



# FACULTY *of* ENGINEERING

AN INTERDISCIPLINARY APPROACH TO ENGINEERING AT THE UNIVERSITY OF GEORGIA

## **TOWARDS 2010: COMPREHENSIVE ENGINEERING AT UGA A SUMMARY OF THE APRIL 2001 SYMPOSIUM OUTCOMES AND ACTIONS**

The purpose of the April 2001 Symposium was to engage University of Georgia faculty from across campus in a daylong effort to identify interdisciplinary engineering initiatives of significance and to articulate ways in which Comprehensive Engineering will strengthen a range of University of Georgia programs. More than 100 faculty representing 9 of the 12 UGA Colleges/Schools participated in the event.

Objectives of the Symposium included:

- exploring the range of engineering expertise and activity across the UGA campus,
- identifying coherent themes or areas of opportunity in engineering specific to UGA as the institution's capabilities are extended in related fields,
- articulating the ways in which Comprehensive Engineering at UGA will strengthen the institution,
- accelerating internal discussion and interactions that contribute to the development of an active, interdisciplinary faculty of engineering at UGA.

*Toward 2010: Comprehensive Engineering at UGA* served as a springboard for the development of the Faculty of Engineering. Several of the concepts and intellectually coherent themes articulated at the Symposium are becoming the core initiatives of the Faculty of Engineering.

Following is a summary of the April 2001 Symposium *Toward 2010: Comprehensive Engineering at UGA*.

## HIGHLIGHTS OF THE APRIL 2001 SYMPOSIUM FOR THE ADVANCEMENT OF ENGINEERING AT UGA

In her remarks to open the Symposium, Dr. Karen Holbrook, Sr. Vice President for Academic Affairs and Provost, said:

“Building engineering at UGA is going to make a major difference in many disciplines. Strong science programs increasingly require engineers and engineering expertise.”

“Fields like pharmaceutical engineering and nanotechnology exemplify the convergence of scientific and engineering disciplines.”

“We may be better off without a traditional School of Engineering to overcome . . . better positioned to devise new approaches to serve a changing world.”

Thirteen faculty members highlighted engineering opportunities in research, graduate studies, teaching and outreach. Their perspectives represented the disciplines of physics, chemistry, pharmacy, molecular biology, veterinary sciences, computer science and mathematics, ecology, marine science, natural resources, textile science, food science, business, education and engineering. Presenters identified opportunities and the potential for advancing engineering by adopting novel approaches. One speaker asked the University academic departments to help “raise engineers” on campus by hiring faculty that can contribute to applied sciences and engineering.

Dr. John Watson, a member of the National Academy of Engineering and an eminent scientist with degrees in engineering and human physiology noted, “Engineering is not just for engineers anymore and biology is not just for biologists.” Dr. Watson heads a prominent bioengineering program at NIH and advocated for interdisciplinary engineering approaches.

Breakout sessions identified the following engineering programs in the Life Sciences, Health, Information and Communication, Environmental Studies, Natural Resources, and Education. By considering reports of the sessions, the Symposium Committee identified the following interdisciplinary engineering program areas:

**Nanotechnology** - Includes aspects of manipulating particles at nano-level for applications in life sciences and bioengineering. Subjects include: micro-fluidics, nano-array, single molecule manipulation, etc. in biological and non-biological materials.

**Pharmaceutical Engineering** - Topics include drug design and delivery; diagnostic tests and devices; screening for toxicity; efficacy and stability; scale-up operations; processing and extraction of beneficial compounds; and others. Also included are pharmaceutical engineering certificate and industrial partnership.

**Informatics** - The area includes application of computational techniques (mathematical, statistical, algorithmic, artificial intelligence, and others) of identifying information from data and observations for discovering knowledge. Some areas that are of special interest to the University of Georgia are:

**Bio-Infomatics** - Derive information from complex data/observations of biological systems at molecular-levels.

**Eco-Infomatics** - Derive information from complex data/observations from ecological systems and by patterns of relationship in landscapes.

**Bio-Imaging** - Derive information from images obtained at micro- and nano-levels of biological systems, such as in bio-imaging (MRI, PET gene-sequencing, etc.), 2-D and 3-D images and others.

**Geo-Imaging** - Deriving information from images obtained at landscape- and geographical-levels of natural resources and demographics, and for visualization.

**Sensors and Controls** - This area includes all developments, which can extend human's ability to sense critical aspects of a system. Develop monitoring and control systems and design systems for early intervention for desired goals.

**Marine Engineering** - This area includes engineering opportunities with marine systems and coastal areas. Some topics of interest identified are structures and devices for data collection and monitoring, development of monitoring structures, harvesting products of the oceans and outreach for economic development of coastal areas.

**Metabolic Engineering and Bioconversion** - Designing metabolic pathways, fermentation technology, increase yield and productivity of biological products.

**Ecological Engineering** - Research and graduate studies for developing engineering science knowledge and principles based on holistics approach central to ecological systems concepts.

**Food Engineering** - This area includes many opportunities in handling and processing food in the fast changing consumer needs. Food quality, safety, the readiness for consumption, process control and postharvest handling systems are opportunities for UGA.

**Business and Policy** - Opportunities for developing academic programs based on the similarities between business and engineering in quantitative analysis and problem solving. Also, engineering analysis and modeling for evaluating consequence of proposed policy is useful in policy development.

Work groups formed to identify UGA faculty and tasks leading to the establishment of engineering programs in the above listed program areas.

Follow-Up: The Symposium planning committee is forming task groups with timelines for developing programs in the fields identified above, as well as developing initiatives such as:

- A University-wide Grant Program for collaborative, interdisciplinary Engineering
- A Pharmaceutical Engineering Certificate Program
- A second Symposium to gather industry input about Engineering needs