New NSF Science and Technology Center

HWI is part of a consortium of eight research universities and institutes that has been awarded a $25 million Science and Technology Center (STC) grant from the National Science Foundation to advance the use of a recently developed free-electron x-ray laser (XFEL) in the imaging of biomolecules such as proteins. UB was awarded the grant on behalf of this distinguished group, and HWI's CEO Eaton Lattman, who also serves as Professor of Structural Biology at UB, is the Center Director. Our Center is called BioXFEL.
What does this grant mean to HWI, scientifically and operationally? The award is very prestigious. NSF selects just a handful of STC winners every four years from a pool of hundreds of applicants. The establishment of this Science and Technology Center will put UB, HWI, and Western New York in the forefront of this technology. It will also be good for our bottom line. Although most of the money goes to the six institutions outside of Buffalo, the funds remaining with HWI still make a significant impact.

So what is the science about, and how will we contribute? HWI scientists work to create amazingly detailed, three-dimensional pictures of molecules, through a process called x-ray crystallography. Such pictures provide a basis for the rational design of drugs, and for an atomic understanding of life processes. For example, all of our current anti-HIV drugs were developed using such pictures. But this method has many limitations.

BioXFEL

What else can this phenomenal beam do?

• It lets us use crystals a thousand times smaller than the ones we use now. Right now most attempts at crystallization fail. Because small crystals grow more readily, we will be able to study new and important drug targets that crystallize in smaller quantities.

• As the x-ray laser is upgraded, we may be able to study single molecules, eliminating the need for crystals.

HWI’s research contribution to BioXFEL will be an outgrowth of our highly successful high throughput crystallization laboratory. We will be developing a whole new set of technologies and protocols to understand, grow, and manipulate the ultra tiny crystals that will be examined with the x-ray laser. BioXFEL expects to provide the scientific community with a complex and valuable toolkit that will advance XFEL science on a broad front including:

• Hardware and software innovations and developments that will enable facile conduct of an array of XFEL structural biology experiments spanning a broad range of specimen types and dynamic regimes.

• A portfolio of successful structural projects providing important insights in their own right, and illustrating the capacities of the XFEL to the scientific community.

• A varied community of talented scholars, both in the US and worldwide, with deep interest in and commitment to XFEL science, who will nucleate and promote new projects and development.

• Broadened public awareness of XFEL science in particular, and of biological imaging in general.

The grant was awarded to the University at Buffalo, SUNY. The other participating research institutions are: Cornell University; Hauptman Woodward Medical Research Institute; University of Wisconsin, Milwaukee; Arizona State University; Rice University; Stanford University; University of California, San Francisco.

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HWI’s 40th Annual Summer Internship Program

For the last 40 years the Hauptman-Woodward Institute has held a summer college intern program. This program is a real life research experience in a state of the art laboratory for each student working under the direction of one of HWI’s faculty mentors. They spend a minimum of 10 weeks, five days a week in the laboratory. They attended our weekly in-house seminars and took part in the group meetings of their mentors. Our interns are outstanding students. The average GPA of this year’s group is 3.72! At the end of the internship each student presented their results to the entire HWI scientific staff, and took part in a research day with students from 5 other summer science programs at UB and RPCI held at UB’s recently opened Clinical Translational Research Center on the Buffalo Niagara Medical Campus. You will see in the descriptions of these students that they are truly quite remarkable. We were fortunate to have had them at HWI this summer.

John Billingsley, a senior at UB studying chemical engineering and biology, worked in Dr. Andrew Gulick’s research group performing a kinetic analysis of a self-standing adenylation domain from Acinetobacter baumannii. John was inspired by the stained glass dodecahedron displayed in the Starpoint High School library where he was a student that was made and donated by Dr. Herbert Hauptman.

Alexander W. Breesser studied lamprey transferritin, an early in evolution carrier protein of tyrosine, under the direction of Dr. Vivian Cody. Alex is a senior at Canisius College majoring in biology and planning to attend medical school following graduation. He spent his previous summer in Costa Rica working in a Medical Mission clinic.

John D. Huck is a senior biology major at Binghamton University focusing on cell and molecular biology. Although planning to pursue a PhD in some area of biology, he is perceptive enough to realize that an internship doing research is a great way to help decide whether or not this is how you want to spend the rest of your life. John worked with one of Dr. Duax’s high school teams to study ribosomal protein s10 using sequence alignments of thousands of proteins and conserved residues to determine evolutionary patterns across the three domains of life.

Angela Lee, a junior majoring in biology at Barnard College, studied with Dr. William Duax and assisted him in directing the high school student teams in Duax’s workshops for high school students. She and her team by aligning conserved amino acid residues studied the evolutionary relationship between the various types of ribosomal protein s18p, specifically the relationship among the four types of mitochondrial RPS18p. She plans to pursue an MD/PhD program in genetics following graduation.

Jiaqi Li also served as an assistant in Dr. Duax’s high school program. Her team created a search vector to align ribosomal protein s12 sequences in order to study the changes and consistencies in protein sequence and structure throughout evolution. Jiaqi is a junior at the University of Maryland studying mathematics and biochemistry.

Mendez studied the kinetics of Hsp90 chaperones under Dr. Dan Gewirth’s mentorship. Kaitlyn E. Victor is a junior at Canisius College majoring in biology. Kaitlyn studied the mechanistic basis for paralog selectivity by inhibitors of Hsp90 chaperones under Dr. Dan Gewirth’s mentorship. Kaitlyn looks forward to completing her undergraduate studies this year and continuing on to graduate school in biomedical science.

A collaborative project to formulate and biophysically characterize hundreds of multi-component chemical cocktails was undertaken in the laboratory of Joseph Luft by Amber L. Penna, a student at Mercyhurst University, Manila M. Nain, Canisius College, and Richard J. Grey, Colgate University. These cocktails have to be prepared precisely and accurately, they are critically important for high-throughput experiments to determine initial crystallization conditions for hundreds of soluble and membrane proteins. Crystalization is a necessary step that is required to see the detailed structures of proteins using X-ray crystallography. Jeffrey Salerno, a physics teacher at Lakoshare High School, has been an important part of the HWI summer internship program for two decades. He worked with the students, providing his own extensive laboratory experience coupled with the perspective of an educator. The students learned important laboratory skills, including instrument calibration, qualitative analysis, note-taking and critical thinking, under the direct guidance of Jennifer Wolfley, Research Associate. Grey returned for a second summer to work with Luft.

He is a senior majoring in biochemistry. Manila Nain came to Buffalo from Afghanistan via Turkmenistan in 9th grade. This is her second summer in the Luft group. She is a sophomore majoring in biology. Amber Penna, a senior majoring in biology and sportsmedicine, spent the two previous summers participating in medical mission trips to Honduras.

Thomas A. Makin returned to the Gulick lab for the second year to study the domain interactions in a family of large, multi-domain proteins that are involved in the production of bacterial natural products and virulence factors. A senior at Canisius College in the pre-med program, Makin followed his two sisters, Deborah and Jennifer, with summer internships at HWI.

Nathan R. Roach is a junior majoring in biology and computer science at UNC at Chapel Hill. Under Dr. Tim Umland’s direction he optimized crystallization conditions in order to obtain a 3-D structure of a new antibacterial drug target in Acinetobacter baumannii, which is considered the poster child for the Bad Bugs, No Drugs public health crisis of the ever increasing occurrence of gram-negative bacteria resistant to many or all antibiotics currently in clinical use. Following graduation he plans to pursue an advanced degree in some area of science.

Jocelyn Redinski returned for a third summer under the tutelage of Dr. William Duax. Through bioinformatic techniques used within the Duax lab, the team found strong evidence supporting the hypothesis that the last universal common ancestor can be found within the Actinobacteria phylum. Jocelyn is a senior at North Central College (Illinois) studying biochemistry and business. She is a gifted athlete and ranked #6 in the country in Division III pentathlon.

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HWI’S RIEDEL FOOD, WINE & SPIRIT EXPERIENCE: A RIDE FOR THE SENSES, RAISED OVER $160,000 FOR THE INSTITUTE

There were many new and exciting differences at the 5th annual fundraising event appropriately named Riedel Food, Wine & Spirit Experience: A Ride for the Senses. On May 3, 2013, over 500 guests came to our new venue, The Hyatt Regency in downtown Buffalo. For this record number of attendees, Georg Riedel, CEO of Riedel Crystal of North America and an 11th generation glassmaker, took us on a journey of our senses as we tasted, not only fine wines, but scotch as well. He showed us that it is, in fact, possible that the shape of a glass can make the liquid inside, not only taste better, but evoke the different aromas inherently unique to that particular wine or scotch.

This event was once again led by an amazing trio of co-chairs, Emily Constantine Doren, who is a current HWI Board Member, Anthony Pandolfi of UBS Services, and Trent Voelkl of Buffalo Pharmacies. We were honored to have their help and expertise, which helped make this year’s event so successful. The night also included a door prize raffle, which raised over $6,000.00, that went towards Dr. Griffin’s Summer Internship program at HWI, and a live auction led by Cash Cunningham, which also helped to far exceed our fundraising efforts for the event in previous years. There were many auction items ranging from a Napa Valley Wine Tasting Trip to prizes that let you experience the wonderful things that Buffalo has to offer. All of these auction items were made possible by our outstanding committee that has grown exponentially in the last few years.

Overall, this was a fantastic evening that supported the innovative research that is taking place at HWI. We are grateful to all who have supported the event in the past and hope you join us again for this signature event. A special thank you to the members of the Riedel Committee, all of the volunteers, HWI staff, Riedel Crystal, Kevin LoVullo, Cash Cunningham, and Abino Mills Glassworks.

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WGRZ-TV, Channel 2
Members of the 2012 Hauptman Society were recognized this past April at HWI with a private cocktail reception to update them on the Institute’s efforts and thank them for their generosity and support for HWI. The Hauptman Society currently has more than 130 members including individuals, corporations, and foundations.

The Hauptman Society was established in 2008 to honor distinguished donors who offer leadership gifts of $1,000 or more annually. These gifts support HWI’s mission and the pursuit of life-altering research. As part of their Hauptman Society Membership they are invited to an annual gathering for an update on new developments at HWI.

Dr. Richard A. Aubrecht, Chairman of the Board and the Vice Chairman and Vice President for Strategy and Technology at Moog, Inc., said a few words to welcome members and along with Dr. Jane F. Griffin, HWI Principal Research Scientist, presented Lewis McCauley with a gift in appreciation for all of the support he has given HWI over the years. Lew was named an Emeritus HWI Board Member to recognize all of his contributions. Dr. Eaton Lattman concluded the program with current news and research going on at HWI.

For more information on becoming a member of the Hauptman Society or to learn more about ways to support HWI’s research, please contact Jill Szczesek at 716-898-8597 or via email at jszczesek@hwi.buffalo.edu.

Dr. William L. Duax’s High School Apprenticeship Program Meets in Two Sessions

This was the fourth summer that Dr. William L. Duax, H.A. Hauptman Distinguished Scientist at HWI, ran a summer program for middle and high school students in Bioinformatics. This year the workshops were held in a first floor room at the Institute that was renovated into a large classroom which is now devoted to Dr. Duax’s high school programs. In two different sessions, one in July and one in August, more than 55 middle and high school students participated from over 15 area schools.

The students were broken up into teams with each team given one of the ribosomal proteins to examine. Each team had a college intern who assisted the team in their efforts to study how the ribosomal proteins have evolved over the billions of years of evolution. At the end of each week, over a pizza lunch, the teams presented their results to the entire workshop. On the closing day of each two to three week session the teams presented their work to the entire HWI staff.

So not only are they doing research but they are learning how to present these results to a peer group. These sessions have been partially subsidized by a UB NSF Grant that is aimed at encouraging middle and high school students to study science.
Dr. George DeTitta Retires as Principal Research Scientist From HWI

Over 80% of our structural knowledge comes from crystallography but it has its limitations; it requires a well diffracting crystal. The success rate in achieving this is poor (at most 20%). When crystals do form, many pathologies prevent the subsequent generation of structural knowledge. Crystalization in microgravity has been used to overcome some of these problems. The growth of crystals in solution is governed by fluid transport and how the individual protein molecules build up the crystal. As the solution becomes depleted of these molecules, convection plumes form and growth is impeded or disrupted. Growth in microgravity reduces these effects for some samples and has been seen to cause dramatic improvements in the quality and volume of the resulting crystals. Unfortunately, the number of samples affected is limited. The proposal aims to identify those proteins where this unique environment helps before they are launched into space and thereby make optimum use of the limited resources available for these experiments.

Structural Biology Students Receive PhD Degrees

Dr. Jesse A. Sundlov and Dr. Carter A. Mitchell both recently received their Ph.D. degrees from their work in the laboratory of Dr. Andrew M. Gulick. Both research projects centered on a family of multi-domain proteins termed the Non-Ribosomal Peptide Synthetases (NRPSs). These large NRPSs contain multiple protein domains fused in a single large protein, in effect, several small proteins form a single assembly line to carry out multiple chemical reactions. The research in the Gulick lab is designed to understand these enzymes and the role they play in bacterial pathogenesis.

Dr. Sundlov described a new crystal structure that demonstrated how two important classes of NRPS domains interact. These structures aid in the engineering of the NRPS proteins to produce novel enzymes and additionally provided information that will guide efforts to define the function of uncharacterized NRPSs. In his thesis research, Dr. Sundlov also examined the enzyme responsible for firefly luminescence, which is closely related to one functional domain of the NRPSs.

Dr. Mitchell’s project included the structure determination of a different two-domain NRPS protein. This protein is involved in production of a novel signaling molecule that is made by a pathogenic bacteria. Additionally, Dr. Mitchell solved the structure of another member of this family and carried out studies on the function of a third. Finally, his research used computational modeling to derive a better model for the dynamics of the NRPS proteins, and provides insights into the molecular choreography performed by these fascinating protein factories. Dr. Mitchell is heading to Norman, Oklahoma to do post-doctoral research with Dr. Robert H. Cichewicz in the Department of Chemistry and Biochemistry at the University of Oklahoma.

Dr. Thomas Grant, of the Department of Structural Biology at HWI, was recognized with the Dean’s Award for the most outstanding dissertation research at the UB School of Medicine and Biological Sciences graduation ceremony. Pictured left are Drs. Blessing, Grant, Snell and Lattman.
Lewis and Harriet McCauley Make a Generous Gift to HWI

Hauptman Woodward Institute is grateful for the generosity of Lew and Harriet McCauley, longtime friends of HWI. The McCauleys recently made a $50,000 gift to invest in the research and education programs at the Institute. Ed Lattman, HWI Chief Executive Officer, commented on the McCauley’s generosity stating, “Lew and Harriet’s gift will make a tremendous difference for all of the new initiatives HWI is currently pursuing. Their generosity is an example of what impresses me most about the community in Buffalo. Our programs will advance as a result of their commitment to Buffalo and to basic research.”

Lew McCauley founded and owns McGard, LLC, which develops and patents a number of mechanical security product lines, predominantly for the automotive aftermarket industry. He and Harriet reside in Orchard Park, NY and are active philanthropists and strong advocates of Western New York.

Sheri Mooney Joins Hauptman-Woodward Board

At the April 17th Board of Members meeting Ms. Sheri Mooney, Esq. was elected to the HWI Board of Directors, class of 2016. Ms. Mooney is a Senior Vice President for Corporate and Government Affairs at the First Niagara Financial Group. Prior to joining First Niagara in 2011, she practiced with the Damon Morey law firm from 2000 to 2011. Sheri is a graduate of the University of Western Ontario, Brock University and the University at Buffalo Law School.

The Board of Members took the opportunity to honor Lewis D. McCauley by naming him an Emeritus Director. Reelected to the Board at the same meeting were Stuart H. Angert, Emily Constantine Doren, Thomas McMahon, Mary Engler Roche, Esq., Lawrence Whistler, CFA and Alexander Cartwright, PhD.