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Dr. Diane Zezza graduated with a PhD in Genetics in 1985 and, following postdoctoral work at the University of Connecticut Health Center and the Massachusetts Institute of Technology, she has developed a very successful career in regulatory affairs. Zezza is currently Vice President, Global Regulatory CMC (Chemistry, Manufacturing and Controls) at Novartis Pharmaceuticals Corporation. Prior to coming to Novartis, she was Vice President, Global Regulatory Affairs CMC at Merck and held various positions in regulatory affairs in the area of small molecules and biologics at Schering Plough Corporation and at Eli Lilly and Company.

For her PhD dissertation, Zezza studied the expression of chicken myosin heavy chain genes in the lab of Prof. Stuart Heywood. Molecular biology techniques were not as simple in those days. “It was very labor intensive, particularly with mRNA,” she said. However, the effort paid off. “In terms of the experience I got through my graduate work at UConn it was a great foundation,” Zezza noted. “I think it really helped me step into a position in regulatory fellowship.”

Following her postdoctoral studies, Zezza decided to follow a career track in the private sector. “I ultimately started my pharmaceutical career in a position in regulatory affairs,” she said. “There was a newly formed group at a pharmaceutical company that was looking to register a new drug with the health authorities around the world that was based on biotechnology, so my molecular biology background was very appealing.”

Zezza found that a research degree helped her in the regulatory affairs field. "Reading a code of regulations is like reading scientific papers,” she said. “Understanding what the data are telling you is still an integral part of what I do in the area of regulatory affairs environment.”

Though Zezza entered graduate school at UConn with an interest in Genetics, “There was a whole universe out there,” she discovered. “When I got into UConn I saw all the research areas that were there and that was great.”

The research community in the newly forming MCB department left Zezza with good memories. “I look back at those years as just a really great experience,” Zezza said. “The whole learning environment, the campus life, the professors, the fellow students just all of it made for a great experience. You felt like you were a part of a real family while you were there.”

Faculty Awards
Assoc. Prof. Barbara Mellone was a recipient of a 2015 AAUP Excellence Award for Excellence in Research & Creativity: Early Career.

Prof. Carol Teschke and Philip Yeagle have been named as AAAS Fellows.

Prof. James Cole was elected president-elect of the Gibbs Society of Biological Thermodynamics.

Faculty News
New Faculty
Asst. Prof. Nichole Broderick joined the MCB faculty in Fall 2015. Dr. Broderick’s research uses Drosophila melanogaster and its associated microbiota to study the impacts of beneficial and pathogenic bacteria on host development, physiology, and health using molecular, genetic, and genomic approaches.

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From the Department Head
It seems like only yesterday that the reorganization of the Biological Sciences faculty set us on our current path by founding MCB. The ensuing 30 years has brought remarkable changes to the ways in which we do scientific investigation and to the ways we teach, and all of those changes have been matched by changes to the department. As we continue to look forward, MCB has conducted an extensive self-study this fall that is prelude to an external review in the coming year. This required a herculean effort of a faculty committee to compile the many accomplishments of our faculty in research, teaching and service over the past 10 years. That study confirms that MCB has been a premier department at the University and our future looks very bright. In this issue are brief highlights from that report documenting our many accomplishments.

Throughout this issue you will find articles celebrating our 30th anniversary, each of which is marked with an “MCB at 30” molecule logo. Three articles feature MCB alumni, who received their graduate degrees in 1985, sharing their memories of their time in MCB and providing valuable advice to new graduate students. Five articles summarize developments in the molecular biosciences in 1985. Another article describes the history of Biology at UConn. Finally, take a look at the page of vintage photos of the inaugural MCB faculty members.

MCB continues to grow, this year adding a new member of the faculty, Prof. Nicola Broderick. Prof. Broderick joins us from her position as Lead and Associate Research Scientist at Yale, and a postdoctoral fellowship at the Swiss Federal Institute of Technology in Lausanne. Prof. Broderick brings us new expertise and an exciting research program that uses Drosophila and its associated microbiota to study the impacts of beneficial and pathogenic bacteria on host development, physiology, and health.

Sadly, in this issue we mark the passing of MCB Professor Emeritus Edward Leadbetter. Prof. Leadbetter was a leading microbiologist who strongly advocated for research and training emphasizing microbial diversity and the importance of microbes in the functioning of our planet. He will be missed, but his impact on his research field and on his former students remains.

In this issue we also feature a report of the “Genome Ambassadors” program developed by Prof. Rachel O’Neill, and conducted at the Connecticut Science Center in Hartford. Three MCB graduate students worked with the museum’s staff guiding 12 Connecticut high school students through the science of genomics and constructing family-friendly exhibits. Other articles in this issue describe research activities of several MCB laboratories.

If you are an MCB alumnus, please let us know of any new developments that you would like to share. I hope you enjoy this issue. Here’s looking forward to 30 more years!

Michael A. Lynes
Professor and Head
Dept. of Molecular and Cell Biology

Expression 2014-2015
When is the last time you discussed genomics with your children? Never? Do you think that would be a tough conversation? That was the challenge faced by twelve high school students this summer at the Connecticut Science Center’s Genome Ambassadors program. The program, the brainchild of MCB Professor Rachel O’Neill and CT Science Center’s Vice President of Programs and Exhibits, Hank Gruner, is funded by SENCER-ISE, a National Science Foundation and NoFcy Foundation funded initiative that supports partnerships between informal science and higher education institutions.

O’Neill and Gruner received support for a two-year program to teach middle school- and high school-age students how to design and present genetic concepts to the public. The program also provided support for PhD students in the MCB Genomics graduate program to gain experience in science communication by working alongside professionals at the Science Center who mentor the young students in the Ambassadors program. “This project with Hank has been partly about how to make a more meaningful exhibit,” O’Neill said, “but more importantly to help future scientists learn how to communicate science.”

Dr. Stephanie Airoldi, STEM Program Coordinator at the Science Center, directed the 6-week Ambassadors program for the past two summers. Last year she worked with high school students from central Connecticut who mentor the young students in the Ambassadors program. “The two biggest things that evolved this project with Hank has been partly about how to make a more meaningful exhibit,” O’Neill said, “but more importantly to help future scientists learn how to communicate science.”

Airoldi said, “We do not tell them specifically what we would like them to design,” Flynn noted the challenge of guiding the students. “One of the harder things for me was just to let them be their own independently driven group,” Flynn said. “You want to push them in one way, but the whole idea is for them to be developing themselves.” Peracchio said, “By the end they did a good job of that.”

“Communicating complex scientific concepts to the general public was a new exercise for the graduate students, too,” O’Neill said. “When you are presenting in grad school it is still mostly to people who have much more background, to mostly people in your field!” Heider said, “You are still not presenting to the general public.”

After initial development of their exhibits, the students brought their exhibits out on the Center floor to present them to families that visited the Center. They then spent the next three weeks testing, changing and adapting them depending on the responses of Center visitors. “The three graduate students worked closely with the high schoolers advising and directing the teams. “All three of them jumped right in and interacted with the teams a lot and felt comfortable with them very quickly,” Airoldi said. “The teams got a lot of content from the graduate students and they got a lot of feedback about their projects. The projects definitely improved.”

On the last day of the program the high school students visited the Center for Genome Innovation on the UConn campus. There they got to see how DNA sequencing works and to experience a research laboratory for the first time. “It was really exciting for the students to get into a lab and do something,” Airoldi said. “They all said it was not like what they thought it would be like.” Importantly, it gave the high school students, some of whom will be attending college shortly, a chance to see how graduate students spend their days. “It was very eye-opening for some of them to actually see what it looks like and to see what people actually do there,” said Airoldi.

The findings of the Genome Ambassadors program will be presented in December at a SENCER meeting. In addition, the program will guide the design and development of a planned 2,300 square foot genomics installation at the Science Center. Plans are underway to continue the Genome Ambassadors program in the future. The program had a profound impact on both the high school participants and their graduate student mentors. “I definitely learned a lot from this program,” Flynn said. “I am personally more interested in interfacing with the community about science now.”

By Kenneth Noll
Prof. Charles Svitlik really, really enjoyed his time as a Microbiology graduate student at UConn. "It was a great time of my life," he said. "I feel I am the most blessed person on the face of the Earth."

Svitlik completed his PhD in 1985 in the laboratory of the late Prof. Phillip Marcus and Professor in Residence Margaret Sekellick. His PhD work centered on examining interferon induction in chick embryo cells after infection with Newcastle disease virus. Following graduation, Svitlik took a position at the Waterbury Health Department where he became its Clinical Laboratory Director. His grounding in basic microbiology methods and theory that he obtained during his studies in MCB served him well in that position. Compared to some of his peers, "I can get the stuff to grow, that is what I learned," he said.

After 17 years at the Health Department, he retired and founded Molecular Diagnostic Laboratory, LLC, a molecular microbiology analytic laboratory in the greater Waterbury area. He also began teaching at Naugatuck Valley Community Technical College where he is an Adjunct Professor of Biology teaching their introductory Microbiology course. He brings to that course his experiences from his graduate student teaching assistant days. "A lot of who I am and what I learned being in the department comes through in the course," he said. He especially credits his TA experience in Fundamentals of Microbiology and Pathogenic Microbiology taught then by the late Prof. J. A. Cameron.

Svitlik fondly remembers his time working with Marcus and Sekellick. Once, while repeating the experiments of a previous student to elicit interferon production from cells, he showed Marcus the result of his first attempt, no interferon production. Svitlik commented, "Charlie, your virus is dead!" Finally Marcus tried this was classic Marcus humor. The next failed attempt elicited the comment, "Charlie, your virus is dead!" Finally Marcus tried the experiment, and he, too, failed to get interferon production. Subsequent experiments and deeper thinking revealed that inhibiting protein synthesis for a time, as they were attempting, prevented those cells from ever making interferon, an observation that lead to deeper insights into the process.

Although the techniques he used in his PhD work were in some ways very basic, that fundamental knowledge served him well as new technologies became available. "I was ready and had the ability to learn about them," he said. "It was the gift that continued to grow."

He provided some advice for new graduate students. "I have been very fortunate to have been able to love my passion," Svitlik said. "You have to know what your passion is. "Take your first job and see what your passion is," he continued. "Somehow these things find you and if you are doing good work and you are committed… your passion will find you."

"The life that I was blessed with at UConn has made me now so busy, I am working night and day Microbiology," he said. Svitlick found his passion in MCB and now inspires new generations of students to do the same.

MCB research is recognized internationally with 35,000 journal article citations since 2010.

On the Cover


Bacteria’s Game of ‘Telephone’ Foils Microbiologists’ Eavesdropping

Aeromonas bacteria. (Shutterstock image)

While human families are easily illustrated as a tree, bacterial families look more like a heap of branches. Scientists are trying to trace the connections between those branches in an effort to learn more about the bacteria that harm us, and those that do not.

UC’s Peter Gogarten and Joerg Graf recently set out with a team of researchers to sketch family trees of 56 strains of bacteria in the Aeromonas genus, a diverse group of bacteria that live primarily in water and in the guts of blood-feeding animals such as leeches, mosquitoes, and vampire bats, but also cause disease in humans, fish, and other animals.

Through an examination of the relationships between species of bacteria in the Aeromonas genus, the researchers hoped to find clues as to which species are harmless and which are pathogenic.

Using a cutting-edge technique that compared large swaths of the Aeromonas microbial genetic code, family relationships between the bacterial strains began to emerge – but the branches of Aeromonas’ family tree are twisted indeed.

Breaking Down the Problem

Trying to piece together any bacterial family tree is complicated by the way they reproduce. Bacteria clone themselves, with each daughter bacteria an identical copy of the mother, which would seem to make tracing family lines easy. But it’s complicated by the way bacteria have sex.

Sex – or the exchange and recombination of genetic material – isn’t related to the cloning process of bacterial reproduction. Instead, bacteria swap genes back and forth promiscuously all the time, even with bacteria that aren’t members of their own species.

Bacterial gene swapping, called horizontal gene transfer by microbiologists, is like a messy game of telephone, during which the information can get garbled as it passes from one bacterium to another. Gene swapping makes it particularly difficult to trace species evolution. Microbiologists routinely argue over whether two strains are in the same species or not, and some will tell you straight that the whole concept of bacterial species is suspect.

“One person struggles with the species concept in bacteria,” says microbiologist Joerg Graf.

“Traditionally, 70 percent identical DNA shared between two bacterial organisms means they are in the same species,” Graf says.

Graf is a believer in bacterial species, while his colleague Peter Gogarten is a doubter. But the two agree that the question is worth investigating, because you need to know what you’re dealing with, and species is as good a label as any.

The UC researchers, along with collaborators at the University of Montpellier in France, show in the Nov. 18 issue of mBio (http://mbio.asm.org/content/5/6/e02136-14.full) that they can effectively group different strains of bacteria into species using genomic analysis.

The researchers compared the genomes of the 56 strains using two computerized techniques. One bioinformatic technique they used mimicked an older, messy lab procedure called DNA-DNA hybridization that was the gold standard for this kind of work for many years. The other one was Average Nucleotide Identity (ANI), a cutting-edge side-by-side comparison of large chunks of DNA.

The results clearly grouped many strains of Aeromonas into distinct species, and showed that several strains of Aeromonas bacteria in the GenBank, a collection of publicly available genetic sequences held by the National Institutes of Health, are misnamed. In fact, two of them appear to be different enough from other Aeromonas to qualify as new species entirely.

The researchers also traced 16 “housekeeping genes,” important for survival, through each of the 56 strains. They tracked how the genes shifted position through the genome and changed, and used those changes to track when each lineage of bacteria split off from one another. For each gene, the researchers were able to create a phylogenetic or ‘family’ tree that grouped the Aeromonas into species, and then showed how those species were related to each other. Species that shared identical or very close versions of a housekeeping gene could be thought of as siblings, while species with quite different versions of that gene were more like distant cousins. Except there was a problem.

“None of those trees agreed,” says Gogarten.

Stumped

The phylogenetic trees weren’t wrong, exactly; they all agreed quite closely on which strains of bacteria were in the same species.

It was in the deeper relationships, the way the bacteria were related to other species in the Aeromonas genus, where the trees began to differ. The bacteria’s constant game of genetic telephone seems to have included even these essential genes.

The researchers had been hoping to see a pattern. Perhaps one strain had all the disease-producing agents for humans and another strain had all the fish pathogens, for example. The researchers could then look for genes that help Aeromonas sicken humans or fish, or perhaps predict whether a newly discovered species could cause disease. But no such luck. The gene trees were all mixed up between pathogenic and harmless bacteria.

Gogarten and Graf say they may never be able to untangle Aeromonas’ family tree, but this work shows that their bioinformatic techniques are good. Their next step will be to analyze the Aeromonas genomes to find the genes that allow them to survive in specialized environments like the gut of a vampire bat or human blood vessels.

They have also set up a website, Aeromonas genomes uconn.edu, where other researchers can access known genomes for Aeromonas and post ones they’ve sequenced themselves.

Adapted from UConn Today

In 1985: Discovery that tumor necrosis factor (TNF) promotes inflammation


“We have found previously that macrophages secrete the hormone cachectin, which specifically suppresses lipoprotein lipase (LPL) activity in cultured adipocytes.”

“A new high-yield purification technique has enabled us to determine further details of the structure of mouse cachectin. We now report that a high degree of homology exists between the N-terminal sequence of mouse cachectin and the N-terminal sequence recently determined for human tumour necrosis factor (TNF). Purified cachectin also possesses potent TNF activity in vitro. These findings suggest that the cachectin and TNF activities of murine macrophage conditioned medium are attributable to a single protein, which modulates the metabolic activities of normal as well as neoplastic cells through interaction with specific high-affinity receptors.”

“As the receptor for TNF is not restricted to adipocytes, we suggest that TNF when elaborated in vivo, elicits specific metabolic responses in various normal host tissues. Moreover, specific suppression of protein biosynthesis might lead to the cytolytic effect observed when certain tumor cells are exposed to the hormone.”

Adapted from UConn Today
**In 1985: Development of DNA fingerprinting**


“Genetic analysis in man could be simplified considerably by the availability of probes for hypervariable regions of human DNA showing multiallelic variation and correspondingly high heterozygosity.”

“We show here that the myoglobin 33-bp repeat is indeed polymorphic. These regions, however, are not related by transposition, but instead share a common short ‘core’ sequence in each repeat unit, which in turn provides a powerful probe for hypervariable regions.”

“We anticipate that these DNA fingerprints will be of general use in human segregation analysis. In addition, they provide a powerful method for paternity and maternity testing, can be used in forensic applications and might also be useful in detecting inbreeding segregation.”

**New genetic tools help unlock the cause of debilitating bone disease**

For children suffering from fibrodysplasia ossificans progressiva (FOP), an inherited, progressive condition that causes bone tissue to form in muscles and joints, everyday life brings the threat of life-threatening trauma. As one mother wrote in her blog, “My daughter is now a pre-teen. And, like clockwork, over the past year or so I’ve been seeing Miranda push for more freedom. With more freedom comes more risk. With FOP, even a minor fall or bump can lead to a flare-up and more bone. It can be a vicious cycle - the child is tired of restrictions, so does more things and takes more chances, suffers a trauma, gets a flare-up; flare-up causes more bone, bone causes more restrictions…”

MCB faculty are playing pivotal roles in the development of the new UConn Institute for Systems Genomics (ISG). ISG was established by the University in 2012 to promote research and training in genomics and personalized medicine. Nine MCB researchers are among the 90 affiliated faculty from UConn-Storrs, the UConn Health Center, and Jackson Laboratories. Some MCB faculty will move to a new Engineering and Science Building to be built on the Storrs campus. ISG will occupy 2 floors of the new building, to be completed in 2017. The Building includes 118,000 square-feet of laboratory space allowing collaboration among researchers from different disciplines.

**X-ray images of a normal mouse (L) and a mouse showing aberrant bone growth in the spinal and hind leg regions (R).**

**Polymorphic human DNA fragments detected by hybridization with individual lambda33 probes.**

MCB Professor David Goldhamer and his team of students and collaborators have made great strides in understanding the cellular causes of FOP with hopes to develop therapies for those afflicted with this condition. Past research on the causes of FOP and other forms of heterotopic ossification (bone growth in abnormal locations) has identified the role of bone morphogenetic proteins (BMPs) as key players in aberrant bone formation. BMPs are parts of pathways of signaling molecules that play normal roles in tissue formation, including bone tissues. Genes encoding BMPs are present in cells not normally used to form bone and perform other functions there. When soft tissues, like muscles, are injured, these genes can be turned on, resulting in formation of bone in the wrong place.

In FOP-affected people, heterotopic ossification occurs throughout life, either spontaneously or following minor bodily traumas. Only about 1 in 2 million people inherit this syndrome and fewer than 300 people in the US are known to have it. Recent US Army studies found that over 60% of soldiers requiring amputation after severe injuries developed heterotopic ossification. Bone growth in those with FOP seems to occur when the BMP pathway becomes hypersensitive to BMPs or unknown signaling molecules or becomes independent of these signals. An inherited mutation in one of the signal receptor proteins causes a change in the cellular trigger for bone growth. However, the identity and location of cells that are activated to form bone in FOP sufferers have been long-standing questions. They may be normal cells found among muscle cells or they may be cells that circulate throughout the body and later lodge in muscle tissue. Goldhamer’s team has investigated the origin of these bone-progenitor cells in mice. “Our contribution to this field has been to identify in mouse models the cell type that is responsible. This has been a question in the field since the early 1960s,” Goldhamer said.

To identify the origin of these cells, Goldhamer introduced mice into the genes necessary to label specific cell types. When genes specific for those cells’ functions become activated, cells of a specific type become labeled. When a BMP is injected into these mice, heterotopic bone formation ensues. Goldhamer and his colleagues found the new bone-forming lesions did not contain stem cells as previous work had suggested. Instead, cells associated with blood vessels within muscle tissues caused bone-growing to form. Goldhamer reasoned that to study FOP a mouse model of the condition was needed. He was able to create these mutant mice after the genetic nature of FOP was discovered. “Every patient in the world that shows the classical symptoms of the disease has the identical mutation,” Goldhamer noted. “Once the genetic basis of the disease was discovered, we took that opportunity to develop a mouse model that has this identical mutation in the mouse.”

Muscle injury in these mice triggered FOP-like heterotopic ossification, just as happens in people with FOP. His mice also develop apparently spontaneous lesions as is found in FOP, though it is difficult to rule out that such lesions form as a result of minor injuries that can occur during the raising of mice. He has been able to introduce the same cell-labeling genes used previously in his studies with normal mice so he can follow the development of lesions.

Following a simple muscle pinch, he and his team can detect cartilage and bone formation within two weeks of injury using several cell imaging techniques. Induced cartilage and bone formation can thus be used to examine experimental treatments to prevent bone development. Goldhamer was interested in identifying the cells responsible for FOP for both scientific and clinical purposes. “Besides being interesting developmental biology, we thought this might open the way for cell-specific therapies that could then have a cleaner, better safety profile,” Goldhamer said.

After he published his findings that identified the cells causing FOP, Goldwater has developed collaborations with biotechnology and pharmaceutical companies interested in developing clinical treatments. “The nature of our collaboration is to use that (mouse) model to develop assays for drug discovery and ultimately to use our model for testing of drug candidates that they are developing,” Goldhamer said.

Goldhamer has attended meetings where FOP patients have spoken of their condition. One young girl spoke of her difficulties resulting from the limited mobility of her limbs. She remarked that “When I cry I cannot wipe away my tears.” Such heart-breaking testimonies motivated Goldhamer to pursue his research and with his new collaborations, his efforts may yet provide relief for those who struggle with this ailment.

David Goldhamer, professor of molecular and cell biology, center, and doctoral student Michael Wosczyna examine a tissue sample in their lab. (Dan Burtle/UConn File Photo)
It is a curiosity. One hears the biology question from freshmen, their parents, administrators, non-biology professors, and sometimes even from bewailed "biology" professors. UConn has Departments of Chemistry, Physics, and Mathematics, so why not a Department of Biology? What is so special about Biology? The answer lies in the history of biological sciences at the Storrs campus as well as how biological disciplines evolved in America starting in the 19th century.

In the beginning... When Connecticut started its first institution of higher education, the Storrs Agricultural School, in 1881, Chemistry and Physics had been established as disciplines for most of the 19th century. Chemistry and Physics started as, and have remained, single discipline departments at UConn. Physics arose in the tradition of natural philosophy, the study of the processes and features of the natural world. Chemistry also sprang from natural philosophy with influence from the older pursuit of attempting to transform "base metals" into precious metals, i.e. alchemy. Consequently, Chemistry and Physics had origins as separate and cohesive disciplines.

The origins of biological sciences were more fractured. Biology research started in three fields: natural philosophy, agriculture, and medicine. In the 19th and early 20th centuries, researchers in each field were largely ignorant of each other's methods and interests. Consequently, discoveries in one field were often unknown to those in other fields. For example, plant breeder Gregor Mendel's 1866 report on pea plant inheritance patterns, was unknown to most natural philosophers until the turn of the 20th century. Yet his findings helped establish the discipline of Genetics.

Divisions at the University paralleled those in the disciplines nationally The separation of fields of biology from the beginning partly explains why they have never coalesced into one discipline either at the national level or at the departmental level at UConn. When the Storrs Agricultural School started in 1881, all sciences were part of its only curriculum, Agriculture. Departments as we now know them only emerged in the late 1930's. Until then, individual professors reported to the Board of Trustees about the collection of courses that they taught. They called these collections "departments." These could include odd collections of courses, like the 1889 entries for "Department of Botany and Military Science" and "Department of Natural Science, Political Economy, and Civics."

In 1893 a General Science curriculum appeared for the first time. Ornithology and Entomology were split from the Agriculture curriculum, though Bacteriology (which appeared in 1901) and Botany remained. A sciences curriculum separate from Agriculture appeared and disappeared as the debate over the purpose of the School changed. This debate was also reflected in the name of the institution that changed four times until it became the University of Connecticut in 1939. In the late 30's, the Colleges (first called "Divisions") and majors that we know today appeared. In 1945, Bacteriology, Botany, and Zoology were the biology departments in the College of Liberal Arts and Sciences. This organization remained until the 1960's.

Around 1970, the biological sciences were reorganized into a unique structure called a "Group" with an "Executive Director." The Biological Sciences Group was subdivided into five "Sections," each with a "Head." Undergraduate and graduate majors were named after the three former departments.

This department organization lasted until the mid '70's when the Executive Director became the "Head" of the "Department" of Biological Sciences and the Sections were no longer recognized as administrative units. The Section names now became the names of the undergraduate majors along with a new "General Biology" major. By 1980 the Section-related majors disappeared leaving only Biological Sciences and Biophysics as majors.

Names of departments or administrative units are those found in Reports to the Board of Trustees or the Catalogs of classes. The dates of founding of relevant national professional societies are shown at right for comparison.

The founding of MCB "Biological Sciences" as a department did not last long, perhaps because by 1985 it had 72 professors! In the mid-80's the department was split into the three current departments: Ecology and Evolutionary Biology, Molecular and Cell Biology, and Physiology and Neurobiology. The undergraduate Biological Sciences major was retained, leaving it under the joint administration of the three departments. Graduate programs largely joined into single programs under each department's new name, except for those under MCB. The five graduate programs overseen by the MCB faculty remained semi-autonomous. A recent joint agreement among them joins several of their common functions under a graduate program called Molecular and Cell Biology while retaining each separate professional curriculum as Areas of Concentration.

Across the country state universities have repeatedly separated or joined their biological sciences fields, just as Connecticut's flagship University. At some larger public Universities, biological sciences are joined in a separate College. As UConn grows, perhaps this is our future, too. The history of the organization of biological sciences at UConn and its predecessors reflects not so much the parochial interests of its faculty and students, but the origin of each discipline and the dynamism of their sciences. Stay tuned.

Kenneth Nol, MCB Notes August 2011

From 2008 to 2014, enrollment in MCB courses increased 34.9%, compared to an increase in UConn enrollment of 9.5%. MCB majors increased 23.8% over that same time period.


"BUSI IIA is a protein of 57 amino acid residues and with a molecular weight of 6800. It inhibits proteasomes such as trypsin, and may play a part in the protection of tissues against inflammatory processes, and possibly also in the control of fertilization."

The structural features of BUSI IIA elucidated by this study are the direct result of distance geometry calculations using geometric constraints derived exclusively from its primary structure and from the n.m.r. experiments." The investigations in this paper show that the information available from n.m.r. spectroscopy is sufficient to define the overall tertiary structure of small proteins in solution, and that algorithms based on distance geometry are a suitable means of determining the global conformation from these data."
Edward Leadbetter’s passion for “The Microbe” inspired generations of students

Edward Benton Leadbetter, 81, died peacefully in his sleep at his winter residence in Falmouth, Massachusetts on April 25, 2015. He had just completed a week lived exactly as he liked to and chose to, and as a microcosm of his entire adult life: in the research laboratory each and every day, thinking and doing science, conversing with colleagues of all ages; and at home, enjoying food, drink, music, books, and conversation with his spouse of 58 years, Gloria. He had spent the last 10 years as a guest scientist at the Woods Hole Oceanographic Institution, most recently with the research group of Dr. Virginia Edgcomb, after “retiring” from a 46-year career as a Professor of Microbiology. He had spent 18 years on the faculty at Amherst College, followed by 28 years at The University of Connecticut at Storrs. A summer resident of Woods Hole, Massachusetts since 1971, his many interactions with the Marine Biological Laboratory and Woods Hole Oceanographic Institution stretched back some 55 years.

Ed was born on January 26, 1934 in the Appalachian village of Dixonville, Pennsylvania, the son of a mine engineer and a schoolteacher. After graduating from high school, he attended Franklin & Marshall College in Lancaster PA, where he received his bachelor’s degrees in Biology in 1955. After completing his degree at F&M, Ed initiated his pioneering studies on biological catabolic degradation, allosteric regulation, and co-metabolism at the University of Texas at Austin. It was during his first year in Texas that he met Gloria (Mydlinski), originally from Syracuse, New York. After completing his PhD at UT, they moved to Amherst, MA in the Fall of 1959, where the 25 year old, already with shiny pate, joined the Biology Faculty at Amherst College, later department head. During the summer months throughout the 1960s, Ed taught courses at UC-Berkeley and UW-Seattle, as well directed a high school enrichment summer program in biochemistry at Loomis Junior High School. In 1968, Ed was appointed acting chairman of the Microbiology Department. During 6 decades of research, Ed enjoyed pursuing the evolution of microbial biochemistry, genome structure, etc. “At the present writing we are in a position to define by such “oligonucleotide” signatures the major subdivisions of the eubacteria. In this communication ten major groups of eubacteria are defined, no occurrence denoted by a dot.

In 1985: Bacterial taxa first defined by ribosomal RNA oligo sequences


It was impossible to determine the natural relationships among the bacteria before their phenotypes could be characterized in molecular detail. Now, with a ready capacity to sequence nucleic acids, the ultimate level in molecular characterization on the cell has, in principle, been reached. A detailed bacterial phylogeny will rapidly ensue, and it a revolutionary change in our understanding of evolution.”

By Dr. Jared Leadbetter

“Since 2008, many new pieces of state-of-the-art instrumentation have been installed in MCB including a high-speed fluorescence cell sorter, a spinning disc confocal microscope, a macromolecular X-ray diffractometer, a small angle X-ray scattering instrument, a high throughput pyrosequencer, a computational cluster for bioinformatics, an In Vivo Imaging System, a B/D Fortessa cytometer, and both super-resolution and time-resolved FRET/FLIM capabilities for confocal microscopy.

“The van Niel Approach” to new generations of microbiologists provided him with a great deal of fulfilling satisfaction. Since its 1971 inception, this program has impacted more than 800 graduate and postdoctoral students from around the world, including many who have subsequently developed esteemed careers in research and mentoring.

During 6 decades of research, Ed enjoyed pursuing the secrets of the microbe and published on a number of topics: from biological hydrocarbon oxidation, to the ecology and ultrastructure of pico forming bacteria, to the enzymology of denitrification, to the utilization of novel electron donors by sulfur and non-sulfur anoxygenic phototrophic bacteria, to the elucidation of sulfonolipids as determinants of bacterial gliding motility, to the microbial metabolisms of sulfonic acids by microbes. In recent years his attentions had turned to ciliates and bacterial symbionts, and to revisiting long held interests in yeast diversity. But for most of his career, his fundamental interests lay in the so-called gliding bacteria, which “can move over solid surfaces but cannot swim through liquids”. Like these bacteria, Ed was never able to learn to swim or to tread water, but in his later years grew comfortable enough to be able enjoy immersing himself in the ocean off of Nobska and Little Gansett Beaches in Woods Hole.

In 1991, he served a year as a Program Manager at the National Science Foundation in Washington, DC. He was a Fellow of the American Academy of Microbiology and twice served as an American Society for Microbiology Lecturer. In 2014 he received the D.C. White Teaching and Mentoring Award from the Society. Ed and the family spent the last 10 years as a guest scientist at the Woods Hole Oceanographic Institution, most recently with the research group of Dr. Virginia Edgcomb, after “retiring” from a 46-year career as a Professor of Microbiology.

In Memoriam

By Dr. Jared Leadbetter

“Barry Goldwater Scholar

MCB Honors student Patrick Lenehan was named a Barry Goldwater Scholar by the Barry Goldwater Scholarship and Excellence in Education Program. Lenehan was one of 200 Scholars selected from a national pool of nominees from STEM fields. Lenehan is conducting research in the laboratory of Prof. Barbara Mellone in MCB.

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Adapted from the MBL website

Expression 2014-2015 14
Faculty win Academic Plan grants supporting MCB research

Almost two years, UConn launched a comprehensive process to develop a new academic vision and identity initiatives that will enable the University to enhance excellence in research and education. The UConn Academic Plan pursues excellence in five fundamental areas: undergraduate education, graduate study, teaching, engagement and research. In May 2015 the first major financial support in support of this path to excellence were announced. Awards totaling almost $10 million were announced that support research across a wide variety of disciplines and departments—the humanities, social sciences, sciences, and professional schools and colleges. Below are awards granted to programs that involved MCB faculty.

In the area of research four grants of nearly $1 million were awarded. One award went to Professors Marc Lalande (Chair, Genetics and Genome Sciences, UCHC and Director, UConn Stem Cell Institute and Institute for Systems Genomics), Brenton Graveley (Genetics and Genome Sciences, UCHC), and Michael O’Neill (MCB), will support the Center for Genome Innovation, enabling UConn to expand genomics technological platforms and create a sophisticated computational data analysis capability to support researchers and students across the UConn community. Several faculty were awarded $50,000 to $75,000 over the next three years, across several different academic areas. MCB Professor Craig Nelson and his colleagues will further enhance UConn’s reputation in Single Cell Biology by joining an external partner, this creative team will work on the construction of a complete cell lineage map of mouse embryogenesis from fertilization to birth. This rare sponsored research opportunity across schools, colleges, and departments will utilize this state-of-the-art technology at SpectrumCT for small animal live imaging. Wide faculty interest is expected.

SpectrumCT was endowed through a $600,000 gift from David Goldhamer was awarded a grant to purchase an IVIS SpectrumCT for small animal live imaging. Wide faculty interest is expected.

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The University reviewed proposals to purchase equipment that will enhance teaching and research, attract top-tier faculty from across the country, and help UConn to develop new knowledge for the state, nation, and the world. MCB Professor David Goldhamer was awarded a grant to purchase an IVIS SpectrumCT for small animal live imaging. Wide faculty interest across schools, colleges, and departments will utilize this state-of-the-art technology at SpectrumCT for small animal live imaging. Wide faculty interest is expected.

The variety of research interests in the department impacted her studies as members of her committee had expertise in biochemistry, molecular biology and microbiology. “The really nice thing was that the faculty were very good colleagues of one another and respectful of one another as well,” Spadaro commented. “As an advisory group they really worked together as a team to help the student.” She found that a part of her success in MCB was the community of students and faculty: “You shared a common day-to-day work life with your colleagues. You developed a lot of relationships with your colleagues throughout your time there,” she said.

When asked if she had advice for new graduate students, Spadaro said, “Get involved in a program that you have some passion for. You don’t always get it right the first time.” She continued, “Sometimes in your early 20s you think you know what you want, but it is a journey and you should not be afraid to explore a little bit.”

Spadaro found that a willingness to make changes continued to benefit her in her subsequent career. “I wouldn’t be in the position I am now if I did not make some changes along the way and learn different things and get out of my comfort zone a little bit.”, she said.

Spadaro’s experience at UConn provided a firm foundation for her career and left a lasting impression. “It was a great experience,” she commented. “As an advisory group they really worked together as a team to help the student.”

Graduate Student News

Sally Chamberland has been named the 2014-2015 Outstanding MCB TA in recognition of her outstanding contributions, professional dedication to inspiring student learning and commitment to education. Sally is a Structural Biology, Biochemistry and Biophysics PhD student from Prof. Robinson’s laboratory.

Scott Chimileski, a Genetics and Genomics PhD student in Prof. Pappe’s laboratory, was invited to present a talk on his work at the 21st annual Boston Bacterial Meeting (BBM) at the Harvard University Science Center in June 2015. *Scott has since graduated, so I’m not sure if this should go in this section.

Tyler Danman, a Structural Biology, Biochemistry and Biophysics PhD student in Prof. Robinson’s laboratory, was awarded a fellowship from the American Society of Biochemistry and Molecular Biology (ASBMB) to attend Experimental Biology 2015 in April in Boston.

Kunal Dolas, a Genetics and Genomics PhD student in Prof. Pappe’s laboratory, won a best poster prize at the 50th annual regional IASM conference, held in Randolph, MA.

Anne R. Kaplan, a PhD student in Prof. Alexandrescu’s laboratory, won an NSF Graduate Research Fellowship Program award.

Leah Rosin, a Genetics and Genomics PhD student in Prof. Melione’s laboratory, was selected to present a talk on her work at the Boston Area Millosis Meeting at the Whitehead Institute/MIT, Cambridge MA in May 2015.

Katrina Veile, a Cell and Developmental Biology PhD student in Prof. Campbell’s laboratory, was awarded a Wiley Poster Prize for her presentation at the PASEB Summer Research Conference on Microbial Pathogenesis in July 2015.

Graduate Degrees Conferred

August 2014

Bettni, Emily, MS Molecular and Cell Biology
Bijur, Christopher, MS Genetics and Genomics
Collins, Andrew, PhD Microbiology
Collins, Roxanne, MS Applied Genomics
Dube, Tiffany, MS Applied Genomics
Hendriksen, Cameron, MS Microbial Systems Analysis
Kapoor, Soyna, MS Genetics and Genomics
Kelly, Kevin, MS Applied Genomics
Launer-Felly, Katherine, PhD Biophysics
Mirando, Gregory, MS Microbial Systems Analysis
Novak, Marc, MS Biochemistry
Pirotteosimo, Kathryn, PhD Molecular and Cell Biology
Rich, Elizabeth, MS Microbial Systems Analysis
Sanford, Eric, MS Applied Genomics
Sathappha, Murugasan, MS Biochemistry
Schleicher, Tyler, PhD Microbiology
Schwall, Christine, PhD Biophysics
Tarkar, Aarti, MS Cell Biology
Willet, Chelsea, MS Cell Biology

December 2014

Belanger, Kristina, MS Applied Genomics
Bell, Cheryl, PhD Genetics and Genomics
Boucher, Nathalie, PhD Genetics and Genomics
Fowler, Dana, MS Microbial Systems Analysis
Hwang, Ran-Der, PhD Molecular and Cell Biology
Jannetty, Nicholas, MS Molecular and Cell Biology
Larsen, Jennifer, MS Genetics and Genomics
Ras, Aleksandra, MS Applied Genomics
White, Emma, MS Molecular and Cell Biology

May 2015

Crowley, Elizabeth, MS Microbiology
Dharmaraj, Dhurga, MS Genetics and Genomics

30% of recent MCB PhD graduates hold postdoctoral positions, 22% university academic positions, 17% jobs in industry, and 10% jobs in medical/university research.
MCB faculty provide two Professional Science Masters (PSM) degree programs, one in Microbial Systems Analysis (MSA) and the other in Applied Genomics (AG). The PSM programs train graduate students for careers outside of academia. Each program offers cross-training for business, governmental or corporate environments. The PSM in Applied Genomics trains scientists with interdisciplinary competency in genetics, molecular biology, and computational analysis. The PSM in Microbial Systems Analysis gives advanced training in the complex interactions among microorganisms in the environment and engineered systems for careers in industry and government. As part of their training in each program, students participate in internships, typically with partnering companies.

Recent internships in the Applied Genomics program
Fall 2014
Shanado Williams Genomics, Inc., Hartford, CT.
Summer 2015
Carolyn (Carrie) Hain DNA Unit, Division of Scientific Services, CT State Forensic Lab, Toxicology lab & DNA diagnostic unit
Kristi Kearney Morton Laboratory, Harvard University
Angelica Messana Boehringer-Ingelheim
Joseph Raymond Genomics, Inc., Hartford, CT
Staci Thornton William Mair Lab, Department of Genetics and Complex Diseases (Harvard T.H. Chan School of Public Health), Harvard University
Zachary Zwiesler Smpl Bio, TIP Program, UConn

Recent internships in the Microbial Systems Analysis program
Fall 2014
Dana Fowler Kumar Venkitaranayanan lab, UConn
Spring 2015
Austin Ricker Microbial Analysis Resources and Services (MARS) Facility
Peihua Wang Genewiz, LLC (Next Generation Sequencing team), Plainfield, NJ
Summer 2015
Dister Deoss Bioinformatics Facility, UConn
Philip Edwin CT Pharmaceutical Solutions
Nathan Lawlor Co-op Associate Intern, Computational Sciences, Jackson Laboratory for Genomic Medicine, Farmington, CT; Krish Karuturi lab
Jennifer McCluskey Microbial Analysis Resources and Services (MARS) Facility, UConn work flow

Recent employment of Applied Genomics graduates
Kristina Belanger Research Technologist at Massachusetts General Hospital/Center for Computational & Integrative Biology DNA Core, Cambridge, MA
Joseph Brown Research Assistant II at The Jackson Laboratory for Genomic Medicine
Roxanne Collins Clinical Laboratory Supervisor at UConn Health
Tiffany Dubé Research Assistant at Genomas, Inc., Hartford, CT
Andrew Hess Senior Analyst at Transgenomic, New Haven, CT
Kristi Kearney Research Assistant II at Jackson Laboratories - George Weinstock Lab
Kevin Kelly Clinical Laboratory Accessioning Technologist at The Jackson Laboratory for Genomic Medicine
Jennifer Larsen Clinical Research Associate at Genomas, Inc., Hartford, CT
Angelica Messana Research Associate at The Broad Institute - Stanley Center for Psychiatric Diseases
Alexandra Ras Clinical Genomic Technologist II at The Jackson Laboratory for Genomic Medicine
Joseph Raymond The Broad Institute, Research Associate, epigenetic research (mainly ChiP-seq)
Eric Sanford Research Associate I at Axiomix Inc, Branford, CT
Shanado Williams Genomics, Inc., Hartford, CT
Jennifer Wobrock Scientist II, Molecular Biology at ThermoFisher Scientific (Life Technologies), Waltham, MA
Zachary Zwiesler Smpl Bio, TIP Program, UConn, bioinformatics software development

Recent employment of Microbial Systems Analysis graduates
Dana Fowler Laboratory Technician at Saputo, Inc., Newington, CT
Courtney Kimble-Badgett Research Associate I at Axiomix Inc, Branford, CT
Gregory Miranda Research Assistant at Axiomix, Branford, CT
Austin Ricker Research Associate at Qiagen, Boston
Peihua Wang Associate Scientist, Genewiz, LLC (Next Generation Sequencing team), Plainfield, NJ

Undergraduate Awards
University Scholars
The following undergraduates who work with MCB professors were named 2015 University Scholars (of 28 total Scholars). University Scholars is a prestigious UConn undergraduate program in which students design and pursue an in-depth research project and craft individualized plans of study during their final 3 semesters.

Prakhar Bansal, Molecular and Cell Biology major
Project Title: In-silico AFM nanoindentation of wild-type and mutant Norwalk virus capsids
Committee: Eric May, MCB (chair), Carolyn Teschke, MCB, and Victoria Robinson, MCB

Michael Bond, Molecular and Cell Biology major
Project Title: Characterization of AK301, a novel microtubule disrupting agent and identification of a novel cancer checkpoint
Committee: Charles Giardina, MCB (chair), Dennis Wright, Pharmaceutical Sciences, and William Bailey, Chemistry

Shauna Forte, Nursing major
Project Title: A new instrument, the accumulated pain/stressor scale, measures how early life stress alters the gut microbiome of preterm infants
Committee: Xiaomei Cong, Nursing (chair), Joerg Graf, MCB, and Deborah McDonald, Nursing

Sonya Haupt, Structural Biology and Biophysics major
Project Title: Characterization of exopolysaccharide genes in the archaeon Haloferax volcanii
Committee: R. Thane Papke, MCB (chair), Victoria Robinson, MCB, and Daniel Gage, MCB

Asahi Hoque, Molecular and Cell Biology major
Project Title: Why is women’s health just maternal health? A view from NGOs and the state in Bangladesh
Committee: Manisha Desai, WGSS/Sociol. (chair), Shareen Hertel, Pol. Sci/Human Rights, and Victoria Robinson, MCB

Kewa Jiang, Molecular and Cell Biology major
Project Title: Novel method for efficient generation of recombinant vaccinia viruses
Committee: Paulo Verardi, PVS (chair), Joerg Graf, MCB, and Antonio Gamerdien, PVS

Rofina Johnkennedy, Molecular and Cell Biology major
Project Title: Novel antimicrobial compound discovery in the Trachymyrmex septentrionalis symbiosis
Committee: Jonathan Klassen, MCB (chair), Marcy Balunas, Pharmaceutical Sciences, and Thomas Deams, English

Shaan Kamal, Molecular and Cell Biology major
Project Title: Computational investigations into the molecular underpinnings of eyesight signaling pathways
Committee: Eric May, MCB (chair), Mary Bruno, MCB, and Victoria Robinson, MCB

Emma Manuel, Biology major
Project Title: Effects of a ketogenic diet on protein damage during osmotic stress and aging in C. elegans
Committee: Elaine Lee, Kinesiology (chair), Thomas Abbott, MCB, and David Daggett, MCB

Srinhad Reddi Pingle, Biology major
Project Title: The effect of K63-linked polyubiquitin on active complex formation of RIG-I and MDA5
Committee: James Cole, MCB (chair), Elizabeth Jockusch, EEB, and Victoria Robinson, MCB

Alexandra Rudolph, Animal Sciences major
Project Title: Effects of bovine granulocyte-macrophage colony stimulating factor on milk neutrophil apoptosis
Committee: Michael O'Neill, MCB (chair) Sheila Andrew, Animal Science and Steven Zuccapan, PVS

Brendan Smalce, Molecular and Cell Biology major
Project Title: Looking beyond the genetic code: mapping the epigenomic landscape of tumorigenesis and metastasis in the white-footed mouse
Committee: Rachel O'Neill, MCB (chair), Judith Brown, Allied Health Sciences, and Jean Givens, Art & Art History

Evrett Thompson, Molecular and Cell Biology major
Project Title: Identification of the cellular targets that govern inhibition of hedgehog signaling by the Vitamin D scaffold
Committee: M. Kyle Hadden, Pharmaceutical Sciences (chair), Ashis Basu, Chemistry, and Charles Giardina, MCB

Lt. Paul Drotch Memorial Scholarships
MCB majors Julia Demoranville and Esther Oak
Alumni News

Cheryl Bell (PhD Genetics and Genomics ’12) is currently working as a postdoc at the University of Pittsburgh School of Medicine.

Katherine Boucheur (PhD Genetics and Genomics ’14) recently was hired as a research scientist at the Wadsworth Center (NY State Dept. of Health).

Andrew Collins (PhD Microbiology ’14) is currently working as a postdoc at Forsyth Institute, Cambridge MA.

Robert Foley (PhD Genetics and Genomics ’15) is currently working as a Scientist 1 at Ariosa Diagnostics in CA.

Gregoria Fonseca (PhD Genetics and Genomics ’09) Assistant Professor of Geobiology at MIT, was selected as a Simons Investigator for the Simons Collaboration on the Origins of Life.

Suzanne House (PhD in Structural Biology, Biochemistry and Biophysics ’15) has taken a position at Merck Research Laboratories, West Point, PA.

Karin Paavola (PhD Structural Biology, Biochemistry and Biophysics ’07) won an AAAS Marion Milligan Mason Award for Women in the Chemical Sciences.

Mike Patel (PhD Structural Biology, Biochemistry and Biophysics ’15) is currently working as a postdoc at Merck Research Laboratories, West Point, PA.

Katherine Pena (PhD in Structural Biology, Biochemistry and Biophysics) has accepted a tenure track position at the University of New Haven in the Department of Biology and Environmental Science. Her current research focuses on DNA repair and its role in human disease.

Caroline Jadin (PhD Genetics and Genomics ’13) is currently working as a postdoc at the University of Wisconsin-Madison.

Dipta Dasgupta (PhD Genetics and Genomics ’04) Assistant Professor of Biological Sciences at Dartmouth College, received an NSF-DEB grant to study “Origin and evolutionary history of gene transfer agents in marine bacteria.”

Your contributions to MCB are appreciated. Visit www.mcb.uconn.edu/giving-2/

In 1985: Invention of the polymerase chain reaction to amplify DNA


“We have been exploring an alternative method for the synthesis of specific DNA sequences. It involves the reciprocal interaction of two oligonucleotides and the DNA polymerase extension products whose synthesis they prime, when they are hybridized to different strands of a DNA template in a relative orientation such that their extension products overlap. The method consists of repetitive cycles of denaturation, hybridization, and polymerase extension and seems not a little boring until the realization occurs that this procedure is catalyzing a doubling with each cycle in the amount of the fragment defined by the positions of the 5’ ends of the two primers on the template DNA, that this fragment is therefore increasing in concentration exponentially and that the process can be continued for many cycles and is inherently specific.”

Three complete cycles of the polymerase chain reaction resulting in the eightfold amplification of a template sequence defined by the 5′ ends of two primers hybridized to different strands of the template.

“We have called this process polymerase chain reaction or (inevitably) PCR. Several embodiments have been devised that enable one not only to extract a specific sequence from a complex template and amplify it, but also to increase the inherent specificity of this process by using nested primer sets, or to append sequence information to one or both ends of the sequence as it is being amplified, or to construct a sequence entirely from synthetic fragments.”

44% of our recent PSM graduates hold research positions in the private sector, 32% in academic research positions, 12% have jobs in government, and 12% in medical research.

Undergraduate News

Klara Reisch received the 2015 Holster Award of $4,000 for summer research. Klara is an undergraduate Honors student in Prof. Papke’s lab. The Holster Scholars First Year program is a highly selective enrichment opportunity for 1st year Honors students. Klara’s project will test the effects of glycoproteins in aorta on their ability to mate.

Sonya Haupt, an undergraduate Honors student in Prof. Papke’s laboratory, was awarded the Life Sciences Honors Thesis Award.

Prakhar Bansal, an undergraduate Honors student in Prof. May’s laboratory, was the recipient of the Todd M. Schuster Award in Molecular and Cell Biology.

The American Society for Microbiology (ASM) has selected MCB major Anne Sung (’16) as a 2015 recipient of an ASM Undergraduate Research Fellowship. This fellowship is aimed at highly-competitive students who wish to pursue graduate careers in Microbiology.