Akron
- ◆ University of Florida
- ◆ University of Iowa
- ◆ University of Massachusetts
- ◆ University of North Carolina
- ◆ University of Texas
- ◆ University of Virginia



# Starting Salaries for 2004-2005 USM Polymer Science Graduates

- Most recent salary range for graduates in our B.S. program is \$45-55,000
- Most recent salary range for graduates in our Ph.D. program is \$70-90,000

***In Mississippi and  
Around the World***



# **USM Polymer Science Teaches You:**

- ◆ **Scientific/Technical Expertise**
- ◆ **How to do Research**
- ◆ **How to Present**
- ◆ **How to Write**
- ◆ **Help you Get the Job you Want:**
  - **On Campus Recruiting**
  - **Interview Skills Training**
  - **Faculty Contacts**



# **Research Facilities: 100K Sq Ft**

## **Synthesis:**

- Traditional and combinatorial
- Micro-scale, lab and scale-up facilities
- Controlled radical polymerization techniques

**Polymer processing  
and fabrication**

## **Polymer analysis and characterization clusters:**

- Morphology: TEM, SEM, AFM, Nanoindentation, X-ray
- Rheology, thermomechanical analysis
- Spectroscopy: NMR, IR, chromatography

**Coatings formulation,  
processing and analysis**



# Faculty

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- **17 Faculty Members**
  - Case Western Reserve
  - Georgia Institute of Technology
  - Michigan Technical University
  - Moscow Academy of Sciences
  - Northwestern
  - Strathclyde University, Scotland
  - Texas A&M
  - University of Akron
  - University of Florida
  - University of Iowa
  - University of Manchester
  - University of Massachusetts
  - U. New South Wales, Australia
  - U. Southern Mississippi
  - University of Tennessee
- **Backgrounds**
  - Chemistry
  - Chemical Engineering
  - Polymer Science & Engineering
  - Physics

***National and International Recognition***



# Faculty Research Areas

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- **Biomedical Applications**
  - Polymer membranes
  - Biocompatibility
- **Coatings and Films**
  - Surface/interfacial characterization
  - Stimuli/response
  - “Green” coatings
- **Polymer Engineering**
  - Composites
  - Nanocomposites
  - Injection molding
- **Polymer Synthesis**
  - Block copolymers
  - Ionomers
  - Living polymerization
  - Polymer photochemistry
- **Formulation Science**
  - High throughput screening
- **Water-Soluble Polymers**
  - Controlled release
  - Enhanced oil recovery



# School of Polymers and High Performance Materials

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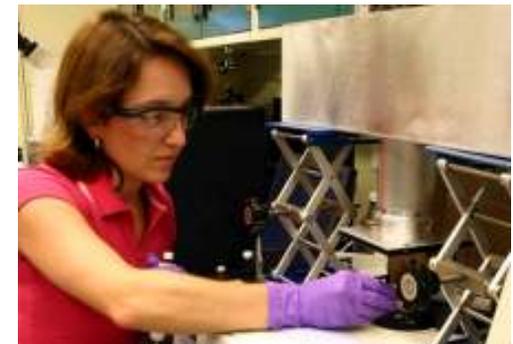


- **2004-2005 Enrollment**
  - 100 B.S. majors
  - 87 Graduate students
  - 20 Postdoctoral Fellows



# Where do we get our students

- Auburn
- Baylor
- Brigham Young U.
- California Institute of Technology
- College of William & Mary
- Duke
- Georgia Institute of Technology
- Indiana University
- Louisiana State University
- Millsaps College
- Marquette University
- Mississippi State University
- North Carolina State U.
- Oklahoma State U.
- Pennsylvania State U.
- Purdue University
- Rice University
- Rhodes College
- State U. of New York
- St. Norbert College
- University of Delaware
- University of Florida
- University of Houston
- University of Illinois
- University of Minnesota
- University of Mississippi
- University of Oklahoma
- U. New Mexico
- U. North Carolina
- U. Wisconsin
- International Universities



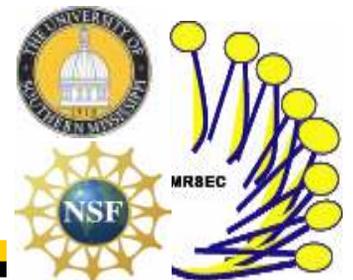
# National Science Foundation Centers

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**Materials Research Science and Engineering  
Center in *Response-Driven Polymeric Films***

**Industry/University Cooperative Research  
Center in *Coatings***

<http://www.usm.edu/mrsec/research/index.htm>



# What will you invent?

