▶ 2013 Symposium on Microbiology at Rutgers.

▶The 60th Anniversary Celebration of the awarding of The Nobel Prize for Physiology or Medicine to Dr. Selman A. Waksman .

▶ Eileen Glick's retirement party.

Lipman 2013 Log

News from the Chair, Max Häggblom

Summer Greetings from Lipman Hall! Highlights from the 2012-2013 academic year are included in this issue. Please browse through this issue to read more on the various activities and accomplishments of our students and faculty, and the awards that they have received.

We welcome our new Secretarial Assistant, Tamara Crawford and congratulate Beth Nugent on her promotion to Administrative Assistant. Eileen Glick retired in November 2012, after many years of dedicated service to our department and to Rutgers University.

Our scholarly and undergraduate and graduate programs in biochemistry and microbiology are flourishing and it is a delight to follow the achievements of our students. Our graduate and undergraduate students are engaged in diverse exciting research projects with our faculty members. Each year several of the top undergraduate students complete a George H. Cook Senior Thesis, an intensive capstone research project. See page 10 for the work by our most recent Ph.D. graduate studies. The Graduate Program in Microbial Biology is now in its fourth year, and Madhavi Shah is our first student to complete her Ph.D.

Prof. Douglas Eveleigh was honored with the School of Environmental and Biological Sciences 2013 Teaching Excellence Award in recognition of his exceptional contributions in teaching at Rutgers over the last 40 years. Doug is a tour de force in microbiology and for many decades students have been enriched by his enthusiasm and eclectic approach to teaching. His knowledge and energy elicit curiosity and his collection of interesting vignettes wake up the attention of students to explore more. Please read more about Doug on page 8.

Our Annual Microbiology Symposium (see page 2) continues to bring together all microbiologists on campus with speakers from SEBS, the School of Arts and Sciences, the Camden and Newark campuses, and also University of Medicine and Dentistry NJ (now merging with Rutgers). In February 2013 we had the pleasure of welcoming back Rutgers alum, Prof. David Benson (Ph.D. 1978, former Head of the Department of Molecular and Cell Biology at the University of Connecticut), who worked under the direction of Prof. Doug Eveleigh. His keynote presentation addressed the actinomycete *Frankia*— plant symbiosis in regard to non leguminous nitrogen fixation.

Rutgers Day-AgField Day continues as a fun event and an opportunity to meet alumni and friends. "*A boisterous biochemistry and marvelous microbiology*" was our program theme. As in previous years, the G.H. Cook Biochemistry and Microbiology Undergraduate Student Club coached budding scientists in building their own microbes.

As always, I wish to thank all our donors for your support, that provide important student scholarships, awards and travel fellowships. We hope that you will continue to show your support for the department and our scholarly programs in the future.

Editors: Douglas E. Eveleigh, Max M. Häggblom and Kathy Maguire
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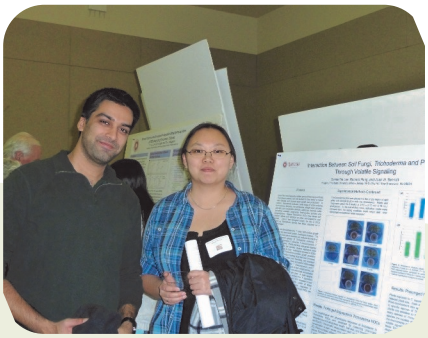
2013 Symposium on Microbiology at Rutgers University, Cultivating Traditions, Current Strength and Future Frontiers



S Bhatt and E Walsh

Z Rosario Cruz, M Häggblom, R Ludescher and J Boyd

YM Seah, J McConnell, P. Gadkari, Y Olifer, A Hicks, D Kurz

Joachim Messing, Director, Waksman Institute of Microbiology gave a talk on the "History of Microbiology at Rutgers." He was also honored for his contribution to humanity, being recognized by the Wolf Foundation of Israel, and awarded a 2013 Wolf Prize in Agriculture. The Wolf Prize honors scientists and artists whose "achievements are in the interest of mankind and friendly relations among peoples." Dr. Messing, a professor of molecular biology is being recognized for innovations in recombinant DNA cloning, more commonly known as genetic engineering, and for deciphering the genetic code of crop plant. Dr. Joachim Messing, University Professor of Molecular Biology and Selman A. Waksman Chair in Molecular Genetics, is being recognized for $100,000 prize with Jared Diamond of the University of California – Los Angeles, a scientist and Pulitzer Prize winner, who has written several best-sellers, including *Guns, Germs and Steel*.

Joachim Messing and Robert Goodman

Dave Benson

David R. Benson (Ph.D Rutgers 1978) Professor of Microbiology and former Head of the Department of Molecular and Cell Biology at the University of Connecticut was the keynote speaker. His talk entitled "The kitchen sink approach to the *Frankia* symbiosis"

Siobain Duffy, Ecology, Evolution and Natural Resources, SEBS: "Geminivirus molecular evolution: bias, recombination and selection."

Vivian Bellofatto, Microbiology and Molecular Genetics, UMDNJ, Newark: "Gene regulatory mechanisms in the African Trypanosome, the causative agent of human sleeping sickness."

Mike Chikindas, Food Science, SEBS: "Antimicrobial proteins from beneficial microbes: applications and challenges."

Tiago Guerra, Chemistry & Chemical Biology - Waksman Institute: "Microalgae as model organisms for solar biofuel research."

Matthew Neiditch, Microbiology and Molecular Genetics, UMDNJ Newark: "Structural biology of bacterial cell-cell communication."

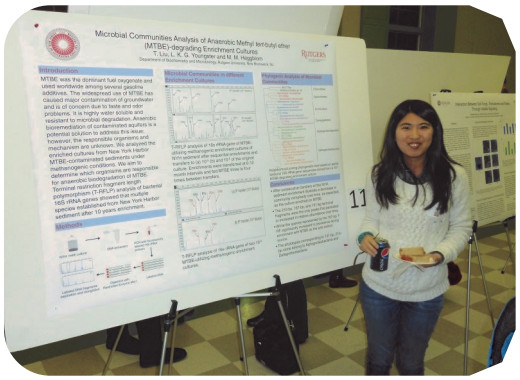
Bryce Nickels, Genetics – Waksman Institute: "NanoRNAs: a new class of regulatory small RNAs in bacteria."

Donna Fennell, Environmental Science, SEBS: "What's up? Are microbes in air active?"

Lee Kerkhof, Marine and Coastal Sciences, SEBS: "Bacterial genome replication at subzero temperatures in permafrost."

Tamar Barkay, Biochemistry and Microbiology, SEBS: "The mercury resistance operon: from an origin in geothermal environments to an efficient detoxification machine."

Poster Session (30 students throughout the campuses presented their work)



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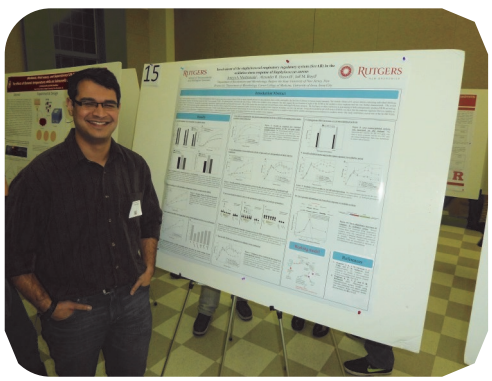
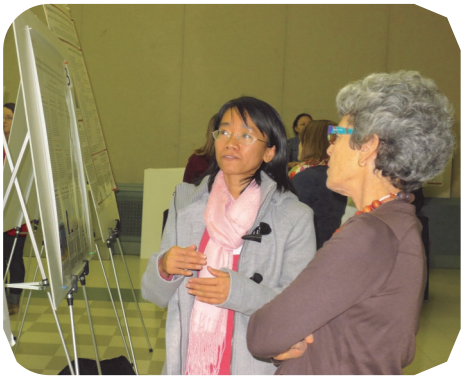


Ameya Mashruwala



Hang Dam and Tamar Barkay

Our Faculty





Awards

Congratulations to **Douglas Eveleigh**, recipient of the ***2013 Award in Teaching Excellence***! This award honors the extraordinary accomplishments of our faculty and staff. (see page 7).
Doug was also honored as the Banquet Speaker at the 35th Symposium on Biotechnology for Fuel and Chemicals, Portland OR.

Doug Eveleigh honored by the Waksman Foundation for Microbiology with a lectureship endowed in his name: "The Douglas Eveleigh Lecture on Microbial Diversity" at the Microbial Diversity Course/ Symposium, Marine Biology Laboratory, Woods Hole, MA. Amy Vollmer, President of the Foundation, in presenting the award noted that he "singlehandedly has sustained the legacy of Selman Waksman's work, both the physical space as well as the narrative of the work in his laboratory." Jörg Overmann, Leibniz Institute DSMZ German Collection of Microorganisms and Cell Cultures, presented the inaugural lecture: "More than the sum of its parts: heterologous multicellularity in phototropic consortia" in which he detailed the contributions even of individual cells within a consortial photosynthetic "mass" through use of elegant microscopy combined with all manner of physicochemical approaches. A "Tour de Force".

Tamar Barkay received an **International Course Development Award** from the Centers for Global Advancement and International Affairs.

Grants

Department of Energy – BES, DE-FG02-10ER1619: "Maximizing Photosystem II Water Oxidizing Efficiency Through the Identification of Optimal Protein Coordination Environments" **Charles Dismukes** (PI) 09/10 – 08/13, $495,000.

Department of Energy – EERE, DE-EE0003373 Consortium for Algal Biofuels Commercialization (CAB-Comm)" Mayfield (PI) Subcontract to coPI **C. Dismukes,** $85,000. 01/11 – 12/13 $393,549.

Air Force Office of Scientific Research, FA-9550-05-1-0365: "Biosolar Hydrogen Production from Robust Oxygenic Phototrophs (Renewal)" $1,100,000 **C. Dismukes** (PI) 08/11 – 08/14.

National Science Foundation – CLP, 1213772: "Probing the Catalytic Core of Photosynthetic Water Oxidation, Atom by Atom"
C. Dismukes (PI) 08/12 – 08/15, $350,000.

Costantino Vetriani (PI) was awarded a $49,972 grant from the Center for Dark Energy Biosphere Investigations (C-DEBI) entitled: Heterotrophy in deep-sea reducing environments: Physiology and metabolism of aerobic hydrocarbonoclastic bacteria. 03/13 – 02/14.

Patents

William Ward celebrates his 35th year in the Department, and has additional cause to celebrate with the cloning and expression of two new Green Fluorescent Protein (GFP) proteins. The cloning was by Michael Tota, CSO of *Brighter Ideas*, Bill's company formed a decade ago as a Rutgers spin-off company at the Commercialization Center for Innovative Technologies in North Brunswick.

The name, Brighter Ideas, reflects Bill's career-long interest in bioluminescence and in particular with GFP. One cloned gene is from a sea pansy, Renilla kollika, and the other from an obscure New Jersey Shore jellyfish. The gene sequence from the latter GFP is distinctive with a new scaffold of genetic diversity, making it patentable. Indeed it's red-shifted spectrum and higher quantum yield make it more desirable in many respects than the famous Aequorea GFP. A provisional patent application has been filed. Brighter Ideas has also negotiated a recent $220,000 contract for specialized, health-related protein purification for a local NJ company.

Other funds come from sales of anti-GFP antibodies, chemiluminescence–based diagnostic kits that use soybean peroxidase as a reporter rather than horseradish peroxidase, and antibodies to a variety of other proteins.

Bill also invented a detection kit for BPA (bis-phenol A), a potentially toxic and carcinogenic chemical used in the manufacturing of polycarbonate plastics and epoxy-based linings of food cans. Additionally BPA occurs in ordinary store receipts and thermal chart paper and can be 200,000 times higher than leachates from bottles and cans. The new assay kit, ideal for educational applications, is based upon soybean peroxidase chemistry. This "BPAssay" is a simple color spot test (blue to lavender) that develops within 5 minutes At last year's Rutgers Entrepreneurial Day, Dr. Ward's BPA assay kit was awarded first prize in the category of Greatest Potential for Social Impact. The assay is being used at the Bergen Academy, Hackensack, to study BPA-inhibited regeneration in Planaria flat worms, also illustrative of university/high school collaboration. Bill's invention has been submitted by Rutgers for provisional patent protection.

The Rutgers Study Abroad course on the Microbiology and Culture of Cheese and Wine is offered each summer by Max Häggblom

The class is co-taught with Stephen Reinert, Professor of History and Catherine Healey, Resident Director, Rutgers Study Abroad Programs in France. During the course students and instructors explore the microbiology and culture of cheese and wine during two-weeks in southern Burgundy. We discover how milk is curdled and processed into cheese and how bacteria and fungi are central in this process, and, of course, savor the complex tastes and aromas of the diverse cheese varieties of the region. We also learn about the history of viticulture, how yeast ferments sugars to ethanol, and the complexity of the chemical and biological reactions during maturation which give wine their character. This intensive two-week course combines applied microbiology with socioeconomic and cultural history, on site in southern Burgundy, one of the most pastoral and physically beautiful regions in all of France. The course combines lectures, group projects and field trips with wine and cheese tasting melding a comprehensive appreciation of the science, history and culture of cheese and wine.

Our Faculty





Conferences

Costantino Vetriani was Invited to participate in the training course on December 5-7, 2012 at the Université Pierre et Marie Curie, Observatoire Oceanologique de Banyuls-sur-Mer, Banyuls-sur-Mer, France intitled *"Extreme environments and deep-sea ecosystems"* as a lecturer on the themes: *1) "Molecular tools in microbial oceanography", and 2) "Microbiology of deep-sea hydrothermal vents: Microbial colonization, biofilms, thermophiles".*

Sharron Crane was awarded a travel stipend from the Rutgers PTL Professional Development Fund to attend the American Society for Microbiology Conference for Undergraduate Educators which took place in Englewood, Colorado, from May 16-19, 2013.

Max Häggblom was an invited speaker at the 9th International Symposium on Persistent Toxic Substances (ISPTS), held in Miami, Florida, October 23-27, 2012. He presented work on anaerobic respiration of selenium and arsenic oxyanions.

Max Häggblom, Männistö MK, Rawat S, Tiirola M, Kerkhof LJ (2012) Assessing the role of Acidobacteria in carbon turnover in Arctic tundra and the mechanisms promoting their activity and abundance in these soil environments. 14th International Symposium on Microbial Ecology, Copenhagen, Denmark, August 19-24, 2012.

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Cruz, K., **C. Vetriani,** and **T. Barkay**. Modeling the role of extracellular polysaccharide secretion in sequestration of mercury as a mechanism of tolerance in deep- sea hydrothermal vent bacteria using Escherichia coli. SETAC North America, The 33nd Annual Meeting, Long Beach, Calif. Nov. 11-15, 2012.

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Teaching

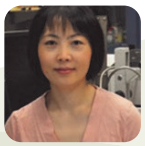
Dr. William Ward will once again be teaching his summer course "Special Topics in Biochemistry". This 3-credit Rutgers Summer Session lab course has been designed for younger, profoundly gifted and talented students. The course is also recommended for early-admitted, first-year matriculated students at Rutgers University's New Brunswick campus. Children from 10 to 17 years of age are eligible, but each student must have taken a high school level chemistry course, an equivalent course via home schooling, or an internet-accessible introductory chemistry course now being created. Visit the course website for more information:
http://dbm.rutgers.edu/11115433SpecialTopicsBiochem.html

"In the summer of 2012, just before my junior year, I was enrolled in the "Special Topics in Biochemistry" course. I wanted to find a challenging and fun program to attend over summer vacation. This was exactly what I was looking for, and more. I learned methods that were never discussed in my biology class, including column chromatography and three phase partitioning. We discuss the chemistry of molecules more in depth than in my school. Even using the Rutgers lab is great, since there is so much technology available for use. Unlike labs in school, here we are able to work on one project for just about 3 weeks. I find this far more rewarding. Although we learn plenty, the classes were always engaging and there was never a dull moment. Dr. Ward is humorous and extremely dedicated to his work with GFP. He and his amiable assistant teachers helped explain the processes of purification with clarity. I would recommend this course for any other student who would like to learn and meet new people. In most high schools, students complete a transformation of bacteria with the gene coding for GFP, and everyone is in awe of the green luminescence. Here is a chance to work with GFP again! I have never encountered a course as special as this one. I was happy to write this. I hope this is sufficient to put up on the website." *-Tej Naganathan—former student*

Max Häggblom and Isabel Horna-Gray (Ph.D. Candidate in Environmental Sciences) were instructors for one week Short Course on Environmental Microbiology organized at Universidad Nacional Santiago Antúnez De Mayolo in Huaraz, Peru in April 2013. In Huaraz they also worked on establishing a research collaboration to study bioremediation in relation to mining residues.

Our Faculty





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Our Faculty





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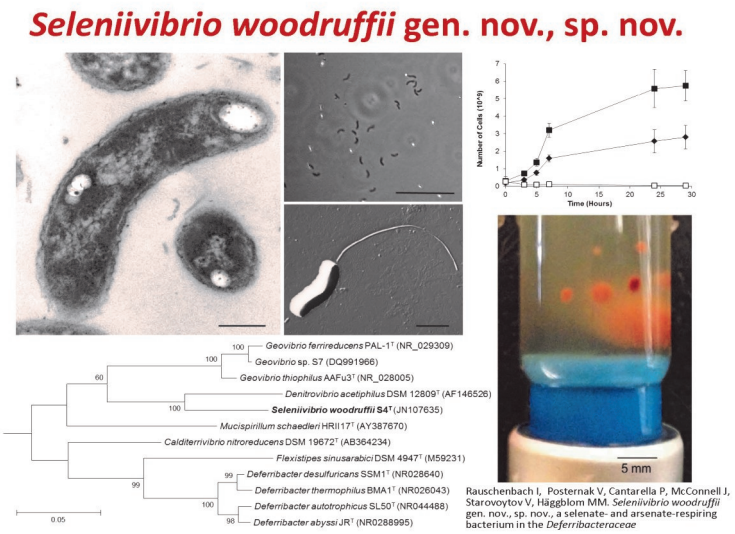


Ines Rauschenbach, Max Häggblom and co-workers have described a novel bacterium, Seleniivibrio woodruffii gen. nov., sp. nov., a selenate- and arsenate-respiring bacterium in the Deferribacteraceae. (Int J Syst Evol Microbiol. 2013 Apr 26). This obligately anaerobic bacterium grows by respiration of selenate and arsenate. The new species is named in honor of Dr. H. Boyd Woodruff, a Departmental Rutgers University alumnus - his lifetime dedication to the advancement of science, his contributions to soil and microbiology and the discovery of natural products important to human and animal health and agriculture. As a Ph.D. student in Microbiology and Molecular Gentics at Rutgers Ines Rauschenbach was the recipient of a Boyd H. Woodruff Graduate Fellowship in Microbiology established with the very generous endowed gift of Dr. H. Boyd and Jeanette I. Woodruff.

Professor Douglas Eveleigh was honored with the
2013 School of Environmental and Biological Sciences Teaching Excellence Award.




Professor Eveleigh, Fenton Professor of Applied Microbiology, is a tour de force in microbiology with over 40 years of distinguished service to Rutgers. He has excelled in teaching at all levels, as an instructor of undergraduate to graduate students, as a mentor to post -doctoral and visiting scholars, and as an educator of the broader community through his extensive outreach activities. He has infected countless students and faculty colleagues alike with his passion and enthusiasm. With Doug, microbiology is “Sheer Fun”!

Doug is synonymous with General Microbiology. He has taught the course since 1973, initially as the sole instructor and more recently as the course coordinator of a team of instructors. Currently the class is offered in the fall, spring and summer semesters to approximately 300 students annually. A conservative estimate is that well over 6000 undergraduate students have learned their microbiology from Prof. Eveleigh and been enriched by his enthusiasm and eclectic approach to teaching. His knowledge and energy elicit curiosity and his collection of interesting vignettes wake up the attention of students to explore more.

To provide a forum for non-microbiology students Doug developed the Colloquium Class Marvelous Microbes in 2001. This class has been filled to capacity every year. In this course Dr. Eveleigh and his students consider the positive attributes of diverse beneficial microbes through interesting vignettes and historical bases: e.g. microbes and the foundation of the U.S. steel industry; mushroom hallucinogens and the hymns of John Greenleaf Whittier; paintings of Beatrix Potter (Peter Rabbit); the stabilization of sanddunes through the activities of bayberry's microbial symbionts. Students write and cite poems on their favorite microbes, draw cartoons, have "show and tell", everything to become aware of the wonders of living in a microbial world and to gain a thirst for understanding more.

Doug’s expertise is recognized in both the academic and industrial worlds and his role as an instructor and academic mentor is highly respected. Over his career Doug has trained over 50 Ph.D. and M.S. students, who have then gone on to distinguished careers in academia, industry and government. His former students uniformly highlight his role as an engaging mentor, developing their abilities to think independently, instilling in everyone a joy in learning something new.

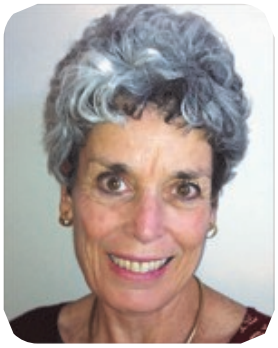
In addition to being a passionate and inspiring teacher, Prof. Eveleigh is a world-class scholar. He pioneered the field of cellulosic biofuels 40 years ago! It is again a hot topic, and now many of his former students are leading the charge. His expertise is recognized in both the academic and industrial worlds and his role as an instructor and academic mentor is highly respected. His support and unwaveringly positive encouragement drive both his students and faculty colleagues to greater achievements.

Professor Eveleigh's interests include the history of science, and of microbiology in particular. He has been instrumental in highlighting the past discoveries in the field of microbiology at Rutgers, organizing several anniversary symposia on the many antibiotics that were discovered here. One of the highlights in outreach was November 5th, 2008, when Prof. Eveleigh provided the inspirational leadership and organization for the now legendary reenactment of the classic 1783 experiment by General George Washington and Thomas Paine of their discovery of the nature of the fiery Will-O'-the-Wisp of marshes and rivers was performed by the Department. "It's a Gas!" (for the second time) was heard across the Millstone River in Rocky Hill NJ, at the site of the original experiment. [We now know that this flammable gas is methane, produced by microbial decomposition of organic matter in the sediment.] Count Volta is usually credited for this discovery, and had reported on the same experiment in 1776, but there are no indications that General Washington was reading the Italian scientific literature while directing the Revolutionary War. This should thus be considered an independent discovery, and the first significant scientific experiment in America, since the signing of the Treaty of Paris. As noted by Dr. Eveleigh at the event: “*We hope that subsequent American Presidents will maintain the keen interest in science expressed in this first major microbiological experiment of the young Republic*.”

Most recently Doug spearheaded the 60th Anniversary Symposium of the Nobel Prize awarded to Selman A Waksman, that was held last December. The Waksman Museum in Martin Hall would not have come to fruition without Doug's dedication and work. Doug has widely disseminated his passion for the history of science though lectures and public outreach, such as leading the charge for selecting "state microbes".

It is most appropriate that the School of Environmental and Biological Sciences recognizes Prof. Eveleigh for his exceptional contributions in teaching over the last 40 years.

Seminal discoveries in the role of microbes in mercury poisonings



Rutgers Professor **Tamar Barkay,** in the Department of Biochemistry and Microbiology at the School of Biological and Environmental Sciences (SEBS), is an international authority on environmental mercury cycling. Her expertise was requested to assess recent critical advances in the role of microbes in mercury poisonings in a commentary for the journal *Science*. These studies unlock certain gates to understanding this complex environmental problem, and merit a brief review of the basis of the worldwide occurrence of mercury poisoning.

Mercury (Hg) is a priority environmental poison which in its methylated form is a major health hazard, especially so as it is biomagnified through aquatic food webs. Human activities associated with industrialization have exacerbated Hg contamination, leading to Hg levels in fish and other aquatic animals that exceed guidelines for human consumption. Mercury toxicity and bioaccumulation depend on the microbially mediated synthesis of methylmercury, occurring mostly in anoxic environments such as marshes and lake sediments. Scientists from the Dept. of Biochemistry and Microbiology at SEBS at Rutgers have been central to mercury biogeochemistry research and for over 30 years and have made seminal contributions to this field. These studies initiated in the 1980's by Prof. Richard Bartha were motivated by the severity of mercury contamination in New Jersey. Throughout the 1980's and 1990's Dr. Bartha's team with Prof. Theodore Chase made influential contributions in their discovery that microbes that live by breathing sulfate in anoxic sediments. They demonstrated the biochemical processes that lead to the formation of methylmercury. These studies were with microbes from the local Cheesequake Salt Marsh.

Professor Tamar Barkay joined the department following Dr. Bartha's retirement and continued the mercury biogeochemistry studies which she previously developed while at the EPA. Then at Rutgers by combining molecular biological and biochemical approaches, her team made a major advancement in discovering that the accumulated neurotoxic methylmercury in the highly contaminated zones can also be reduced by the degradative activity of microbes. Her discovery provided an explanation to the "mercury accumulation paradox" whereby methylmercury accumulation in highly contaminated environments, such as Berry's Creek in the Meadowlands of New Jersey, is relatively low compared with accumulation in environments with low levels of contamination, such as Pinelands lakes. Dr. Barkay has other major accomplishments in this realm. She has developed luminescence bioreporter microbes that indicate the concentrations of mercury that are bioavailable for methylation. In co-operation with biogeochemists and geo-microbiologists from all over the world, including Canada, Denmark, Slovenia, France, Brazil, and Japan, Dr. Barkay has used her bioreporters to define factors that control mercury speciation and availability to methylating microbes in diverse environments. She has shown how deep-sea microbes in hydrothermal vents are highly adapted to the high concentrations of mercury that are emitted from the vents. In contrast, she also showed how even in one of the coldest places on Earth, northeast Greenland, that microorganisms in the ice and snow of the high Arctic actively transform mercury between its various chemical forms. This is a potential rationale for methylmercury accumulation in the Arctic food chains. In recent years, Dr. Barkay has also discovered that the early evolution of mercury resistance among microorganisms apparently occurred among thermophilic microbes in geothermal environments. Her team was able to demonstrate that the activities of these resistant organisms support life in hot mercury-rich springs in Yellowstone National Park.

Through many years of active research on the microbiology of the mercury geochemical cycle, Dr. Barkay has gained the respect of the international mercury biogeochemistry community. Her standing within this community was recently highlighted when she was asked by the editors of *Science* magazine to prepare a commentary on the discovery of mercury methylation genes in anaerobic bacteria that respire sulfate (yes, those discovered by Dr. Bartha and his team so many years ago…) and those that respire iron. Her commentary, titled "Cracking the mercury methylation code" was published in the same issue of *Science* (March 15, issue, Vol. 339 p. 1280-1281) where the original paper describing these genes appeared. This discovery is one of the most important developments in mercury biogeochemistry because it identifies specific genes and thus biochemical reactions that explain how mercury is methylated, while these genes can additionally be used as biomarkers to assess the potential for methylation in the environment.

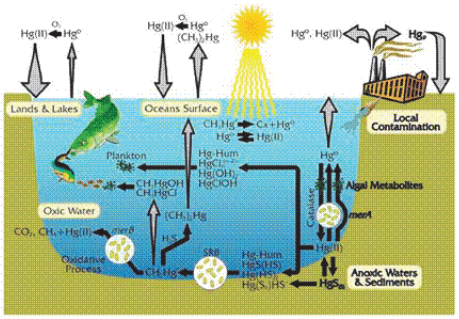


Figure 1: The geochemical cycle of mercury in the environment. The major public health concern with mercury is the bioaccumulation and biomagnification of methylmercury (CH_3Hg^+) by the aquatic food chain. These, in turn, are determined by rates of Hg transformations and transport in the environment. Black arrows depict transformations and gray arrows depict transfer pathways.

60th Anniversary of the Selman Waksman Nobel Prize in Physiology or Medicine
Antibiotics – Soil's Microbial Miracles
Wednesday, December 12, 2012 (9 a.m. - 6 p.m.)
Trayes Hall, Douglass Campus Center, Rutgers University, New Brunswick, NJ

The day long symposium addresses the sweet smell of success driven by antibiotics in diverse fields – how the roles of wispy, bacterial threads, the Actinomycetes, went from soil fertility enhancers to a practical and vital broad based medical resource. The speakers all nationally recognized, explore both the direct and indirect effects of antibiotics. The Waksman novel antibiotic armamentarium that followed penicillin and tyrothricin, including actinomycin, streptothricin, fradicin, chaetomin and especially streptomycin, stimulated the uncovering of a variety of "block buster" antibiotics which changed the approaches to treatment of world diseases. This treasure trove expanded to include anti-tumor agents, immunosuppressants, food preservatives and insecticides. Impacts on Society were diverse - the enhancement of the human life span resulting in more distant considerations as delayed retirement to Social Security issues. The Symposium recognizes the effects of antibiotics in diverse spheres- new antibiotics through novel screening, new interpretations of their role, how they aid in unraveling metabolic and microbiome conundrums and the current status of tuberculosis. They have turned the world topsy-turvy. The inspiration behind the Morrill Act in the creation the Land Grant Universities system was again realized. Waksman received the Nobel Prize in Physiology or Medicine, 1952 for "ingenious, systematic and successful studies of the soil microbes" that led to the discovery of streptomycin. As Selman Waksman later commented: "Out of the earth shall come thy salvation."

Program

Dean Robert M. Goodman (Rutgers University, School of Environmental and Biological Sciences)

President Robert Barchi (Rutgers University)

Joachim Messing (Rutgers University, Director, Waksman Institute)

Amy Vollmer (President, Waksman Foundation)

Douglas E. Eveleigh (Rutgers University, Dept. of Biochemistry and Microbiology)
Introduction of H. Boyd Woodruff

Boyd Woodruff: History of the discovery of antibiotics at Rutgers

Richard Ebright (Rutgers University, Waksman Institute)
Soil microbes: an unexhausted source of antibacterial drug leads

David Hopwood (The John Innes Centre, Norwich, UK)
***Streptomyces* genomics reveals an Aladdin's Cave of novel natural products**

Jeff Boyd (Rutgers University, Dept. of Biochemistry and Microbiology)
Intracellular iron metabolism in *Staphylococcus aureus*: A novel antimicrobial target?

Ann Stock (UMDNJ, Center for Advanced Biotechnology and Medicine)
Targeting novel features of response regulator proteins for antimicrobial drug development

Eva Top (University of Idaho, Institute of Bioinformatics and Evolutionary Studies)
Rapid coevolution of plasmid-host pairs contributes to the spread of antibiotic resistance

Lee Reichman (NJ Medical School UMDNJ – Newark)
Forgotten but not gone

Richard Baltz (CognoGen Biotechnology Consulting, Indianapolis, IN)
Combinatorial biosynthesis of lipopeptide antibiotics related to daptomycin

Barry Kreiswirth (NJ Medical School UMDNJ – Newark)
The challenges of tuberculosis in 2013.....Calling Dr. Waksman

Carl Zimmer (Contributor, New York Times)
Collateral damage from the magic bullet: Antibiotics and the microbiome

Reopening of the Waksman Museum, Martin Hall, School of Environmental and Biological Sciences - Wine/Cheese Reception

Our Graduate Students

PH. D Theses

Madhavi Shah, Microbial Biology
"Iron Oxide Reduction by a Clostridia Consortium: Insights from Physiological and Genome Analyses". Dr. Nathan Yee (advisor)

Abstract: Iron reducing organisms are ubiquitous and phylogenetically diverse. Their acitivity in the environment not only affects the speciation of iron in aquatic systems or sediments, but it plays a major role in iron mineral formation, sediment diagenesis, carbon cycling and the fate and transport of contaminants in subsurface environment. Iron oxide reduction has been extensively studied with pure cultures of dissimilatory iron reducers such as Geobacter and Shewanella. However the effects of syntrophy on iron oxide reduction and secondary mineralization by microbial consortia are poorly understood.

The research presented in this dissertation thesis describes enrichment of an iron reducing anaerobic microbial consortium from subsurface sediments. The consortium was composed of fermentative *Clostridium* sp. strain FGH and a novel Veillonellaceae, strain RU4. The experimental results indicate the role of hydrogen, sulfate and growth medium in rapid reductive dissolution of iron oxides and subsequent secondary mineralization by clostridia consortium. The data demostrated that iron oxide reduction by the consortium was catalyzed by both biotic reduction by strain FGH and syntrophy driven biotic/abiotic reduction by strain RU4. Reductive dissolution of iron oxides by the consortium resulted in formation of solid-phase Fe(II) and poorly crytalline ferrous bearing minerals such as nanoparticulate magnetite and iron sulfides. The results of this work provide new insights in the ecological role of Clostridia in subsurface Fe(II) mineral formation processes.

Unlike iron respiring Geobacter and Shewanella, mechanism of iron oxide reduction is poorly understood in iron reducing fermentative bacteria. In this study we conducted experiments with fermentative *Clostridium* sp. strain FGH to elucidate its mode of iron reduction. Experiments and genome analysis suggest a indirect, cytochrome c independent mechanism of iron reduction by strain FGH.

Veillonellaceae are recently found to be active during bioremediation studies at contaminanted sites. Genomic characterization of the novel Veillonellaceae, strain RU4, that could not be isolated in pure culture revealed its potential metabolic capabilities. Strain RU4 draft genome consists of fatty acid metabolism genes and pathways for sulfate, sulfite and polysulfide reduction. These results may assist in better understanding of biogeochemical and ecological role of this novel subsurface bacterium

Ramaydalis Keddis, Environmental *Sciences* *"Alkane oxidation in pure cultures and natural microbial communities from deep-sea geothermal environments: linking diversity and function".* Dr. Costantino Vetriani (advisor)

Abstract: At deep-sea hydrothermal vents, the flux of energy is mediated by microbial oxidations, through the conversion of the chemical energy stored in reduced compounds (e.g., sulfide, hydrogen, hydrocarbons) into biochemical energy. Natural hydrocarbons are largely formed by the thermal decomposition of organic matter (thermogenesis) or by microbial processes. However, hydrocarbons can also have an abiotic origin and may form, in hydrothermal systems, by water-rock interactions, for example involving Fisher-Tropsch reactions and the serpentinization of ultramafic rocks. Despite the observation that hydrocarbons are enriched in deep-sea hydrothermal vents, our knowledge of the taxonomic and functional diversity of alkane-oxidizing bacteria from these environments remains very limited. In this dissertation, I investigated the diversity of alkane oxidizing bacteria and the genes alkB, CYP153 and almA by performing enrichment cultures for hydrocarbon oxidizing microorganisms from fluid samples and biomass collected from experimental microcolonizers that were deployed on diffuse flow vents on the East Pacific Rise. These enrichments led to the successful isolations of pure cultures of aerobic, mesophilic organisms capable of using n-alkanes as their carbon sources.

Our isolates were, for the most part, Gammaproteobacteria of the genus *Acinetobacter* and *Alcanivorax*, but some rare occurring bacteria that were numerically relevant in the environments were also isolated. The PCR amplification of the alkB, CYP153 and almA gene fragments from these isolates, and a phylogenetic analysis of these genes was carried out. The alkB, CYP153 and almA genes encode for the alkane hydroxylase, cytochrome P450 and flavin binding monooxygenase respectively, which are enzymes that catalyze the first reaction in the stepwise oxidation of n-alkanes. Furthermore, transcripts of the alkB gene were detected in two model organisms from the laboratory culture collection, Alcanivorax sp. strain EPR 7 and Acinetobacter sp. strain EPR 111. Qualitative Reverse Transcription PCR (RT-PCR) experiments showed that alkB transcripts could be detected in the presence of dodecane but not in acetate, confirming that, in these strains, the alkB gene is induced. Finally, a functional gene survey of alkB genes in vent natural microbial populations showed that the majority of the detected sequences derived from Gammaproteobacteria and Alphaproteobacteria.

Charles O'Brien, Microbiology and Molecular Genetics
Surveying the metabolic versatility of biofilm forming Epsilonproteobacteria: A study into develeoing ecosystems at extreme environments". Dr. Costantino Vetriani (advisor)

Abstract: At deep-sea hydrothermal vents, mixing of reduced, super-heated, hydrothermal fluids with cold, oxygenated, seawater creates steep temperature and chemical gradients that support chemosynthetic primary production and rich communities of invertebrates. In 2006, an eruption occurred on East Pacific Rise at 9° 50'N, 104° 17'W. Direct observations of the post-eruptive diffuse flow vents clearly indicated that the earliest colonizers were microbial biofilms. A series of cruises in 2006-07 allowed to monitor the recovery of the ecosystem.

The main objectives of this dissertation are to assess the taxonomic and functional diversity of chemosynthetic bacteria following the eruption, and to correlate it to macrofaunal colonization. To this end, I investigated several microbial biofilms that developed at the bottom of the ocean during exposure to different temperature, redox and biological regimes. Furthermore, I selected pure cultures of vent bacteria representative of these biofilms and designed experiments to investigate their expression of diagnostic genes involved in carbon fixation and respiration. Finally, I used the information obtained from the pure cultures and from metatranscriptomic studies of the vent biofilms to design experiments for the detection of gene transcripts in chemosynthetic microbial biofilm communities collected from deep-sea hydrothermal vents, and to interpret the results.

My studies indicate that the biofilm communities that were exposed to active venting were substantially different from the ones that formed at control sites, and that vent invertebrates could only be detected at the former sites. Furthermore, I found that various members of the Epsilonproteobacteria dominated the chemosynthetic biofilm communities, and that these bacteria fixed carbon dioxide in-situ via the reverse tricarboxylic acid (rTCA) cycle and that they expressed different terminal reductase in response to variable temperature and redox conditions. I demonstrated for the first time that different respiratory pathways (e.g., nitrate reduction, sulfur oxidation/reduction, microaerobic respiration) are expressed simultaneously in chemosynthetic biofilms. In turn, these results imply that the extremely dynamic conditions found at diffuse flow vents, where reduced hydrothermal fluids mix with oxic seawater, provide the biofilm bacteria with a diverse "metabolic menu" in the form of different redox couples that they can use to conserve energy .

Our Students

Honors and Awards: Congratulations for the following Biochemistry and Microbiology undergraduate students on their awards:

David H. Strumeyer Award: Theodore Drashansky (GPA 3.90)
Selman Waksman Award in Microbiology: Wie Jie Tan (GPA 3.92)
Theodore Chase Award: Hema Sekaran (GPA 3.81); Nikki Chand (GPA 3.83); Mary Thompson (GPA 3.81); Disha Patel (GPA 3.75)

The Department would like to congratulate the following students for completing their George H. Cook Scholars Program :

Cathie Ruesch (Genetics) Advisor William Belden (Cathie was accepted at Princeton).
Bavani Subramaniam, (Biotechnology) Advisor Max Häggblom.
Hema Sekaran (Microbiology) Advisor Constatino Vetriani
Viraj S. Dala (Ecology Evol. & Nat. Resources) Advisor Tamar Barkay
Yixi Zhang (Biochemistry/Biotech) Advisor Kyle Murphy

Robison Scholarship Award for 2012

A Mashruwala and T Kung

Congratulations! Ameya Mashruwala (Microbial Biology, Boyd Lab) and Tiffany Kung (Toxicology, White Lab) have been selected as recipients of the Robert S. and Eileen A. Robison Scholarship Award for 2012. It is truly a meritorious group of students. A special thank you to Peter Kahn and Doug Eveleigh who served on the selection committee.

The Robert S. and Eileen A. Robison Scholarship Award For Excellence in Graduate Studies was established in 2003 and is supported by the Robison family. This year we also have additional support from the Linda and Dennis Fenton Fund for a second scholarship. The scholarship is awarded to a graduate student(s) who has demonstrated tremendous competence and accomplishment in their academic and research program while at Rutgers University, has shown an active participation in or a leadership role in the activities of the department, college, university or community, and is motivated to help and improve the human condition at this time and upon gradua-

Jessica Choi

Congratulations to **Jessica Choi** (Graduate program in Microbial Biology - Yee Lab). The Microbial Biology Academic Standing Committee nominated Jess for the *Hachnasarian Scholarship Award*. This is a $1,000 fellowship awarded through the SEBS dean's office. The Committee basis its selection on Comprehensive Exam scores, first year course grades, and lab rotation performance. Our past two Hachnasarian awardees were Ameya Mashruwala and Zuelay Rosario Cruz.

Hamidah Raduwan

Hamidah Raduwan (Graduate program in Microbial Biology—Belden Lab) is the first student in the Microbial Biology Graduate Program to publish a first author manuscript "Methylation of Histone H3 on Lysine 4 by the Lysine Methyltransferase SET1 is needed for normal clock gene expression" Authors, Hamidah Raduwan, Allison L. Isola, and William J. Belden. JBC Papers in Press. Published on January 14, 2013. The manuscript was accepted for publication in 2012 and published January 13th 2013. This is exemplary, considering she is only a second year student. She has also given service to the department through a weekly mentoring of Malaysian students in Peter Kahn's Biochemistry course. She has displayed excellence for the Microbial Biology Program. Hamidah was also awarded a $2000 special studies support from the NB Graduate School.

Tong Liu

Tong Liu (left) and **Seo Yean Sohn** (Graduate program in Environmental Sciences ~ Häggblom Lab) each received a $5000 Graduate Student GRANTS-IN-AID grant from New Jersey Water Resources Research Institute for FY2013.

Seo Yean Sohn

American Society for Microbiology Student Chapter

Student Chapter of the American Society for Microbiology - Rutgers

http://dbm.rutgers.edu/asm_studentchap.html

Mission

Hello and welcome to the Rutgers Student Chapter of the American Society for Microbiology webpage. We are a graduate student organization affiliated with Theobald Smith Society, the North Jersey branch of ASM. Our mission is to encourage education, research and application of microbiology, and to widen our breadth of exposure to all faucets of microbiology. We work to meet these objectives by hosting monthly membership meetings, guest lectures, joint ventures with the Theobald Smith Society, research symposia, and social activities that foster relationships between faculty and chapter members.

Who We Are

We are composed primary of graduate students in the microbiology and biotechnology disciplines. However, undergraduate students, as well as anyone with an interest in microbiology, are also welcome to be a part of the organization. For more information on applying for a membership, please contact Ameya Mashruwala： ameya@rci.rutgers.edu.

ASM Student Chapter Officers:

Ashley Grosche - President

Ashley is a first-year graduate student in the Microbial Biology program working in Dr. Vetriani's Deep Sea Microbiology Lab at the Institute for Marine and Coastal Sciences. She graduated from Rutgers University in 2010 with a Bachelor's Degree of Marine Science. Her current research is focused on studying the oxygen detoxification mechanisms of strict anaerobes isolated from deep-sea hydrothermal vents as a function of fluid temperature and length of exposure.

Fatima Foflonker - Vice President

Fatima is a second-year graduate student in the Microbial Biology program and am working on algal genomics in the Bhattacharya lab. She is from Michigan and graduated with degrees in microbiology and Arabic from Michigan State University. A member of the IGERT (Integrative Graduate Education Research Traineeship) traineeship for renewable and sustainable fuel solutions and have research interests in biofuels, algal genomics, and harmful algal blooms.

Zuelay Rosario Cruz - Treasurer

Zuelay obtained her Bachelor's degree in Industrial Biotechnology from the University of Puerto Rico at Mayagüez. Zuelay joined the Microbial Biology Program in 2010 and she currently works in Dr. Jeff Boyd's lab. The focus of her research is studying low-molecular-weight thiols in methicillin-resistant *Staphylococcus aureus* and understanding their function in oxidative stress metabolism and metal homeostasis.

Ameya Mashruwala - Secretary

Whats Shaking!

J. Maguire, T. Crawford and B. Nugent

The Department congratulates **Beth Nugent** on her promotion to Department Administrative Assistant. We also welcome **Tamara Crawford** to her new job as Secretary Assistant working with the faculty on travel, and grants.

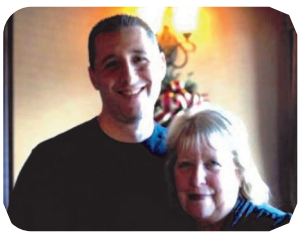
The lovely ladies pictured with their RU service gifts were also honored for their years of service at Rutgers in June. Jessie and Tamara for 10 years, and Beth for 20 years! Congrats!

The **7th Annual Joint Molecular Biosciences Graduate Student Association Symposium**, UMDNJ/Rutgers University was held on March 8, 2013. Our **Zuelay Rosario-Cruz** and Jeff Boyd's study "The role of the low-molecular-weight thiol bacillithiol in trace metal metabolism in *Staphylococcus aureus*" was selected among the best poster presentations. The talented graduate students are pictured (l to r): Christina Ramirez JMBGSA Secretary, Cellular and Molecular Pharmacology Graduate Program (CMPGP); Mai Soliman (best poster, Cell and Developmental Biology Graduate Program (CDBGP); Michael F. Decclessis - JMBGSA Treasurer, (CDBGP); Jessica Fellmeth - JMBGSA President, Microbiology and Molecular Genetics Graduate Program (MMGGP); Abby Hare (best talk) (MMGGP), Zuelay Rosario Cruz (best poster, Microbial Biology); Tzeh Keong Foo (Vice President JMBGSA & CMPGP): Jake Jacobs (best poster - Department of Molecular Biology and Biochemistry). Absent: Frank Macabenta (CDBGP) and Malan Silva (MMGGP) respectively the winners of best oral and poster presentations.

Eileen Glick and Max Häggblom

Eileen Glick Retires: Eileen Glick's retirement party was held at Fresco's (Miltown NJ) on November 30, 2012. Thirty of her co-workers, and her family enjoyed a sumptuous dinner, and were able to wish Eileen well in her retirement.

Eileen has been with the Department of Biochemistry and Microbiology for 25 years. She began part-time at Rutgers in 1981 at the Douglass Career Development Office when her children were young. She has also worked part-time in Entomology, Food Science and Animal Sciences. Then Eileen went to Busch campus and with the Department of Computer Science from 1984 until 1988, at which time she left to begin her work in our department.



David Glick and Eileen

She has been most happy in Biochemistry and Microbiology interacting with the students, both undergraduate and graduate. "*Without a doubt, the interaction with our students is most gratifying. I find they are so appreciative of any help or kindness. I am also grateful that I have wonderful co-workers and a very supportive department chair and faculty.*"

Eileen will be involved in her community during retirement years. She enjoys the theater, reading, knitting, gardening and antiquing. She is enjoying her retirement and spending quality time with the kids and grandkids. Mike (husband) just retired at the end of January so they are enjoying the family together. "*I don't miss getting up early, but I miss my co-workers and the people in Lipman!* "

Picture taken by Hang Dam (Microbial Biology Ph.D student)

Thanks to all who assisted in writing, assembling, editing, nudging, preparing, critiquing (always constructively), and producing this newsletter. Please feel free to email corrections, complaints, submissions to: maguire@aesop.rutgers.edu

Editors: Douglas E. Eveleigh, Max M. Häggblom and Kathy Maguire
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