

# Effective techniques for recruitment of undergraduate MSE majors

## The MSE Open House

Kevin S. Jones  
Professor and Chair  
University of Florida

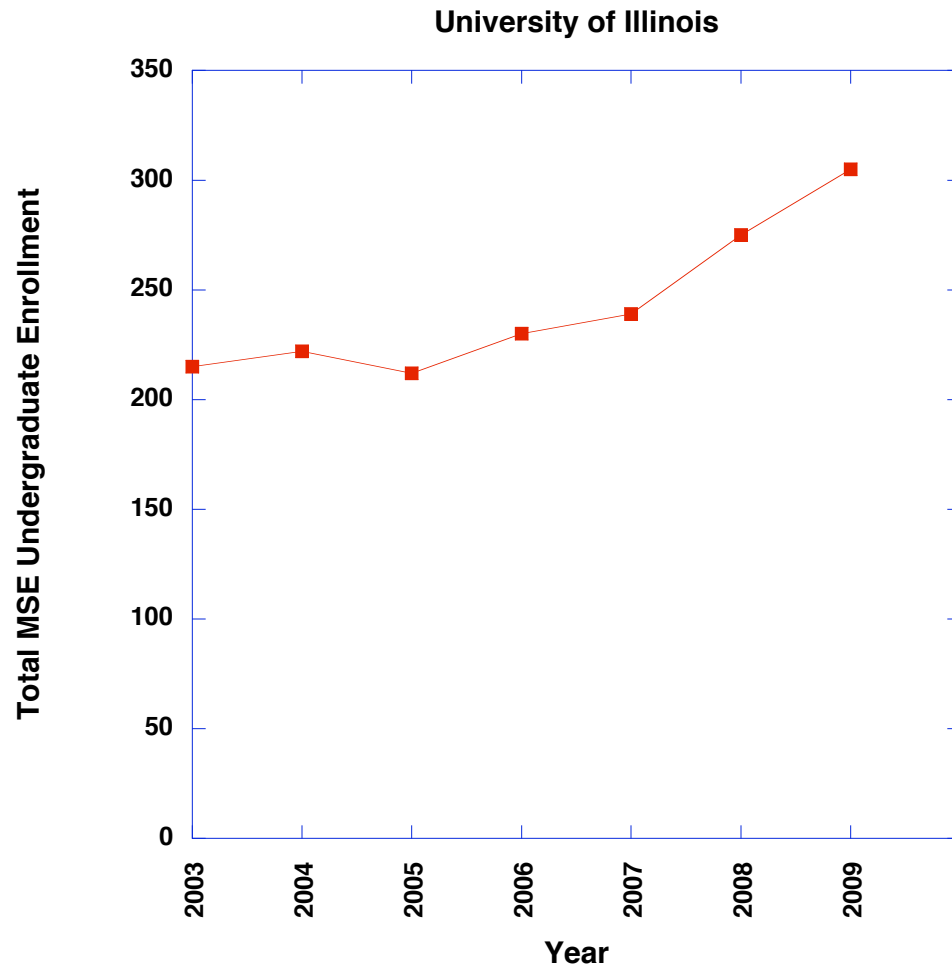


# Challenge

- There exists a continuing challenge to recruit MSE students into our departments
- With challenging budgets, schools looking at SCH generation and enrollment
- Many approaches have been tried (outreach, curriculum changes, etc.)
- Purpose of this talk is to discuss one approach we recently implemented  
at UF that has been particularly successful at Illinois
- The Incoming Freshman Open House



# Effect of Open House on Enrollment



- Illinois has been conducting the open house for 15 years
- However recent changes in who is doing the open house has resulted in a significant boost to their undergraduate enrollment
- Critical to have the right people



# Approach

- Early Spring Semester: Obtain an email list of all the high school seniors who have been admitted into engineering
- Scheduled 2 open houses (one in May and one in June) and sent out emails inviting them and their parents and siblings
- The Open house takes place Sunday afternoon from 2 to 6PM
- The agenda is copied after the successful Illinois Open House
- Getting the right student and faculty participation is critical
- Follow up to the open house included a pizza reception at the beginning of the fall term



# Agenda

2-2:30

- What is Materials Science and Engineering?
- Transitioning from High School to MSE

2:30-3:30

- Hands On Research Experience (prospective students only)  
5 different labs (students pick one)
- Reception/Q&A for Parents and siblings

3:30-4:30

- Lab Tours- Prospective Students and family with current students as guides (no faculty)

4:30-5:00

- The UF-MSE Undergraduate Experience

5:00-whenever

- Pizza Party with Faculty and Students



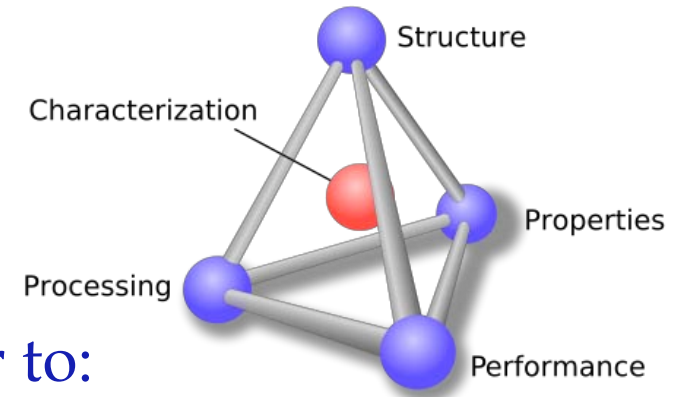
# What is Materials Science and Engineering (MSE)?

- **Materials Science and Engineering** is the study of how the structure and processing of materials affects the properties and performance of these materials in engineering applications.
- Engineering design is often limited by the materials that are available. New *materials* enable engineering advances...
- New materials are the key to all these questions
  - How did purifying glass enable the internet?
  - Why do IPODs continue to hold more songs?
  - How do you design a biocompatible artificial organ?
  - How do you build an aircraft wing that fixes itself?
  - How do you enable a passenger car to travel 150mpg on biofuel?
  - How do you convert sunlight to electricity for under \$1/watt?



# So what does a Materials Engineer do?

- They study how to process materials
- They study the properties of materials
- They study the structure of materials
- They seek to understand these in order to:
  - Create new materials
  - Optimize production of materials
  - Help select the best materials
  - Characterize materials
  - Understand how and why materials fail
  - Improve sustainability
- Materials Engineers work with a range of materials:
  - Metals, Ceramics, Polymers, Semiconductors, Biomaterials, Nanomaterials etc.



# What do MSE students do upon graduation?

- About half our graduates go to industry
  - Industrial starting salaries are around 55K for BS
  - Many become process engineers, optimizing the production of new materials
- About half our graduates go to graduate or medical school
  - Much higher percentage than any other engineering field
  - Ph.D. programs typically provide full stipends for the entire course of study
- UF-MSE has an excellent record of placing graduates in many of the top companies or graduate programs in the country





# Who Employs UF-MSE Undergraduates?

- 
- Exxon Mobil
  - General Dynamics
  - General Electric Glob
  - Intel Corporation
  - KAPL
  - Kimberly-Clark Corporation
  - Ladish
  - Lockheed Martin
  - Morton Custom Plastics
  - Butler Technical Group
  - NAVAIR
  - Nuclear Regulatory Commission
  - Nucor Steel
  - Berkeley Power Systems
  - Raytheon
  - Siemens
  - Southern Comp
  - United Space Alliance
  - US Steel
  - Walt Disney World

# What graduate/professional schools do our students attend?

- MIT
- UC Berkeley
- Cal Tech
- UC Santa Barbara
- Illinois
- Northwestern (Medical)
- Stanford
- Georgetown Medical
- Carnegie Mellon
- Duke
- Boston University
- Ga Tech
- Michigan
- Penn State
- Cornell
- U. Massachusetts
- Warrington School of Business
- RPI
- UNC Chapel Hill
- U. Pennsylvania
- UF College of Med.
- U. Maryland

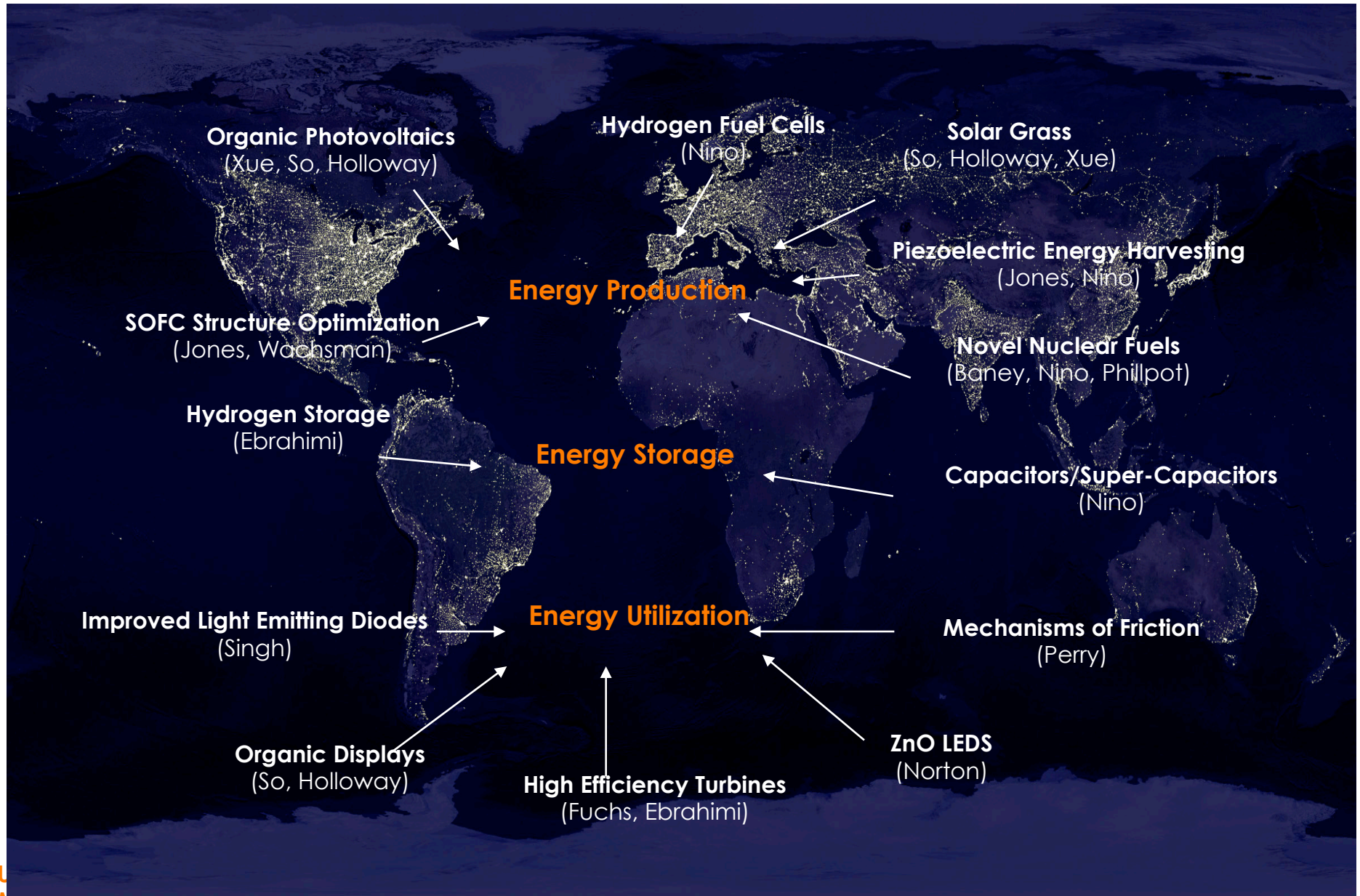


# Who is UF-Materials Science and Engineering?

- Nationally Recognized Department
  - The highest ranked program in Engineering
  - Consistently ranked in top 10 in the US (currently 8<sup>th</sup> among all public and private universities)
  
- World Class Faculty
  - 30 full time tenured and tenure-track MSE faculty
  - All are research active with graduate students
  - Conducting between \$10M and \$11M in research annually
  - Over 100 invention disclosures and patent applications in 07-08 (#1 at the University of Florida)

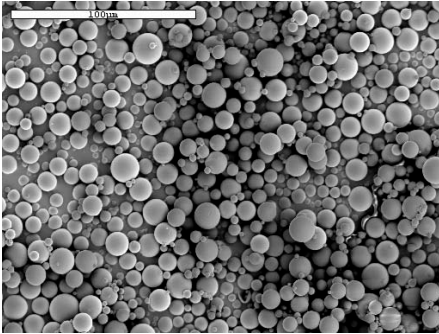


# Energy Research in UF-MSE



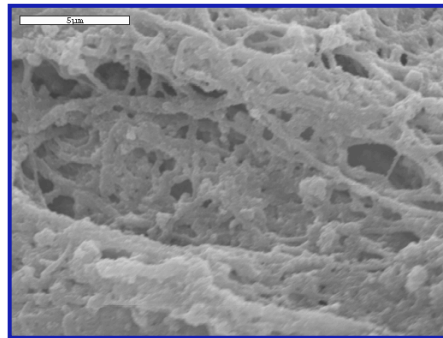
# Examples of **Biomaterials** Research

## Cancer Drug Encapsulation



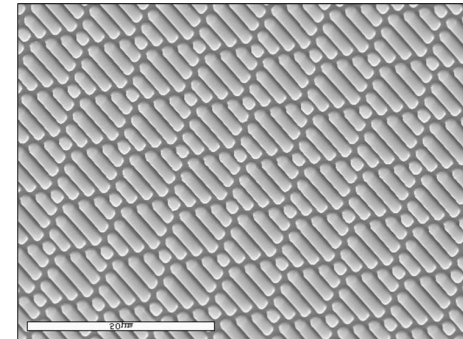
- 6 Micron Diameter Cancer Drug filled Mesospheres

## Artificial Biomimetic Bone



- SEM image of mineral collagen composite

## Antibiotic Sharklet® Surfaces



- SEM image of Engineered Polymer Sharklet Surface

### UF-MSE is Developing Novel Cancer Treatments

A team led by Prof. Gene Goldberg is developing a new method of encapsulating Cancer drugs to increase the drug concentration without adverse side effects

Impact: Currently in very successful clinical trials

### UF-MSE is developing Novel methods of fabricating Bone

A team led by Prof. Laurie Gower is studying how to copy nature to produce bone grafts with all the properties of real bone

Impact: May lead to a biocompatible prosthetics

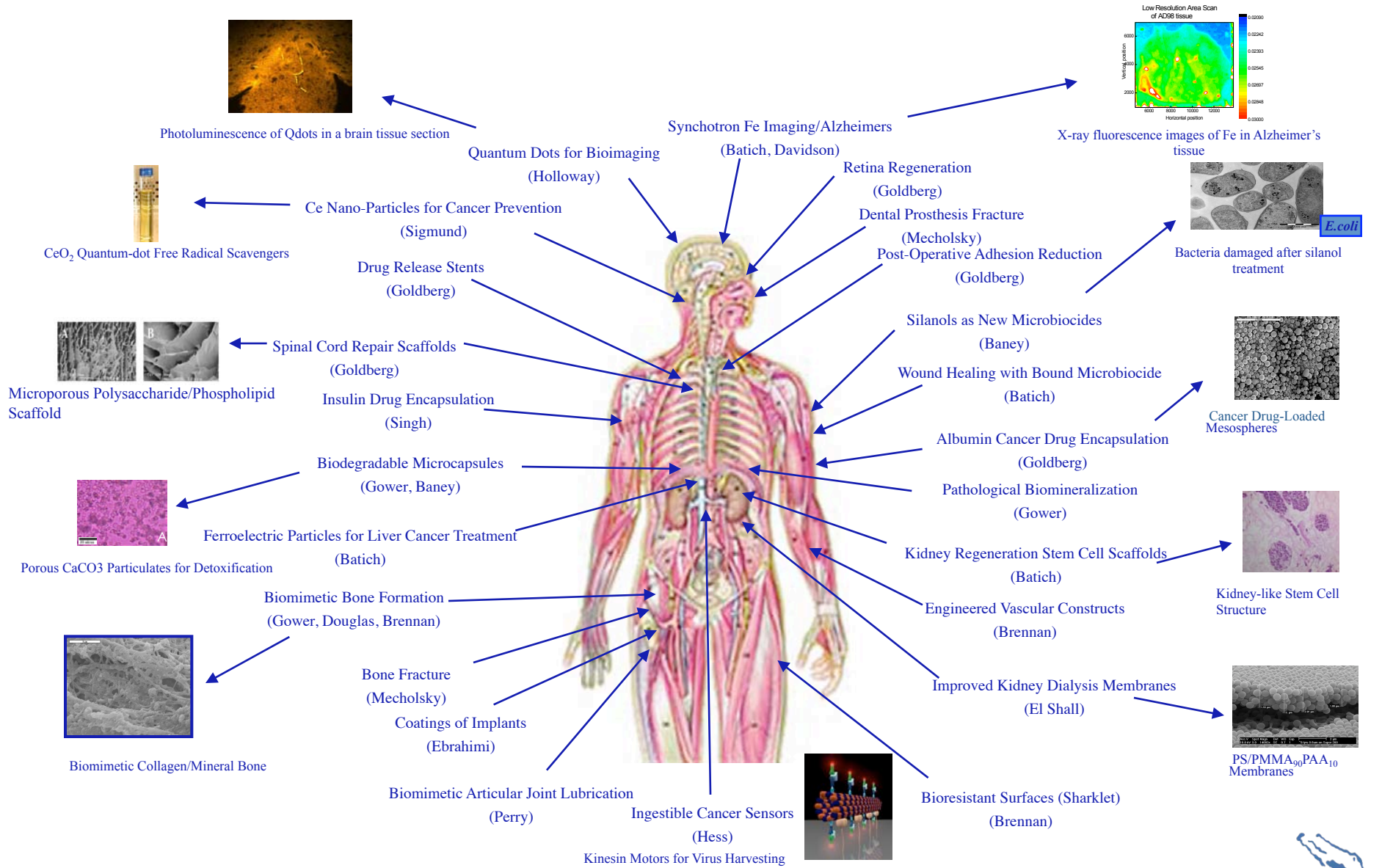
### UF-MSE is developing New Surfaces that are antibiotic

A team led by Prof. Tony Brennan has pioneered a surface of a plastic that mimics sharkskin and on which bacteria don't grow

Impact: May lead to the first structural antibiotic surface for coatings



# Biomaterials Research in UF-MSE



# Transitioning from High School to UF-MSE

- Award winning student advisors
  - Martha McDonald
  - Doris Harlow
  - Jennifer Horton
- 50:1 Student to advisor ratio
- Academic Services Office
  - 103 Rhines Hall
  - Walk-in assistance policy (8am-5pm)



# Transitioning from High School to UF-MSE

To remain on track, students must complete the appropriate critical-tracking courses, which appear in bold.

Eight critical-tracking courses are required in the first four semesters.

## Recommended semester plan

Semester 1	Credits
If you don't place out of ENC 1101, take it in the fall.	
<b>CHM 2045 General Chemistry 1 (GE-P)</b>	<b>3</b>
CHM 2045L General Chemistry 1 Laboratory (GE-P)	1
<b>MAC 2311 Analytic Geometry and Calculus 1 (GE-M)</b>	<b>4</b>
Humanities (GE-H)	3
Social and Behavioral Sciences (GE-S)	3
<b>Total</b>	<b>14</b>
Semester 2	Credits
<b>CHM 2046 General Chemistry 2 (GE-P)</b>	<b>3</b>
CHM 2046L General Chemistry 2 Laboratory (GE-P)	1
<b>MAC 2312 Analytic Geometry and Calculus 2 (GE-M)</b>	<b>4</b>
ENC 3254 Professional Writing in the Discipline (GE-C)	3
Humanities (GE-H)	3
<b>Total</b>	<b>14</b>

Semester 3	Credits
CHM 2200 Basic Organic Chemistry	3
EIN 4354 Engineering Economy (3) or MAN 3025 Principles of Management (4) or MAR 3023 Principles of Marketing (4)	3-4
<b>MAC 2313 Analytic Geometry and Calculus 3 (GE-M)</b>	<b>4</b>
<b>PHY 2048 Physics with Calculus 1 (GE-P)</b>	<b>3</b>
PHY 2048L Laboratory for PHY 2048 (GE-P)	1
Computer programming course (CGS 2421 or see adviser)	2
<b>Total</b>	<b>16-17</b>
Semester 4	Credits
EGM 2511 Engineering Mechanics - Statics	3
EMA 3010 Materials	3
EMA 3800 Error Analyses and Optimization Methodologies in Materials Research	3
<b>MAP 2302 Elementary Differential Equations</b>	<b>3</b>
<b>PHY 2049 Physics with Calculus 2</b>	<b>3</b>
PHY 2049L Laboratory for PHY 2049	1
<b>Total</b>	<b>16</b>





# Agenda

2-2:30

- What is Materials Science and Engineering? - Dr. Kevin Jones
- Transitioning from High School to MSE- Ms. Martha McDonald

2:30-3:30

- Hands On Research Experience (prospective students only)  
Prof. Jones, Manuel, Meng, Nino, Perry, and So
- Reception/Q&A for Parents  
or
- Tour Swamp and Union

3:30-4:30

- Lab Tours (Undergraduate lab, MAIC, Energy) - with current students

4:30-5:00

- The UF-MSE Undergraduate Experience - Dr. Scott Perry

5:00-whenever

- Pizza Party with Faculty and Students



# The UF-MSE Undergraduate Experience

- Expert classroom instruction
  - All classes taught by Faculty



- Small Classes
  - average undergraduate class is < 50 students
- Accredited degree program (ABET)
- Interdisciplinary education covering both science and engineering topics
- Laboratory experience/Capstone design



# The UF-MSE Undergraduate Experience

## MSE Curriculum

### Freshman

Materials Impact on Society

### Sophomore

Introduction to Materials Science  
Fundamental Principles of Materials

### Junior

Introduction to Inorganic Materials  
Introduction to Organic Materials  
Energetics and Kinetics  
Materials Laboratory  
Mechanical Behavior  
Interfacial Engineering  
Electronic Properties of Materials  
Analysis of Structures

## Outside department

General Chemistry

Physics                      Statics  
Calculus

Mechanics of Materials



# The UF-MSE Undergraduate Experience

## MSE Curriculum

### Senior

Research in Materials-All undergraduate students in MSE are required to complete a one year class entitled senior research. During this class you will work one on one with a faculty member to conduct an independent research project.

Transport Phenomena

Stability of Materials

Materials Selection

Specialty Courses in one of the following disciplines:

Electronic Materials

Ceramics

Metals

Polymeric and Bio-materials



# The UF-MSE Undergraduate Experience

## Research Opportunities

The **Research Experience in Materials (REM)** program is open to all *freshmen* and *sophomores*. Paid research position in MSE laboratories (\$10/hour) working with MSE graduate students ~10 hours/week.

The **University Scholars Program** is a research scholarship program funded by UF commonly utilized by *juniors* and *seniors* to pursue/continue research under the direction of MSE faculty.

The **Students Understanding Nanotechnology (SUN)** workshop is open to *freshmen/sophomores* during the summer between their 1<sup>st</sup> and 2<sup>nd</sup> year at UF. The 1-week workshop includes lectures, tours and hands-on experiences at Sandia National Laboratory in Albuquerque, NM. (all expenses paid)

Many universities around the US offer **Research Experience for Undergraduates (REU)** programs funded by the National Science Foundation (NSF). Summer programs typically cover the cost of travel and living as well as a stipend.



# The UF-MSE Undergraduate Experience

- Internships
- Student Societies
  - The Materials Advantage
  - American Ceramic Society
  - Society for Biomaterials
  - Materials Research Society
  - Society for Plastics Engineers
  - American Vacuum Society
  - Electrochemical Society
  - Society for Sustainable Engineering
- Scholarships
  - Award ~50 scholarships from \$200 to \$2000 annually



# The UF-MSE Undergraduate Experience

The Materials Science and Engineering undergraduate program provides students with opportunities to learn the fundamental aspects of materials science, and how to apply that knowledge to cutting edge research and technology. Our goal is that after graduation, our undergraduate students will become engineering practitioners and graduate students who are:

**Problem solvers** – using their technical skills to advance society, science and technology.

**Designers** – using their knowledge to improve systems, components or processes.

**Professionals** – using their professional skills  
To create solutions and advance their ideas.

**Role Models** – creating solutions that meet  
the needs of society.



## Conclusions

- The MSE program offers the opportunity to receive a world class education
- The MSE discipline spans science and engineering topics, detailing both fundamental and applied aspects of emerging technologies
- An MSE degree prepares you for a range of career opportunities
  - Industry
  - Graduate School
  - Medical/Law School

*Our goal today has been to give you a small sampling of what MSE is all about. We would welcome additional questions!*





# Letter to students



Department of Materials Science and Engineering

100 Rhines Hall  
PO Box 116400  
Gainesville, FL 32611-6400  
352-846-3300  
Fax 352-392-7219

March 26, 2009

Dear Future Gator Engineer

Engineers are in the business of making things – without *materials* there would be no engineering. How do you develop a plastic that will light your room or charge your IPOD; how do you make a car that goes over 100mpg on renewable fuels; how can the structure of shark's skin be replicated to prevent the spread of diseases on surfaces found in hospitals; how do you trigger bone re-growth, and thus enable deaf children to hear; how do you develop self-healing metals for tomorrows aircraft? These and many other projects are currently being explored in the laboratories of the faculty of the Materials Science and Engineering (MSE) Department at the University of Florida. Breakthroughs in new materials have enabled tremendous advances in engineering in the past. Future developments in all areas from renewable energy to advanced healthcare solutions will require new materials solutions and the brightest engineering minds.

If you are still deciding your college major, the MSE Department at the University of Florida ([www.mse.ufl.edu](http://www.mse.ufl.edu)) offers great opportunities that you should consider. *U.S. News and World Report* ranks MSE at Florida as 8<sup>th</sup> among materials program in the country. As an MSE undergraduate, you will take science and engineering courses, learning to utilize, control, synthesize, and develop materials from both fundamental *and* engineering perspectives. Graduates with MSE degrees find jobs in aerospace, automotive, biomedical, chemical, electronics, energy, consulting, legal, and telecommunications industries – virtually any industry that uses 'stuff'. In addition over half of our undergraduates go on to graduate school and we have great relationships with other top 10 programs like Berkeley, MIT, UC Santa Barbara, etc.

The MSE Department currently has an undergraduate enrollment of ~150 students – one of the largest Materials programs in the country. However, with 30+ faculty and 3 full-time advisors, you can be assured of close contact with the faculty, average class sizes of ~40, and individualized academic advising throughout your degree program. Of the undergraduate students, we are proud to note that 36% of the population is made up of women and 18% are minorities. We are also proud to offer many research opportunities for undergraduates, many starting in the freshman year. In addition, the Department offers ~50 academic scholarships ranging from \$150-\$2000 annually.

Want to find out more about materials? You and your family are invited to join us for an **MSE Open House**. You can choose between two dates – **Sunday** afternoon **May 17 or June 28** from 2:00-5:00 p.m. During your visit, you will learn about exciting new developments in materials, participate in hands-on materials demonstrations, meet current MSE undergraduates, and enjoy a free pizza supper with students and professors. A special reception will also be available for parents during the laboratory demonstrations. Advance registration is required for the visit day as space is limited. For registration information please go to <http://www.mse.ufl.edu/students/prospective/undergraduate/highschool>.

The Foundation for the Gator Nation  
An Equal Opportunity Institution

U N I V E R S I T Y O F F L O R I D A  
M A T E R I A L S S C I E N C E A N D E N G I N E E R I N G

We look forward to meeting you at the open house in either May or June. If you have any questions about our department or the open house, please feel free to contact Meredith Shadwill at [mshad@mse.ufl.edu](mailto:mshad@mse.ufl.edu) (phone 352-846-3305). We look forward to meeting you.

Sincerely,

Dr. Kevin S. Jones,  
Professor and Chair

## Save This Date!!!

May 17 or June 28, 2009

MSE OPEN HOUSE

Come join us for a fun afternoon, play in a lab, tour labs that are working on world record fuel cells that could enable cars to get over 100 mpg on renewable fuels, harvest energy with novel ceramics, store energy in new materials, or convert sunshine to electricity using plastics. Come visit and find out why Materials Science and Engineering at UF is ranked among the top undergraduate MSE programs in the nation!

Advance registration is required. Please complete the online registration form at <http://www.mse.ufl.edu/students/prospective/undergraduate/highschool> by May 11 or June 22 respectively to let us know you will be attending. We will be meeting in Room 125 of Rhines Hall on the University of Florida Campus. A map to Rhines Hall and where you can park can also be found on the website.

**Sunday, May 17 or June 28, 2009**

- |               |   |
|---------------|---|
| 1:45 p.m.     | Sign in and receive visitor folder                |
| 2:00-2:30p.m. | Introduction to Materials Science and Engineering |
| 2:30-3:30p.m. | Hands-on materials demonstrations*                |
| 3:30-4:30p.m. | Lab tours with undergraduates                     |
| 4:30-5:00     | Question and answer with academic services        |
| 5:00          | Free pizza with undergraduates and professors     |

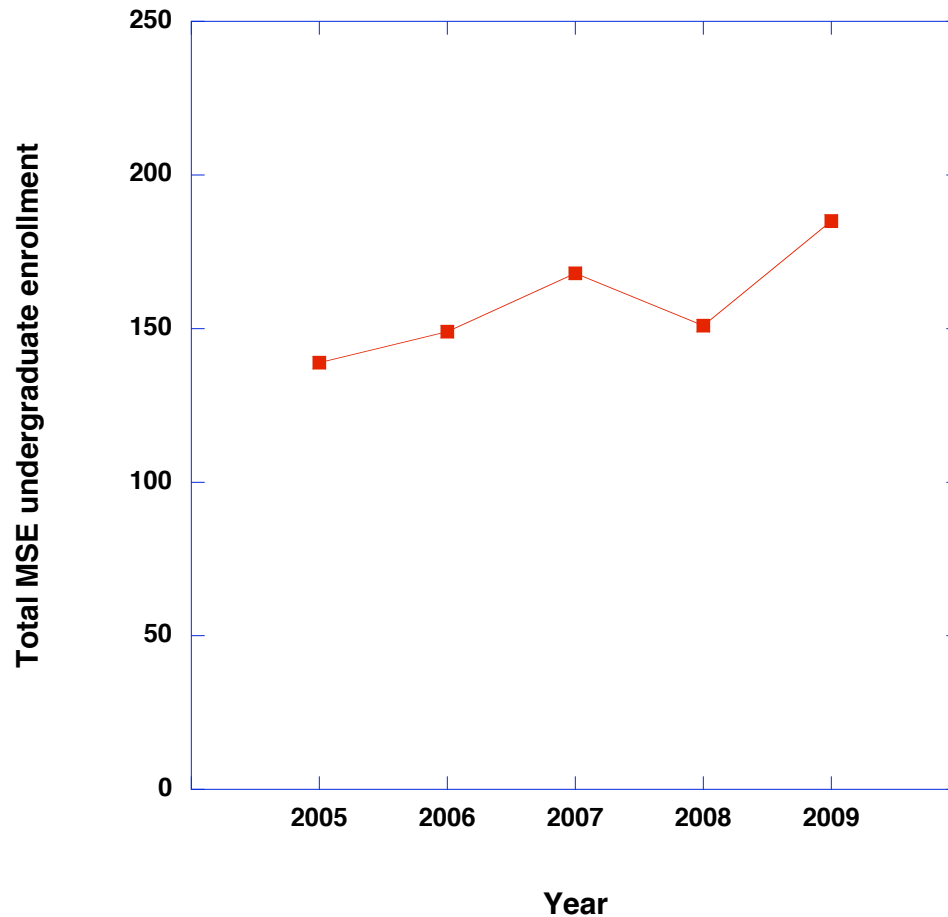
\*see application on the website and choose from one of the five options listed

GO GATORS!!!!



# Effect of Open House on Enrollment

University of Florida



- 2009 1<sup>st</sup> year of Open House
- ~80 students attended  
2 open houses
- **Incoming Freshman class:  
Jumped by 50%**  
  
Exceeds 60 students
- Goal ~70 new UG's per year
- Goal Total 250-300 undergraduates



# Conclusions

- The open house works
- We expect to increase our average incoming class to ~70/year or ~280 total
- It involves only 2 Sunday afternoons
- Its Cheap (pizza)
- I'd be happy to send you our slides, just email me (Kevin Jones) at

[kjones@eng.ufl.edu](mailto:kjones@eng.ufl.edu)

Or if you prefer I will email it to the list of attendees

