

Biological + Environmental Engineering

CORNELL ENGINEERING

Degree Programs and Research Areas

- ABET-accredited undergraduate programs in Biological Engineering and Environmental Engineering (Environmental Engineering ABET accreditation pending, Fall 2008)
- Master of Engineering (BEE)
- Master of Professional Studies (Agriculture)
- MS and PhD programs

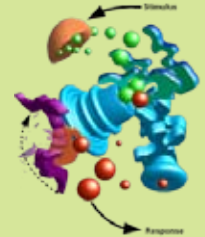
Members of our faculty have been instrumental in the development of international education programs. Professor Norman Scott serves as chairman of the University Consortium for Chinese Agriculture and Professor Tammo Steenhuis is an organizer of an MPS program at Bahir Dar University in Ethiopia (Cornell University's 1st degree program in Africa).

Our faculty performs research in the general areas of Biological Engineering and Environmental Engineering. BEE faculty members lead programs in cellular and molecular bioengineering, nucleic acid engineering (e.g. dendrimers), bioanalytical devices (e.g. dipstick immunoassays), animal physiology, preferential flow, variable area hydrology, and bioprocessing related to the production of biofuels and bioproducts.

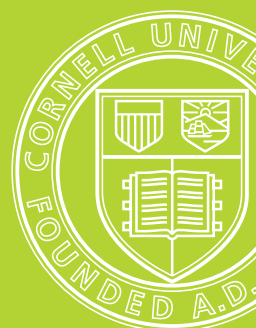
The BEE OSP expenditures for 2007 were \$2.3M. Bioenvironmental activities are focused on water and watershed management (projects totaling \$4M). Innovative biotechnological studies that are continuing to expand include biosensors (\$2M) and using synthetic DNA (\$2.2 M). The most significant new thrust is bioenergy, especially biofuels, which includes the NE Regional SunGrant (\$6M). Other research and outreach programs include metabolic engineering, modeling and measurement of physiological processes, controlled environment agriculture, aquaculture, and waste management.

Trends

We have moved from application of engineering in living systems to integration of biology and environmental science into engineering. Our industry focus ranges from agriculture to bio-based. Our faculty is changing to focus on objects at molecular and cellular levels while using new and innovative engineering methodologies and technologies, including nanobiotechnology.



**Metabolic Engineering
(March)**



Achievements

Educational: Our undergraduate program has tripled (now 400 students) in the past 10 years. An undergraduate environmental engineering program has been developed with CEE and is being evaluated for ABET accreditation. We are developing international degree programs.

Facilities: Two wings of BEE's home, Riley Robb Hall, have been transformed into modern biological and environmental engineering research facilities, including a state-of-the-art Biofuels Research Laboratory for biomass pretreatment, enzymatic conversion of cellulose to sugar, fermentation of mixed sugar streams, and use of these processes on New York State energy crops.

Priorities/Goal

Education: Balance undergraduate programs, develop UG laboratory courses and a larger selection of graduate courses.

Research: Grow the sustainable energy and biomaterials programs.

Infrastructure: Develop undergraduate lab teaching facilities.

Diversity: Increase diversity of our faculty, staff and students.

Challenges

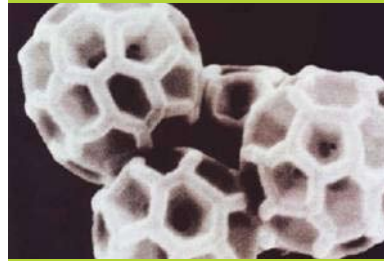
Due to the difficult economic times, we will need to be thoughtful in the selection process and cooperative in our approaches to research, education and outreach. We are fortunate to have new facilities and an aggressive faculty willing to take on the task of finding funding to support our goals and opportunities.

Opportunities

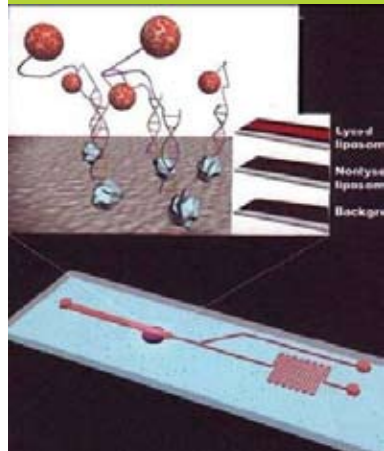
Water: Improve sustainable access to sufficient good quality water for human consumption and agricultural use.

Energy: Develop sustainable bioenergy systems compatible with the environment and improve the economy of communities.

Food: Ensure a safe and sustainable supply of food for human and agricultural consumption.



Nanometer-sized buckyballs and DNA hydrogel (Luo)



Microfluidic biosensor with liposome lysis fluorescence signal enhancement (Baemner)