DEPARTMENT OF
BIOCHEMISTRY &
MICROBIOLOGY
COOK COLLEGE

Lipman Log

OCTOBER 2005

News from the Chair — Alan Antoine

This issue of the Lipman Log contains information about faculty scholarship, awards (the Instructional Computing Awards represent two of the four such awards earned by the college faculty) and professional activities, student accomplishments and degrees, details of the Discovery of the Actinomycete Antibiotics Conference held on campus last May, 2005, information concerning the retirement of Dr. Stanley Katz and a biosketch about one of our special departmentally-sponsored Part Time Lecturers, Dr. Sukhvinder Sandhu. I hope you enjoy reading about these departmental activities.

I would again like to thank all of the contributors and supporters of the Department of Biochemistry and Microbiology. So far this year the department has received support from 15 donors to enable us to give special academic programs and services, and this support is greatly appreciated. I hope you will continue to keep us in mind for support in the future.

Many of you took the opportunity to visit Lipman Hall during the ACS conference in May. It was so good to greet and talk with you about our expanding teaching programs and renovation plans for research laboratories. I am happy to be able to report that Lipman Hall, Room 108 is undergoing renovation for Dr. Elisabetta Bini, our newest Assistant Professor. I expect that she will be able to relocate into this renovated facility early next year. Should you ever be nearby in the future, please stop in and visit with us. Best wishes to all.

INSIDE THIS ISSUE:

What's New in the Microbiology Teaching Lab

Diane Davis and Max Häggblom

With the establishment of the new Microbiology Major, and increased teaching and research, a lot is happening in the Microbiology Teaching Laboratory.

Preparing our students for the increasing technical sophistication they will encounter in the workplace is a major challenge. It requires that state of the art instrumentation is available for use in the classroom. As microbiology and its applications is a rapidly progressing field a frequent updating of teaching facilities is essential. With the continued support of the Cook College and Rutgers University administration, we have continually updated our teaching laboratory, including the purchase of phase-contrast microscopes, so that each student may work with modern, research quality equipment.

Last year we began teaching General Microbiology during both the spring and fall semesters, to approximately 240 students annually, doubling the demands on the equipment and the laboratory. Again the Cook Administration heard our pleas and answered with funds for the replacement of old and addition of new equipment up to the task of full year teaching. We have added the following equipment to our lab:

- 2 New bench-top incubators
- New Brunswick Scientific bench top shaking incubator
- Water baths
- Shaking water bath
- Laminar flow hood
- Flex cam & LCD projector for live and recorded demonstrations
- Micropipettors
- Refrigerator
- Bench top sterilizer
- 2 microcentrifuge
- Refrigerated bench top centrifuge

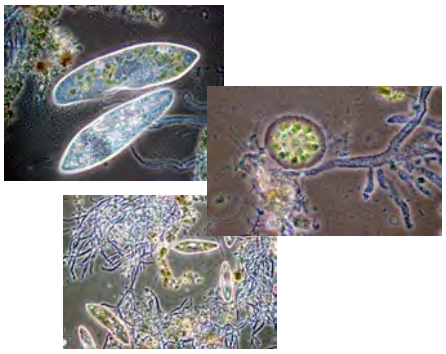
This new and updated equipment has allowed us to introduce new and exciting experiments and lab modules to the laboratory courses from General Microbiology to Applied Microbiology, Microbial Ecology, and Analytical Methods in Microbiology.

We are equipped with a phase contrast microscope with digital imaging capabilities as well as a fluorescence microscope with a digital camera that can do time lapse photography (very cool!). We also have 5 internet connected computers. If you haven't visited out website yet please do. (http://www.rci.rutgers.edu/~microlab) All the images on the site (in both General Micro and Applied Micro) were generated in the lab, many by students!

The challenge of preparing students for the increasing technical sophistication they will encounter in the workplace also requires continual curriculum updating. Through an internal college grant we recently have added a New Brunswick Scientific BioFlo* 110 Fermentor/Bioreactor to our teaching facility.

Fermentation is the lifeline of the food, pharmaceutical and biotechnology industry, the key to production of all manner of products - vinegar, essential amino acids such as lysine, antibiotics including the Rutgers discovered streptomycin and neomycin, anthelmintics, anti-tumor agents, coccidiostats, food preservatives, insecticides and, especially noteworthy, immunosuppressants, without which organ transplants would be virtually impossible. With the discovery of streptomycin came the need for fermentors sparged with air (the prior large scale systems such as beer production, were simplistic without bubbling air or agitators). Thus in the 1940's the discipline of fermentation engineering arose. From it sprung the now world famous New Brunswick Scientific Company, founded through early studies in our department. Microbiologists today, in the modern biotechnology era, are even more reliant on fermentation than they were 50 years ago. Culturing microbes in a reproducible manner, especially in large volumes, includes sophisticated monitoring, and complete computer control of the fermentors. This is the state of the art that we must teach our students.

To capture this experience and to equip Rutgers graduates with the skills required in today's job market the use of fermentors will be integrated into existing microbiology courses including General Microbiology, Applied Microbiology, and Analytical Methods in Microbiology.



The New Brunswick Scientific BioFlo* 110 Fermentor/Bioreactor will be used; a) for novel experiments to be integrated into three pre-existing undergraduate laboratory courses; b) for demonstration of this technology by the faculty in these and other courses; and c) by the students and faculty of these courses for preparation of course materials. The fermentor will also be used for preparation of materials used in other courses. This application may be viewed as another step in assuring the cutting edge and high quality of microbiology instruction at Cook College. Our goal is to provide a hands-on learning experience in the use of fermentation and cell-culture applications.

With the availability of the new computer-controlled fermentor we will introduce a new module on growth studies and fermentors to the General Microbiology lab. The course in Applied Microbiology will benefit from the addition of an experiment on antibiotic fermentation and production of other microbial metabolites, and more detailed analysis of cell culture, growth yields and continuous culture growth kinetics. The chemical analysis of fermentation products, e.g. antibiotics, will be "re-visited" in the course Analytical Methods in Microbiology. In the future the hands-on use of a laboratory scale fermentor will be integrated with on-site demonstration at the Waksman Institute large scale fermentation facility (co-operative teaching with Ken Callanan has been agreed upon and we have discussed introducing a new course in industrial fermentations).

The "exposure" to fermentors from the laboratory to pilot scale and industrial applications will proceed from demonstrations to hands-on experience and training in their use throughout the undergraduate education span. We believe that this will dramatically improve our students' education and preparation for the workplace and for graduate studies.

EXPERIMENTS AND TOPICS IN GENERAL MICROBIOLOGY LAB

- Microscopy: Proper use of the phase contrast microscope
- Preparation of a culture medium
- Microscopy, Diversity of Microorganisms
- Ubiquity of microorganisms: Isolation & selection of growth by pH
- Culturing and handling microorganisms: Aseptic technique
- Isolation of a pure culture: Use of the quadrant streak plate technique for the isolation of an unknown organism from a mixed culture
- The Gram stain
- Bacterial motility
- Factors affecting growth: Temperature, pH, water availability, oxygen, nutrients
- Counting bacterial populations: Plate counts, dilution problems
- Posters: Results of the "Factors" experiment are presented via a poster session
- Microbial metabolism: Microbial enzymes, Metabolic pathways, Commercial test kits-identification & classification
- Microbial genetics: Isolation of chromosomal and plasmid DNA. Transformation and conjugation
- Microbial genetics: Restriction enzymes, electrophoretic characterization
- Control of microorganisms: Pasteurization, disinfectants, ultraviolet light, hand-washing, antibiotics: Student designed experiment

EXPERIMENTS AND TOPICS IN APPLIED MICROBIOLOGY LAB

- Principles of Microscopy: Advanced instruction in phase contrast microscopy
- Fungal Morphology
- Microbial Population Counts: Comparison of commercially available yeast products based on viability, purity and CO_2 production
- Effect of Temperature on growth: Growth kinetics under varied conditions of experimentation
- Microbial Food Spoilage: Effects of improper handling on microbial populations in food
- Isolation of *Bacillus cereus*: This experiment begins with Pasteurization of soil extracts and isolation of organism on MEP (mannitol egg yolk polymyxin) agar, colonies consistence in appearance with *Bacillus cereus* are transferred onto bloodagar with a nitrocellulose membrane in place on the medium. After growth hemolysis zones are measured and an immunological detection for a *B. cereus* specific toxin is per formed. This experiment continues over several weeks but much is learned!
- Isolation of Salmonella: Selection and various detection (immunological and nucleic acid sequence based)
- Identification of bacterial strains by gas chromatography of cellular Fatty acids: Throughout the semester the students are required to generate a culture collec tion from their experiments. Each student chooses several organisms from their culture collection for identification via FAME
- Yeast Metabolism: Factors affection fermentation are explored in a controlled experiment
- Preparation of a Malt Beverage: This speaks for itself – always a favorite
- Photography Contest: Those students not interested in the malt beverage fermenta tion product are encouraged to submit a photo of a micro organism they have taken during the semester.
- Water Analysis: Microbial Indicators of Fecal: Distinguishing Human/ Non-Human Fecal Contamination
- Microbial Products: A panel of experts comes in to judge the Malt Beverages. Prizes are awarded. A fun and delicious discovery process.

OUR FACULTY

Faculty - Grants

Max Häggblom, National Science Foundation (03/05-02/08), Microbially mediated cycling of organohalides in marine sponges. Lead PI (with Lee Kerkhof and Young-Beom Ahn).

> We will investigate the dehalogenating bacterial populations within the sponge animal with the goal of understanding the roles and metabolic activities of the endomesohyl microbiota. Sponges harbor large numbers of bacteria that can amount to 40% of the biomass of the animal, although little is know about the specific roles of the bacterial populations associated with them. Sponges are known to produce a plethora of secondary metabolites that may function as chemical defense against predators and biofouling. Many secondary metabolites are organohalogen compounds that may constitute over 10% of the animal dry weight of some species. The abundance of halogenated compounds in sponge tissue and the high bacterial biomass implies that sponge-associated microorganisms may have the ability to metabolize the organohalide compounds. Our overall hypothesis is that dehalogenating bacteria form stable populations within the sponge animal that function in the cycling of organohalide compounds.

Tamar Barkay, Department of Energy. NABIR Program. "Microbial pathways for the reduction of mercury in saturated subsurface sediments." Lead PI (with Lily Young and Gerben Zylstra).

Tamar Barkay, National Science Foundation. Research Experience for Undergraduates supplement to "Collaborative Research: Mercury isotope fractionation during microbial and abiotic redox transformation.

Keith Cooper and **Beth Ravit**, New Jersey Meadowland Commission. "Kearny Marsh remediation and restoration phase I, data analysis, fate transport models."

Constantino Vetriani, (P.I.). National Science Foundation, Microbial Interaction and Processes Program. Collaborative Research: Physiology and Molecular Ecology of Thermophilic Nitrate-Reducing Microorganisms at Deep-Sea Hydrothermal Vents. June 15, 2005 - May 31, 2008. In collaboration with Karen Casciotti (WHOI) and Stefan Sievert (WHOI).

> This study will investigate the physiology and ecology of thermophilic, nitrate-reducing microorganisms at deep-sea hydrothermal vents. Since the microbial contribution to the nitrogen cycle at deep-sea hydrothermal vents remains largely unknown, this study is designed to fill this gap. Recent studies revealed the occurrence of novel thermophilic microorganisms that couple the reduction of nitrate with autotrophic CO2 fixation in marine geothermal environments. This research will integrate novel cultivation and molecular techniques with stable isotope analyses to explore the physiology of nitrate-reducing microorganisms, and to assess their functional diversity and activity. This project will offer training opportunities to one graduate student and several undergraduate students, and it will support educational and outreach activities associated with several NSF-sponsored programs (e.g., the Mid-Atlantic Center for Ocean Science Education Excellence and the Student Experiments at Sea).

In Print

Barkay T and. Wagner-Döbler I (2005) Microbial transformations of mercury: potentials, challenges, and achievements in controlling mercury toxicity in the environment. Adv. Appl. Microbiol. 57:1-52

Wiatrowski, HA and **Barkay, T** (2005) Monitoring of microbial metal transformations in the environment. Cur. Opin. Biotechnol. 16:261-268

Coombs, JM, and **Barkay T** Pathways in the evolution of metal homeostasis genes; evidence from the genomes of bacteria and archaea. Appl. Environ. Microbial. In press

Ruess L, Tiunov A, Haubert D, Richnow HH, **Häggblom MM**, Scheu S (2005) Carbon stable isotope fractionation and trophic transfer of fatty acids in fungal based soil food chains. Soil Biol. Biochem. 37:945–953.

Ravit B, **Häggblom MM**, Ehrenfeld JG (2005) Salt marsh rhizosphere effects microbial biotransformation of the widespread halogenated contaminant tetrabromobisphenol A (TBBPA). Soil Biol. Biochem.37:1049-1057.

Ruess L, Schütz K, Haubert D, **Häggblom MM**, Kandeler E, Scheu S (2005) Application of lipid analysis to understand trophic interactions in soil. Ecology 86: 2075 -2082.

Häggblom M, Margesin R (2005) Editorial. Microbial life in cold ecosystems. FEMS Microbiology Ecology 53:1-2.

Ahn Y-B, **Häggblom MM**, Fennell DE (2005) Co-amendment with halogenated compounds enhances anaerobic microbial dechlorination of 1,2,3,4-tetrachlorodibenzo-*p*-dioxin and 1,2,3,4-tetrachlorodibenzofuran in estuarine sediments. Environ. Toxicol. Chem., in press.

Männistö MK, **Häggblom MM** (2005) Diversity and hydrolytic enzyme activities of psychrotolerant bacteria from Finnish Lapland. Systematic and Applied Microbiology, in press.

Vetriani, C, Chew,YS, Miller, SM, Yagi, J, Lutz, RA and Barkay T (2005) Microbially mediated mercury reduction in deep-sea hydrothermal vents. Appl. Environ. Microbiol. 71:220-226

Awards

Tamar Barkay 2005 Annual Waksman Honorary Lectureship Awardee; Theobald Smith Society award to a scientist who has a distinguished career in science and who has made a significant contribution to the field of microbiology.

Doug Eveleigh was honored with the Professor of the Year Award from the Alpha Zeta National Agricultural Honors and Service Society.

Max Häggblom and **Gerben Zylstra** were awarded Instructional Computing Awards: "ABC Instructional Computer Laboratory Upgrade" Gerben Zylstra, Director of the Biotechnology Center for Ag and the Environment, and "Computing in Microbiology Education" Max Häggblom, Department of Microbiology and Biochemistry

Peter Kahn received the 2005 Cook College Academic Professional Excellence Award for Academic Innovation and Creativity. The course he teaches Homology Modeling of proteins teaches student to develop an original 3-D molecular model of a protein whose sequence, but not structure is known. "*When students see what they're doing, something catches fire,"* Kahn said*, That's how we know we've done our job*."

South African Chemical Institute—Merck Medal 2005
The Merck Medal is presented annually to the senior author of the paper or papers published in the So. African Journal of Chemistry in a specific field of chemistry. This years awardees: **T. van Es** and B. Staskun. 2003, Chlorine-and sulphur substituted Pyrrolo[3,4-b]quinolines and related derivatives arising from the aminolysis of 3,3,9-Trichlorothieno[3,4-b]quinolin-1(H)-one. S. Afr. J. Chem. 56:40-46.

Conferences - Seminars -Symposia

Tamar Barkay was an invited speaker at the Joint Meeting of the 3 Division of the International Union of Microbiological societies, hosted by the National Academies Operational Management by the American Society for Microbiology. San Francisco CA July 23-29, 2005. The talk was on Gene Transfer and Metal Resistance in Soil Bacteria.

Barkay T, Schaefer, J, Poulain, A. and, Amyot M. Microbial transformations in the mercury geochemical cycle. 15th Goldschmidt Conference. Moscow Idaho, May 20 – 25, 2005. Invited talk

Kritee K, Klaue B, Blum J & **Barkay T.** Biological Mercury (Hg) Isotope Fractionation. Microbial transformations in the mercury geochemical cycle. 15th Goldschmidt Conference. Moscow Idaho, May 20 – 25, 2005.

Wiatrowski, H. A. and **T. Barkay**. A Novel Mechanism for Reduction of Mercury (II) by *Shewanella oneidensis* MR-1. 105th Annu. Meet. Am. Soc. Microbiol. Atlanta, June 5 – 9, 2005.

Coombs, J., G. Oregaard, I. Torres, C.H. Black, P. Sobecky, and **T. Barkay**. A Functional Gene Microarray for the Detection of a Genomic Linkage Between Metal Resistance and *inc/rep* Genes on Broad Host Range Plasmids. 105th Annu. Meet. Am. Soc. Microbiol. Atlanta, June 5 – 9, 2005.

Schaefer, J., and **T. Barkay**. Diversity of Mercuric Reductase (MerA) Genes and Transcripts in Mercury Contaminated Waters 105th Annu. Meet. Am. Soc. Microbiol. Atlanta, June 5 – 9, 2005.

Barkay, T. Gene transfer in the soil environment. International Union of Microbiological Societies 2005. San Francisco. CA, July 23-28, 2005 - invited

Barkay, T. and J. Coombs. Horizontal gene transfer of metal homeostasis genes and its role in microbial communities of the deep terrestrial subsurface. Society of General Microbiology Symposium on "Micro-organisms in Earth Systems", Keele, England, Sept. 12–15, 2005 – invited

Doug Eveleigh gave invited presentations at on cellulase and also on the Rutgers development of antibiotics at: The Department of Botany, Chulalongkorn University, and the Royal Golden Jubilee Biotechnology Congress, Bangkok, Thailand, NEMPET (North Eastern Microbiologists for Physiology, Ecology and Taxonomy), the Heritage, Microbiology and Science (HMS 2005) Symposium - Microbes, Monuments and Marine Materials, Portsmouth, UK, and to students at the American Chemical Society, Middle Atlantic Regional Meeting (MARM), and the American Society for Microbiology General Meeting, Atlanta, GA.

Max Häggblom was an invited speaker, Society for General Microbiology 156th Meeting, Edinburgh, UK, April 4-7, 2005 in a session on Microbe-Pollutant Interactions. The title of his seminar was: Anaerobic dehalogenation of organohalide pollutants in estuarine and marine environments.

Max Häggblom was an invited speaker at NATO-Advanced Research Workshop on Viable methods of soil and water pollution monitoring, protection and remediation: development and use held in Krakow, Poland, June 26 - July 1, 2005. Seminar title: "Anaerobic dehalogenation of halogenated organic compounds: novel strategies for bioremediation of contaminated sediments"

Max Häggblom was an invited speaker at International Union of Microbiological Societies (IUMS) Conference, San Francisco, July 23 - 28, 2005 in a session on Biodegradation of xenobiotic compounds. Seminar title: Anaerobic metabolism of xenobiotic compounds - biotransformation of MTBE and related fuel oxygenates.

Constantino Vetriani "Alkane-oxidizing bacteria from deep-sea hydrothermal vents". CEBIC (Center for BioInorganic Chemistry) Summer Conference, Princeton, NJ, June 12-15, 2005

Our undergrads

Francisca Allotey, a Douglass junior, is working with **Emilia Rus** and **Dr. Ted Chase, Jr**. (and much advice from **Lori White**) on developing a quantitative PCR lab experiment for Experimental Biochemistry. We will assess levels of mRNA for anaerobically induced alcohol dehydrogenase, fructose 1,6-bisphosphate aldolase, sucrose synthase and hemoglobin in control, nitrogen-incubated and ethanol-sprayed *Arabidopsis* plants. **Stephanie Buszczak**, a University of Maryland sophomore, is working on the kinetics of cinnamyl alcohol dehydrogenase of *Burkholderia cepacia.*

Other research projects during the academic year involved the nitroaromatic reductases of *Ralstonia pickettii* YH105, *Pseudomonas pseudoalcaligenes* JS45 and *Ralstonia eutropha* JMP134, by **Courtney Benson** (Douglass junior), **Kristen Sica** (Cook 4th year student) and **Irene Wohlman** (Douglass '05).

Awards:

Cristina Pascale won the New Jersey Academy of Science Award for the poster she presented at the 50th Annual Meeting of the New Jersey Academy of Science. Title: "Metabolism of aromatic compounds in the hyperthermophile *Sulfolobus solfataricus*." She is working with Elizabetta Bini.

Katie Voskoboynik has received an internship of the 2005 Biotechnology Summer Undergraduate Research Program in the Bini Lab.

Renee Schnaidt (Microbiology/ Biochemistry) and **Brandon Saks** (Biotechnology) received Rutgers Undergraduate research Fellowships for 2005-06. Renee's research in the Häggblom Lab is on Microbial degradation of brominated flame retardants, while Brandon in characterizing dehalogenating bacteria in organohalide-containing marine sponges.

Conferences:

John Dittmar and **Cristina Pascale**, two undergraduates in the Bini lab working on GH Cook Honors Theses, graduated in May. They presented posters of their work at the Meeting in Miniature of the Theobald Smith Society, April 28, 2005 in New Brunswick, NJ, and at the 50th Annual Meeting of the New Jersey Academy of Science, April 2, 2005, in Newark, NJ. In June we attended the 105th General Meeting of the American Society for Microbiology (June 5-9, 2005) in Atlanta, GA, with two other posters.

Kevin George (Biochemistry), a Rutgers Undergraduate research Fellow for 2004-05 in the Häggblom Lab presented results of his work on bacterial O-methylation of tetrabromobishpenol A at the American Society for Microbiology General Meeting in May. Kevin was also awarded the Class of 1944 Scholarship

Our Graduate Students

Jedd Hillegass (Cooper Lab) received one of three "Outstanding Student Poster Presentation" awards at the Mid-Atlantic Chapter Society of Toxicology meeting on May 17, 2005 for his poster entitled "*Exposure to Hydrocortisone or Dexamethasone Causes a Strain-Dependent Effect on Matrix Metalloproteinase Expression During Zebrafish Embryogenesis.*" Jedd received a plaque and a cash award.

Melitza Crespo-Medina received an NSF graduate fellowship **Chris Di Pasquale** received a Rutgers University Biotechnology Summer Research Internship

Master's & Ph.D. Theses

Aspassia D. Chatziefthimiou, Masters of Science (Advisors: Dr. Barkay Tamar and Dr. Constantino Vetriani) "Microbe-metal interactions in geothermal hot springs. Isolation and characterization of thermophilic, mercury resistant, thiosulfate-oxidizing bacteria from Mount Amiata, Italy.

Results of this study suggest that mercury resistant thermophilic bacteria are abundant in sulfidic hot springs, and provide data that, with further study, could be used to evaluate the linkage of *mer* ancestry to geothermal environments. Further characterization of *mer* genes in the described culture collection is needed to elucidate the mechanisms of mercury resistance and their evolution in this unique environment. (Aspa Chatzifthimiou is starting her studies toward a Ph.D. degree in Ecology and Evolution.

Leslie Wickham, Masters of Science - Graduate School of Biomedical Sciences UMDNJ 2005. (Advisor Max Häggblom) "*Taxonomic characterization of psychrotolerant bacteria from Finnish soils.*

Thirteen strains of *Burkholderia* isolated from soils in a cold region of northern Finland were characterized and analyzed for adaptations to cold temperatures. The 16S rRNA gene was entirely sequenced for 6 strains. These were aligned to 16S rRNA sequences of all *Burkholderia* species and analyzed by neighbor-joining, maximum parsiomony and maximum likelihood phylogentic trees. Five of the strains were most closely related to *Burkholderia sordidicola* while the other strain was most closely related to *Burkholderia caledonica*, and likely represent two new species. Many of the other strains were also identifiable with the *Burkholderia* genus by fatty acid composition. The ability of these strains to grow at cold temperatures and at temperatures above 20°C would classify them as psychrotolerant microorganisms. Their adaptation to survival at cold temperatures was analyzed by cellular fatty acid profiles.

Jeffra Schaeffer Ph.D. **(Dec. 2004)**. (Advisor: Tamar Barkay) "The role of mercury resistance genes in the environment and the factors controlling their expression"

Elizabeth Jane Pavlik Ph.D. (October, 2005) (Advisor: Max Häggblom**) "**Multiple Aspects of Dehalogenation by Denitrifying Bacteria"

Organohalide compounds are released into the environment by natural and anthropogenic sources. Significant levels of chlorinated organic compounds are produced industrially as pesticides, herbicides, fungicides and organic solvents. Degradation of organohalide compounds by denitrifying bacteria is ecologically significant due to the widespread deposition of nitrate in soils and groundwater. The diversity of bacteria capable of detoxifying chlorinated compounds is constantly expanding. A novel bacterium from the *Azospira* genus was isolated on 4-chlorobenzoate as a sole carbon and energy source with nitrate as the electron acceptor. This bacterium is also capable of growing on 4-bromobenzoate, 4-hydroxybenzoate and benzoate, but not 3-chlorobenzoate. Chlorobenzoates are good model compounds for delineating bacterial dehalogenation mechanisms. Here, the mechanism for dechlorination of 3-chlorobenzoate was elucidated for the denitrifying bacterium *Thauera chlorobenzoica* strain 3CB-1. Analysis of both whole cell and cell-free extract experiments suggested that dechlorination proceeded by a reductive mechanism in this bacterium. A High Throughput Screening technique was described that correlates chloride release and pH change in whole cell systems. Optimization of the system provided conditions that allowed both a visual and spectroscopic monitoring of candidate clones for dechlorination reactions. The combination of these studies provides a multifaceted study into dehalogenation.

THE DISCOVERY OF THE ACTINOMYCETE ANTIBIOTICS - SOIL MICROBIOLOGY'S GIFT TO MEDICINE

National Historic Chemical Landmark Program, American Chemical Society (ACS). May 24th - 25th, 2005 held in conjunction with Chemistry at the Crossroads of Science - 37th Middle Atlantic Regional Meeting (MARM 05)

(Pictured: Drs. Donald Johstone and H. Boyd Woodruff)

The American Chemical Society recently honored the Department with the presentation of a National Historic Chemical Landmark Award in recognition of the research of Selman Waksman and his research group that lead to the discovery of the actinomycete antibiotics. Waksman's program led to the discovery of nearly twenty antibiotics the more significant including actinomycin and streptothricin by Boyd Woodruff, streptomycin by Albert Schatz and neomycin and candicidin by Hubert Lechevalier. Waksman received the Nobel Prize for physiology or medicine in 1952 for "ingenious, systematic and successful studies of the soil microbes" that led to the discovery of streptomycin.

The first day Landmark ceremonies featured an address by H. Boyd Woodruff ("Teaching, research, museum: personal reminiscences from the lifetime of an ACS National Historic Chemical Landmark Laboratory", and oral histories, remembrances and anecdotes by "Antibiotic Alumni" - Donald Johnstone (discoverer of *Streptomyces bikiniensis* which also produces streptomycin - University of Vermont), Warren Iverson (US Department of Standards) , Anthony Romano (University of Connecticut) and Carl Schaffner (Waksman Institute faculty). Prior comments and discussion were received from Noberto Palleroni, Hubert and Mary Lechevalier, Willard Taber, Leo Vining and Dorris Hutchison. Nan Waksman Schanbacher discussed the current programs of the Waksman Foundation, and Joachim Messing outlined the current research goals of the Waksman Institute.

A commemorative bronze plaque was presented by William F. Carroll, president of the American Chemical Society which was accepted by Tim Casey, Dean of Academic and Student Programs. The Reception included a visit to the Waksman Room, the site of streptomycin discovery in Martin Hall (the old Administration Building), with the evening dinner attracting a range of Departmental alumni, old and new.

The second day's festivities focused on a symposium - "The Actinomycete Antibiotics - Soil Bacteria's Gift to Medicine" (*see below). Jo Messing accepted a further ACS plaque on behalf of the Waksman Institute. The symposium addressed the status of the Actinomycete antibiotics, ranging from assessment of current antibiotic research, novel screening approaches which included studies at Rutgers using soil as a source of genes for production of novel anti-microbials through to design of inhibitors of bacterial RNA polymerase, a timely assessment of the potentially rampant tuberculosis, and a colorful painting of the diversity of pharmaceutical products from Actinomycetes.

The outreach of this Landmark gala celebration was enhanced through preparation of a US Post Office stamp cancellation for that day which incorporated an actinomycete logo drawn by Paul Procaccini (Arleen Nebel's son-in-law), and a commemorative coffee mug. The talents of the Department were well in evidence and the co-chairs Doug Eveleigh and Arny Demain give special thanks to all participants especially Peter Anderson for photography, Jenny Kist for her preparation of a brochure of the history of the development of soil microbiology, Brandy Houser and Victoria Prince for the antibiotic display in the Library of Science and Medicine (still on display - go have a look see), and Jessie Maguire for her design of an historic "fridge magnet" illustrating the diverse range of antibiotics discovered in the Department.

Generous support for this celebration was through the New Brunswick Scientific Company, Amgen Inc., Wyeth Research Bldg., Bristol-Myers Squibb, The Schering-Plough Foundation, Cook College, the Rutgers Research Council, The Rutgers President's Fund, Waksman Institute, The Biotechnology Institute, and ACS Middle Atlantic Regional Meeting.

In overview, the ACS through their Historic Landmark Program, gave international recognition of the Department's role in the discovery of antibiotics, and how these wonder soil drugs changed the world. The discovery of streptomycin and neomycin went well beyond the cure for diseases such as tuberculosis, cholera and other pathogens against which penicillin was ineffective. Indeed the discovery shaped society today, for example the dramatic effects of extension of the life span of the world's population - from the elder generations enjoying the growing up of their grand-children (and even great grand-children) to the younger generation's perspectives regarding the status of their future Social Security.

"ACTINOMYCETE ANTIBIOTICS - SOIL MICROBIOLOGY'S GIFT TO MEDICINE"
Program held at Chemistry Department, Busch Campus, Rutgers University

WILLIAM STROHL - Natural product antibiotics from actinomycetes - past, present and (hopefully) future - Merck & Co., Inc., West Point, PA

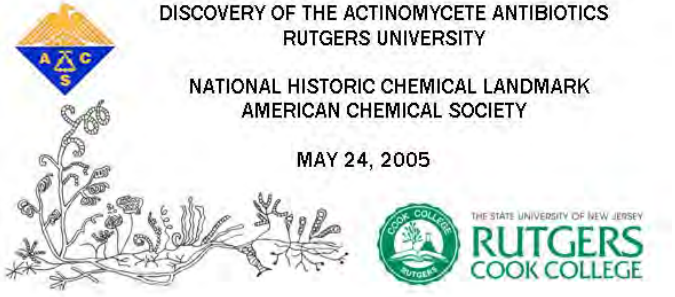
JULIAN DAVIES, FRS - Why aren't we finding antibiotics as easily as we used to? University of British Columbia

GERBEN ZYLSTRA - Soil as a source of genes encoding the production of novel anti-microbials
Director, Biotechnology Center for Agriculture and the Environment, Cook College

RICHARD EBRIGHT - Small-molecule inhibitors of bacterial RNA polymerase - The Waksman Institute, Rutgers University

LEE B. REICHMAN - Global Timebomb
National Tuberculosis Center, Newark

ARNOLD DEMAIN - Actinomycete secondary metabolites: Gifts from the soil -Drew University, Madison, NJ



Dr. Stanley Katz's has retired after 47 years at Cook College, Rutgers University. A party in his honor was held on July 21st. Many of his former students attended along with his family and friends, fun was had by all!

Stan Katz and Paula Marie Ward

Still shoveling!

Dr. Katz receiving his "nobel" prize in **MILK-O-MYCIN**

I first met Stan in December of 1973. He was designated as my official advisor. Being a very green freshman and not knowing what to expect, I dress in my best clothes for our first official meeting to discuss my plans for the future. As I climbed the stairs leading to his third floor office, I saw this rather large man with a giant grin on his face dressed in a very clean lab coat. He had sugar on his face and two jelly donuts (one in each hand). Thinking it odd but, then again growing up in New Jersey I have seen worse, I shrugged it off and continued to look for Stan's office. As I knocked on the door to Stan's office I hear a voice. "Young man, are you Michael Salvatore?" As I turned, I see this guy with the donuts again. I replied that I was and he said "come on in I have been waiting to meet you". Standing there, Stan, me and the donuts, I didn't know what to think (the thought did cross my mind that I was way over dressed for this encounter). He then said "Could you get the door my hands are full?". I opened the door and he offered me a seat. He then conveyed the most important information that I will ever remember. He said "It is very important to keep you clothes clean, that's why I wear a lab coat when I eat jelly donuts. Elaine would kill me if I got jelly on my clothes". I knew right then and there that Stan and I were going to have a lasting relationship. To this day, every time I pass a Dunkin' Donuts I smile. One other thing, Stan my be retiring but I doubt if he will ever stop shoveling it!
Congratulations on your Retirement, **Mike Salvatore**

… Stan and I share the same birthday and birth year. Based on the distance between New Jersey and Montana and of course travel being what it was in the 1930s, I have concluded that it is highly unlikely that we had the same mother or father. Nevertheless, I am proud to have shared in a brotherhood with Stan as a member of a great Department and College. Since my own retirement, I have missed working with Stan. But I must say in all honesty that I do not miss those sort of dead chicken-Salmonella smells emanating from his lab. I wish all the best for Stan during his retirement years and prompt him to keep on shoveling.
Jim Macmillian (Emeritus)

A scholarship in his name is being planned—more to follow.

Paula Lessem and Sue Brady graduate students of Dr. Katz

Doug Eveleigh - "Our mad scientist"

About our Colleagues by Alan Antoine

Dr. **Sukhvinder Sandhu** has been affiliated with the department, and the college since 1974 when he began his Ph.D program in Biochemistry. As the years have gone by, he has continued supporting several important educational activities at the university that are appropriate for reporting here. Here is his story in his own words.

I immigrated to the United States in early 70's after completing an undergraduate degree followed by a Master's degree in Biochemistry from Punjab University, Chandigarh, India. In 1974, while working in the applied Research Department of the Personal Products Company, then a Division of Johnson & Johnson, I entered the Graduate Program in Biochemistry as a part-time graduate student. I completed my thesis research on the "Aerobic degradation of choline by *Proteus mirabilis*: Enzymatic requirements and pathway" under the guidance of Dr. Theodore Chase, Jr. in this Department. After graduating from Rutgers University in 1983 with a Ph.D. in Biochemistry, I was hired by Colgate -Palmolive Company as a Senior Research Scientist to work at their worldwide Research & Development Center in Piscataway, NJ. Over the past 22 years at Colgate, I have worked in many different areas of basic research primarily to develop viable technical leads and documentation of claims for Colgate products. Such studies involved biochemical and microbiological studies on hair, skin, antimicrobial and antifungal agents, antiperspirants and deodorants, and hard surface cleaners. I am currently working in the Product Safety and Dermal Clinical Research Department and am responsible for review of various product formulas to insure product safety, conduct clinical studies to establish product safety and efficacy for new products. In 1992, I introduced, in collaboration with the Cook College Cooperative Education Program, a year-round internship program at Colgate exclusively for students from Rutgers University. This program offered students an opportunity to gain valuable "real-life" industrial work experience, either during the summer months or part-time during the academic year, prior to graduation. Over the years, more than a dozen students have benefited working under my mentorship. Some of these students, as a result of their performance as interns, have been hired by Colgate as full-time employees. In 1996, I was recognized with a Director's "You Can Make a Difference" Award for coordinating this program at our company. Finally, since 1997, I started teaching a Cook College Undergraduate Colloquium course, "Industrial Research & Product Development" to Cook undergraduate students. The primary objective of this course is to provide students with an over view of industrial research, applications of science to develop new product with particular focus on personal care products, and the type of skills that are necessary to succeed in an industrial environment.

I enjoy my continued association with the Department and Cook College and hope to continue in this for years to come. It is important to stay active in these academic pursuits, and I enjoy the opportunity to help educate our future scientists.

(Note: Dr. Sandhu's colloquium course is always filled.)

What's Shaking

by Kathy Maguire

Wedding Bells: **Jedd Hillegass (**Ph.D student in Cooper Lab**)** was married on July 16, 2005 at Holly Hedge Estates in New Hope, PA to Wendy Myers.

The Department welcomes: **Zachary Freedman** and **Matthew Rodman**, who are TA's for General Microbiology in Fall 2005**. Ileana Perez**, a GA in the Vetriani Lab and **Rachel Ward**, a new graduate student in the Barkay Lab.

Adam Mumford is the new Woodruff Fellow. Adam is in the Environmental Sciences program, in the Fate and Effects of Pollutants option, Ph.D track. He graduated with a BS in microbiology from the University of New Hampshire in December of 2003. Adam's undergraduate research was focused on microbial community analysis. ` He is spending this semester rotating between the labs of Drs. Kerkhof, Fennell, Kukor, and Young. His main interests are in microbial community dynamics, and how this can be applied to bioremediation.

Jeffra Schaefer left the Barkay lab in April to take a postdoctoral position at Princeton University. Jeffra and her husband Joe Ferris became the proud parents of Dorian James Ferris born in early August.

Jonna Coombs left the Barkay lab in August to take an Assistant Professor position at Adelph University on Long Island

Diane Davis's son, Glenn is now a Rutgers College student. He is also writing for the student newspaper "*The Targum*".

Department of Biochemistry and Microbiology
Cook College—Rutgers University
Lipman Hall
76 Lipman Drive
New Brunswick NJ 08901-8525
732.932.9763

www. cook.rutgers.edu/~dbm

Editors: Max M. Häggblom and Kathy Maguire

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