

The research for using plants to decontaminate the soil is already well along. Middleport could be using these “green” methods rather than the destructive measure of cutting all trees and bulldozing.

<http://www.nysaes.cornell.edu/hort/faculty/harman/>



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Gary E. Harman

Professor

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1970 **Ph.D.** Plant Pathology, Oregon State University

1966 **B.S.** Botany, Colorado State University

Division of Effort - Research-100%, Biological control and biological plant productivity enhancement, fungal and plant molecular biology, biological remediation of pollution, uses of enzymes for commercial processes.

A major focus is entrepreneurial translation of basic research to commercial reality.

Program Overview

Recent research of plant-microbe interactions in this lab and elsewhere have changed fundamentally our view of interactions between the fungi in the genus *Trichoderma*, other microbes and plants. These organisms have long been known as biocontrol agents and strains developed in this lab are widely sold commercially for these purposes. Recent discoveries indicate that they are opportunistic avirulent plant symbionts. They induce systemic resistance to diseases in a wide variety of plants. They also enhance root and plant growth and confer resistance to abiotic plant stresses. Proteomic research indicates that they dramatically change the plant proteome and the plant-microbe interaction is strongly influenced by plant genotype, at least in maize. We intend to discover the basis of these changes through examination of changes in the fungal and the plant gene expression and proteome. These basic findings are being immediately translated to agricultural practice through associations with two companies who are funding and cooperating with applied aspects of this research. Through cooperative grants and coordinate research, improvements in delivery and application systems are being directly developed.

Trichoderma spp. also produce enzymes that degrade environmental pollutants such as cyanide and polyphenolic compounds. The abilities of these fungi to enhance root development, plant growth and uptake of materials from soil are expected to enhance phytoremediation. Thus, there are numerous applications to alleviation of pollution of soil and water. Several demonstration/proof-of-concept trials are underway to examine these capabilities in the US and in Europe, including arsenic removal from the future site of the Cornell Venture Center in Geneva.

These fungi also produce other enzymes that of interest. We are developing systems using synergistic mixtures of fungal and bacterial chitinases for production of the nutraceutical N-acetylglucosamine, which has value for treatment of inflammatory bowel disease, including Chron's disease, osteoarthritis and ulcerative colitis. The technology has been fully developed at the lab scale and we expect scale-up to begin in 2004, probably in a facility located in Geneva. There are two primary goals of the remainder of my career at Cornell, as follows:

1. To understand the interactions between *Trichoderma* spp., plant and pathogenic microbes, and
2. To translate most of the technology developed in my laboratory over the past 30 years to

commercial reality.

Links

Affiliated companies: [ABM](#); [BioWorks](#)

Curriculum vitae and publication list

[Full CV and complete publications](#)

[Short CV](#)

[Important Publications \(pdf files\)](#)

Research and development topics

Biological control systems

Plant-Microbe interactions

Remediation of polluted soils and waters

Enzymes and their uses

Transgenic plants

Professional Experience

- Various management roles including Acting CEO.

Phytobials, LLC and LTD; sister companies in the US and Europe that intend to become the principal global provider of unique, low cost, and green microbial-plant remediation systems.

- Co-principal inventor
- Cofounder, with responsibilities for securing funding, arranging for collaborations with other academic and corporate partners and providing major input into company structure and the business plan.

Advanced Biological Marketing, a company that markets and produces microbial products for the row crop (e.g., maize and soybeans) market.

- Inventor of key technologies
- Consultant

Biomarinex, a company that is seeking to market N-acetylglucosamine as a nutraceutical.

- Co-principal inventor
- Consultant, including assistance in obtaining Ontario County and NYS funds to match those provided by the Canadian government

Professional Activities

Professional Societies

American Phytopathological Society
American Association for the Advancement of Science
Sigma Xi

Research Leaves

1980 Colorado State University
1990 Agricultural University of Norway

Professional Assignments, Honors, and Awards

Fellow, American Phytopathological Society
Award of Merit in Plant Pathology, American Phytopathological Society, NE Div.
Visiting Professor, Colorado State University
Visiting Professor, Agricultural University of Norway.

University and College Committees

Provost's Life Sciences Advisory Council
Scientific Advisory Board, Cornell Biotechnology Program

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