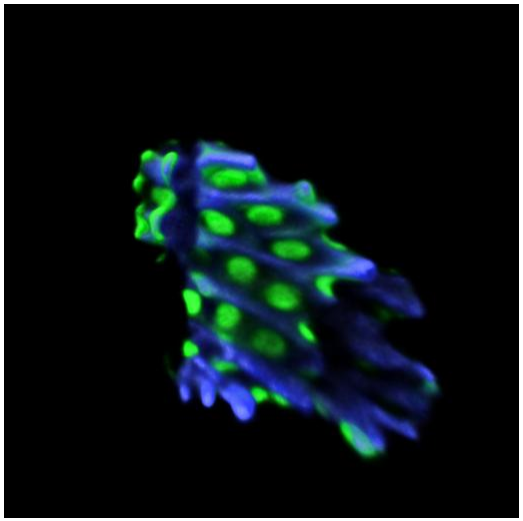
Some Late Nights Thoughts While Listening to Thelonious Monk

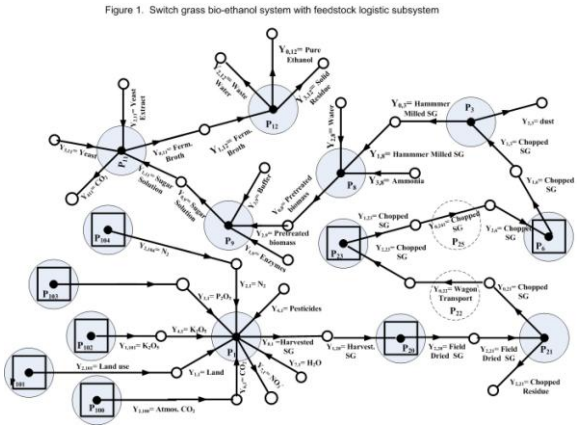
Dr. Larry P. Walker
Professor
Department of Biological and Environmental Engineering
Director of the North East Sun Grant Institute of Excellence
Director of Cornell Biofuels Research Laboratory
Cornell University

Major Premise

Agriculture will increasingly provide the raw materials and energy needed to drive our transition to a sustainable world.

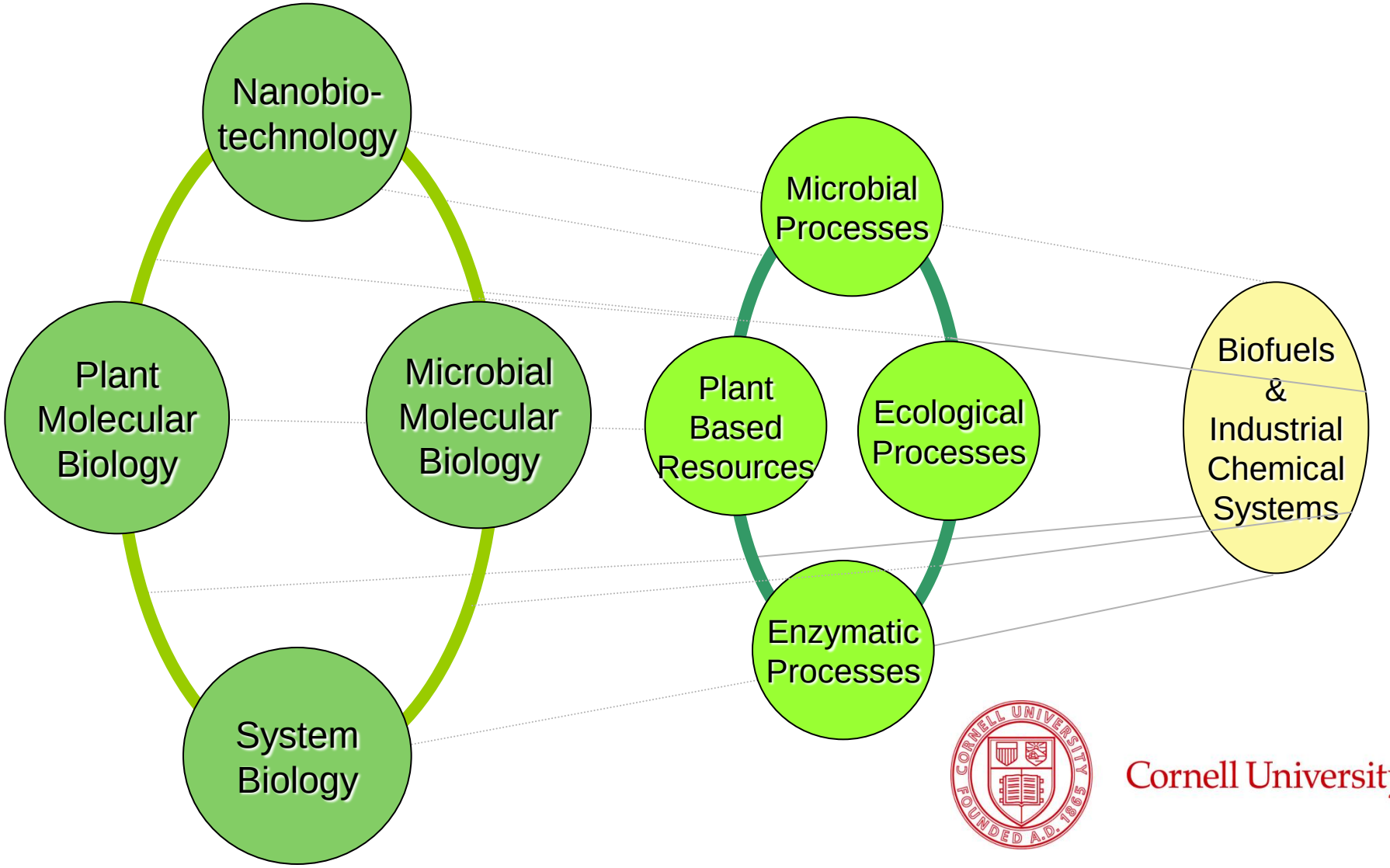
Good Science and Engineering





- genomics
- proteomics
- protein engineering
- system biology
- molecular modeling
- nanobiotechnology
- advanced materials
- advanced bioreactors
- more sophisticated control systems
- advance systems engineering tools

Integrating Knowledge and Methods from Basic and Applied Sciences for a Mission



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Major Subsystems of Sustainable Agricultural Based Energy System

BIOMASS PRODUCTION

FEEDSTOCK LOGISTICS

CONVERSION TECHNOLOGY

Innovative in How We Network Transformation Processes

How do we integrate structural and dynamic aspects of natural ecology in our design of industrial ecology?

Some Principles of Ecosystem Design

An ecosystem model implies an evolutionary process as a major organizing principle:

- Components come into existence at different times and are therefore in different stages of their evolutionary history.
- New components coexists with mature products and with other on their way to extinction.

Number of tractors on farms exceeds the number horses and mules for the first time in 1954

Some Principles of Ecosystem Design

An ecosystem model assumes that the system is not the results of centralized planning or any systematic design process:

- "Natural selection acts more rapidly and most forcefully at the small scales, where feedback loops are tight...".
- Evolutionary processes do not necessarily produce optimum outcomes –they produce satisfactory outcomes.

Dealing with Complexity!

"For every complex problem there is a simple, and often wrong, solution!"