SUNY Center for Applied Microbiology

SUMMARY REPORT
2005-2011
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SUNY-Center for Applied Microbiology at SUNY-College of Environmental Science and Forestry, Syracuse, New York

The SUNY-Center for Applied Microbiology (CAM) was established at the SUNY College of Environmental Science and Forestry (ESF) in 2005 by a generous donation from Dr. Chin Yang, who received his PhD in Mycorrhizae and Mycology from ESF working with Dr. Hugh Wilcox and Dr. Chun Wang. Dr. Wang is currently an emeritus faculty member in the Department of Environmental and Forest Biology and a mycologist of international stature.

Center Goals

In order to establish the CAM as a successful research center at ESF, several goals have guided the vision and direction of the center since its inception. These goals include:

• To nurture and encourage high quality research in the field of microbiology, to
• Increase the prestige and recognition of the institution, its faculty and its students by publishing notable research in recognized, professional publications, to
• Secure significant new research funding from external sources, leveraging the CAM’s base fund as an investment, to
• Engage and develop multidisciplinary partnerships among leading faculty researchers at ESF focusing on applied microbiology, to
• Provide opportunities for students to engage in research of significance in the field of microbiology, and to
• Purchase special equipment essential to conducting research in the field.

Near-Term Goals for the SUNY Center for Applied Microbiology

• Establish working relationships with local environmental engineering companies who routinely deal with microorganisms and their processes. The companies could include O’Brien and Gere, Galson and Galson, Stearns and Wheeler, Albany Molecular Research Institute, and others. Projects could include the use of microorganisms for bioremediation strategies, degradation/detoxification of munitions stored at military facilities, and detection of biological agents with potential use in terrorist activities for contamination of aquatic resources and food supplies.

• Reaching out to Upstate Medical University to identify collaborative relationships which will bridge the gap between environmental and medical pursuits. Some of this
• has already been initiated with research on the interaction between indoor air quality (fungal contamination) and allergies, as well as research on mycobacteriosis and zebrafish, a well-known workhorse for biomedical research.

• Establish a physical presence at the Biotechnology Research Center (construction anticipated to be complete by July, 2012). The Center for Applied Microbiology could function as a resource for incubator companies who will lease and occupy space within the building. The Center could assist companies by providing consulting expertise and use of equipment in all things microbiological, biochemical, and molecular. Availability of such technical support could serve as a draw for companies seeking research space to develop and extend their original technologies.

• Continue to expand the Center membership by attracting highly qualified researchers from ESF as well as Syracuse University and Upstate Medical University who will contribute to the Center as members, and participate in collaborative investigations. Such collaborations can also include corporate entities such as Bristol-Myers Squibb and Albany Molecular who have considerable microbiological expertise and function in applied microbiology with considerable resources.

**Significant Accomplishments by Members of the Center for Applied Microbiology 2005-2011**

Since 2005, the faculty members comprising the CAM have grown from the original three to six, and all six have active research programs in applied microbiology.

**Dr. Susan Anagnost** – Chair, Department of Sustainable Construction Management and Engineering: ultrastructure and molecular biology of wood-degrading fungi.

**Dr. John Fieschko** – Department of Paper and Bioprocess Engineering: physiology and bioprocess engineering of fuel-producing microorganisms.

(*Dr. Fieschko recently left SUNY-ESF to assume a position with a biotechnology company in southern California).
**Dr. James Nakas** – Department of Environmental and Forest Biology: production of fuels and biodegradable polymers from renewable resources.

**Dr. Christopher Nomura** – Department of Chemistry: physiology and molecular biology of microorganisms producing biodegradable polymers.

**Dr. Chun Wang** – Department of Environmental and Forest Biology: biology of microfungi and applied mycology.

**Dr. Christopher Whipps** – Department of Environmental Forest Biology: physiology and molecular biology of disease-causing microorganisms.

- During the five year time frame for this report, a total of $7,481,000 in research funds was awarded to the six members of the Center. In addition, 56 research papers were published in scientific journals during this period (11 per year).

- Demonstration that biodegradable plastics, with properties similar to polypropylene, can be produced from glycerol, a byproduct of the biodiesel industry. US patent application submitted Nov. 23, 2011.

- Demonstration that xylose from wood, in combination with levulinic acid, can be used as carbon sources for the microbiological synthesis of a co-polymer containing both butyric and valeric acids as monomers. European patent issued Nov. 11, 2008 (Eur. Pat. No. 1585821).
Established a collaboration with Tessy Plastic Corporation for the use of microbially-derived biodegradable polymers (from biodiesel-glycerol) for injection molding processing for the production of biodegradable medical products.

During this time interval, members of the CAM have secured funding from the National Science Foundation, the US Department of Energy, New York State Energy Research and Development Authority, the US Department of Agriculture, Oregon State University via the National Institutes of Health, the Alaska Fish and Game Department, and several corporate entities including Hilliard Corporation, Blue Highway LLC., Welch Allyn Inc., and O’Brien and Gere Engineers.

Wood-inhabiting Microfungi of New York. This project was funded by the New York State Biodiversity Research Institute and the Nature Conservancy, 2007-2009. The SUNY Center for Applied Microbiology provided summer stipends for student research assistants and the final report was completed in August 2010. This report is now available online: [http://www.esf.edu/nymicrofungi/](http://www.esf.edu/nymicrofungi/).

This report is an inventory and distribution record of wood–inhabiting conidial fungi collected primarily from northern hardwood forests and a few conifer plantations in 24 counties of New York from 1965 to 2004 and 2008. A small number of collections from Massachusetts, Vermont, Indiana, Ontario, Canada, and Wales, UK are included.

A total number of 2,036 collections, representing 166 genera and 297 species, are listed alphabetically in the text. Distribution of each species is presented in table format and in GIS maps (total of 175 maps). Keys to species for genera with multiple species were prepared and photomicrographs of already published species are included.

Considerable progress has been made in advancing the basic understanding of the molecular biology regulating the production and yield of PHA polymers to bring this technology to a more economically-competitive level with petroleum-derived plastics.

CAM funds were used to supplement an award from the US Environmental Protection Agency to simultaneously detect opportunistic, pathogenic, and wood-decay fungi in buildings using a membrane-based DNA technique.
• Researchers described the importance of spores from basidiomycete fungi as major components of indoor air. Previously, these fungi were typically ignored in studies of indoor aeromycology due to difficulties in identifying this group in air samples.

• Significant advances have been made in elucidating the role of bacterial biofilms in the mycobacterial infections of fishes.

• Two new PCR-based diagnostic tests have been developed for the detection of *Mycobacterium* species and the delineation of pathogenic and non-pathogenic species.

• A review paper on mycobacteriosis in zebrafish, used for biomedical research, will be published in the next issue of ILAR (Institute for Laboratory Animal Research Journal).

Grants Obtained by Members of the SUNY Center for Applied Microbiology 2005-2011

**Susan B. Anagnost**

Biomass Blueprints: Constructing Photocatalysts from Cellulosic Templates
Co-Principal Investigator
SUNY-ESF/Seed Grant Program
$7,577
01-Mar-2010 – 30-Jun-2011

Application and Demonstration of Macroarray Analytical Techniques for the Detection of Fungal Bioaerosols in Buildings
Bluepoint Environmental LLC
$41,541.00
01-Jan-2008 -- 30-Apr-2009

Membrane-based DNA Technique to Simultaneously Detect Opportunistic, Pathogenic and Wood-decay Fungi in Buildings
Syracuse Center of Excellence
$100,000.00
01-May-2007 -- 30-Apr-2009

Unrestricted Research in Construction Management & Wood Products Engineering
Multiple Sponsors
$31,242
01-Jul-2003 -- 31-Mar-2009
Developing a Method to Distinguish True from False Heartwood in Sugar Maple
USDA Forest Service
$26,991.00
01-Aug-2006 -- 31-May-2008

Sustainable Innovations in the Built Environment Project Initiative # 4
Co-Principal Investigator
Syracuse University
$20,000.00
01-Jul-2008 -- 30-Jun-2010

Green Buildings and Practices: LEED Accredited Professional Core Principles
Co-Principal Investigator
Multiple Sponsors
$9,435.96
25-Aug-2009 -- 27-Jun-2010

Predicting the Size of Discolored Hearts of Sugar Maple
Co-Principal Investigator
USDA Forest Service
$100,523.00
01-Aug-2005 -- 31-Jul-2009

A Collaborative Initiative to Advance High Technology: Developing Skilled American Workers
Co-Principal Investigator
Manufacturer's Association of Central NY Inc. via US Department of Labor
$809,830
05-Jan-2004 -- 04-Jan-2009

Identification of Unknown Fungal Isolates for Survey Completion and Refinement of DNA
New York Indoor Environmental Quality Center, Inc.
$200,000
01-Sep-2004 – 31-Aug-2007

Chemical and Structural Changes in Decaying Wood Observed by Magic Angle Spinning NMR
Co-Principal Investigator
USDA-CSREES/ McIntire Stennis Program
$76,488
01-Oct-2004 – 30-Sep-2007
John C. Fieschko

The Use of Microporous Ceramic Composite Membrane Technology in the Improvement of Biofuels and Bioproducts Production
Hilliard Corporation
$190,000.00
27-Jul-2007 -- 30-Apr-2011

Conversion of Dairy and Biodiesel Waste Products to Omego-3 Fatty Acids Lipids for Biodiesel
NYS Energy Research and Development Authority
$75,000.00
01-May-2009 -- 31-Mar-2011

Production and Evaluation of a Food Grade Yeast from Cheese Whey Permeate
NYS Energy Research and Development Authority
$75,000.00
02-Jun-2008 -- 31-Oct-2009

Manufacture and Use of Biodegradable Polymers in Medical Applications
Blue Highway LLC
$75,000.00
01-May-2008 -- 30-Apr-2009

Performance Testing of a Novel Bioreactor for Ethanol Production from Cheese Whey
NYS Energy Research and Development Authority
$75,000.00
28-Jan-2008 -- 27-Jul-2008

Biodegradable Plastics from Renewable Sources for Manufacturing Medical Products in CNY
Co-Principal Investigator
Blue Highway LLC
$350,000.00
08-Oct-2008 -- 31-Dec-2011

Central New York Biotechnology Symposium 2011
Co-Principal Investigator
Multiple Sponsors
$3,411
01-Feb-2011 -- 01-Dec-2011
Central New York Biotechnology Symposium 2010 - Cultivating Economic Growth
Co-Principal Investigator
Multiple Sponsors
$9,388.46
13-Nov-2009 -- 29-Oct-2010

Advances in Bioprocessing: Cultivating Economic Growth
Co-Principal Investigator
Multiple Sponsors
$7,360.22
01-Jul-2008 -- 11-Sep-2009

James P. Nakas

“Biodegradable Plastics from Renewable Sources for Manufacturing Medical Products in CNY”
Blue Highway LLC
$350,000.00
08-Oct-2008 -- 31-Dec-2011

Center for Applied Microbiology
ESF College Foundation
$24,355.00
01-Jul-2010 -- 30-Jun-2011

Hydrogen Research
Antek Incorporated
$32,924.00
01-Jul-2006 -- 31-Dec-2010

Center for Applied Microbiology
ESF College Foundation
$26,100.00
01-Jul-2009 -- 30-Jun-2010

Novel PHA’s from New York's Renewable Resources
NYS Energy Research and Development Authority
$40,000.00
29-Jan-2007 -- 31-Dec-2009

Hot Water Extraction of Hardwood Chips and Utilization of the Residual Chips and Wood
Co-Principal Investigator
US Department of Energy  
$2,201,625.00  
01-Oct-2007 -- 31-May-2011

The Use of Microporous Ceramic Composite Membrane Technology in the Improvement of Biofuels and Bioproducts Production  
Co-Principal Investigator  
Hilliard Corporation  
$190,000.00  
27-Jul-2007 -- 30-Apr-2011

Production of Value-added Biodegradable Plastics from New York State's Low-value Biodiesel Process-Glycerin  
Co-Principal Investigator  
NYS Energy Research and Development Authority  
$74,983.00  
25-Jul-2007 -- 01-Jun-2010

Production and Evaluation of a Food Grade Yeast from Cheese Whey Permeate  
Co-Principal Investigator  
NYS Energy Research and Development Authority  
$75,000.00  
02-Jun-2008 -- 31-Oct-2009

Lyonsdale Biorefinery/Ethanol Pilot Plant  
Co-Principal Investigator  
O'Brien and Gere Engineers  
$1,000,000.00  
01-Jan-2007 -- 30-Jun-2009

Manufacture and Use of Biodegradable Polymers in Medical Applications  
Co-Principal Investigator  
Blue Highway LLC  
$75,000.00  
01-May-2008 -- 30-Apr-2009

Woody Biomass Project at SUNY ESF  
Co-Principal Investigator  
US Department of Energy  
$674,000.00  
01-Jan-2006 -- 30-Jun-2008
Christopher Nomura

Production of Polyhydroxyalkanaotes with Defined Repeating Unit Composition  
NYS Energy Research and Development Authority  
$75,000  
01-Jun-2012 – 31 May-2014

Protein and Metabolic Engineering for the Production of Biodegradable Plastics  
National Science Foundation  
$378,000.00  
01-Jul-2009 -- 30-Jun-2012

Unrestricted Research in Molecular Biochemistry  
ESF College Foundation  
$30,000.00  
01-Apr-2006 -- 30-Jun-2011

Production of Value-added Biodegradable Plastics from New York State's Low-value Biodiesel Process-Glycerin  
NYS Energy Research and Development Authority  
$74,983.00  
25-Jul-2007 -- 01-Jun-2010

Efficient Production of Biodegradable Polyesters by Transgenic Plants Using Newly Developed Enzymes  
Hokkaido University  
$42,718.53  
30-Nov-2006 -- 20-Mar-2008

Efficient Production of Biodegradable Polyesters by Transgenic Plants Using Newly Developed Enzymes Involved in Polyester Synthesis  
Tokyo University of Science  
$120,590.00  
30-Nov-2006 -- 20-Mar-2008

Biodegradable Plastics from Renewable Sources for Manufacturing Medical Products in CNY  
Co-Principal Investigator  
Blue Highway LLC  
$350,000.00  
08-Oct-2008 -- 31-Dec-2011

Hot Water Extraction of Hardwood Chips and Utilization of the Residual Chips and Wood  
Co-Principal Investigator
US Department of Energy
$2,201,625.00
01-Oct-2007 -- 31-May-2011

Manufacture and Use of Biodegradable Polymers in Medical Applications
Co-Principal Investigator
Blue Highway LLC
$75,000.00
01-May-2008 -- 30-Apr-2009

Woody Biomass Project at SUNY ESF
Co-Principal Investigator
US Department of Energy
$674,000.00
01-Jan-2006 -- 30-Jun-2008

C.J.K. Wang

Identification of Unknown Fungal Isolates for Survey Completion and Refinement of DNA
Co-Principal Investigator
New York Indoor Environmental Quality Center, Inc.
$200,000
01-Sep-2004 -- 31-Aug-2007

Wood-Inhabiting Microfungi (molds) of New York
Nature Conservancy
$25,536.00
01-Apr-2007 -- 31-Mar-2009

Membrane-based DNA Technique to Simultaneously Detect Opportunistic, Pathogenic and
Wood-decay Fungi in Buildings
Co-Principal Investigator
Syracuse Center of Excellence
$100,000.00
01-May-2007 -- 30-Apr-2009

Christopher M. Whipps

Characterizing Mycobacterium Species from Zebrafish and Diagnostic Development
Oregon State University via National Institute of Health
$60,000.00
01-Mar-2010 -- 31-May-2012
PCR Analysis of Chinook Salmon
Alaska Department of Fish and Game
$4,485.00
06-Oct-2008 -- 01-Apr-2009

ARRA Renovation of Wet Labs and Cyber-Infrastructure to Enhance Integrated Research and Teaching in Aquatic Science at SUNY ESF
Co-Principal Investigator

National Science Foundation
$1,470,000.00
01-Oct-2010 -- 30-Sep-2013

Fish and Wildlife Diagnostic Services
Multiple Sponsors
$5,510
01-Jul-2009 – 30-Jun-2012

Co-Principal Investigator
USDA-CSREES/ McIntire-Stennis Program
$50,415
15-Aug-2009 – 30-Sep-2011

Molecular Prospecting: Genomic DNA Sequence Data for Myxozoa
SUNY-ESF/Seed Grant Program
$8,000
01-Apr-2011 – 30-Jun-2012

Systematics and Biodiversity of the Myxozoa
SUNY-ESF/Seed Grant Program
$8,000
01-Mar-2009 – 30-JUN-2011

Publications from the SUNY Center for Applied Microbiology
2005-2011


Wang, C. J. 2011. Wood-inhabiting Microfungi of New York. This project was funded by the New York State Biodiversity Research Institute and the Nature Conservancy 2007-2009. ESF Center for Applied Microbiology provided summer stipends for student research assistants Cesar Herrera, 2009, and Christina Chan, 2010. The final report was completed in August 2010. This report is now available online: http://www.esf.edu/nymicrofungi/.


