Dear Students, Alumni, and Friends,

Welcome to the 2013 Biochemistry newsletter! As usual, the newsletter is conceived, written and edited by undergraduates in the Biochemistry Club.

It is with mixed emotions that I report to you all that two of the founders of the Biochemistry program, Dr. Anna Tan-Wilson and Dr. Karl Wilson, have retired from the university. Dr. Wilson and Dr. Tan-Wilson joined the faculty of SUNY-Binghamton (as we were called then) in 1976. When I arrived on the scene in 1985, the Biochemistry program was already a popular major with a well deserved reputation for academic rigor. The Wilsons and Dr. Fred Kull invited me to join them in the program as soon as I got on campus, and with that offer came advice, mentoring and friendship that sustained me as an assistant professor. This spring has been the first semester that I can recall without Dr. Tan-Wilson teaching Biochemistry 302 and Dr. Wilson in the Biochemistry 426 lab and senior seminar, and it just doesn’t seem right.

At the time of their retirements, Dr. Wilson and Dr. Tan-Wilson had each completed 37 years of service, which is a total of almost 75 years (148 semesters!) of experience in teaching and research. They have touched literally thousands of lives during their tenure on the faculty, and their dedication to the education and welfare of students is second to none. I greatly miss them as colleagues, and I know that you join me in wishing them all the best in this new chapter in their lives.

On a brighter note, I am delighted to report that two new biochemists joined the faculty in the fall of 2012. In keeping with the chemistry department’s increasing interest in biological applications of chemistry, Dr. Brian Callahan has joined the chemistry department faculty as our first bone fide biochemist. Dr. Callahan earned his bachelor’s degree from SUNY Cortland, so he is no stranger to the SUNY system. He is a protein biochemist with multiple interests, including design and implementation of biomolecular sensors for analytical screens and genetic selections. Dr. Jeffrey Schertzer hails from Canada and is the newest faculty member of the department of biological sciences. His expertise is in bacterial communication, toxin trafficking and biofilm formation. Dr. Schertzer and Dr. Callahan have both taken up the challenge of teaching Biochemistry 302 this spring.

In more faculty news, Dr. Susannah Gal is on a leave of absence this year to serve as a program officer at the National Science Foundation. She has recently agreed to serve for a second year, so look for her next time you are in the Washington DC area!

Enjoy the newsletter!

Best wishes,

Susan Bane
New Developments in the Biochemistry Program

Reported by Jenny Tse

Retirement of Dr. Anna Tan-Wilson and Dr. Karl Wilson

Since 1976, Drs. Anna-Tan and Karl Wilson have become mainstays of the Binghamton Biochemistry Program. Between the two professors, they have taught many of the primary courses in the Biochemistry Major, including Introductory Biology, Molecular Genetics, Biochemistry, Biochemistry Lab, and Senior Seminar in Biochemistry. Their influence extended outside of the lecture hall with their research in plant biochemistry, which has brought in grants from the USDA and NSF. Each of their labs has seen multitudes of talented undergraduates from Binghamton and other schools grow into skilled researchers. Most recently, they were faculty mentors for the Howard Hughes Medical Institute and SUNY Upstate Bridges to the Baccalaureate programs. Dr. Tan-Wilson also directed both of these programs. Needless to say, they will leave behind a legacy of quality education, as well as a lasting impact on the Biology Department and Biochemistry Program.

Molecular Biology Lab Course Revision

Dr. Karin Sauer, microbiologist and Associate Professor of Biological Sciences, is now teaching Molecular Biology Laboratory. She has made many welcome changes to the course, permitting students to acquaint themselves with an array of methods that Dr. Sauer uses in her own research. Many of the experiments take advantage of the new real-time PCR machine. This exciting addition has allowed Dr. Sauer to extend the scope of her lab exercises, including the use of RNA for detection of differential gene expression. She has also included exercises with medical applications, such as using molecular beacons to differentiate pathogens from harmless microbes within two hours and detection of mutations with single nucleotide polymorphism.

New Faculty

Dr. Brian Callahan joined Binghamton University in Fall 2012 as an Assistant Professor of Biological Chemistry. He is currently teaching Frontiers in Chemistry. His research concentration is protein biogenesis and degradation.

Dr. Jeffrey Schertzer began as an Assistant Professor of Biological Sciences in Fall 2012. He is currently teaching Biochemistry. His research interests lie in the improved treatment of chronic and antibiotic-resistant infections.
During the summer, I witnessed a program called Bridges to the Baccalaureate in which students from community colleges were given a chance to work in a laboratory setting. This opportunity gave them training in a research lab, as well as insight into a potential career in science. I could not ignore the importance of the knowledge and connections attainable from this program, which is why the Bridges program inspired me to craft my own little version, the miniBridge program.

The miniBridge program, like Bridges, intends to motivate students to pursue a field in science. However, we aim to motivate younger age groups, when their love for learning and creativity burns brightest. Through the passionate words of Binghamton University students and some short, but exciting, scientific demonstrations like turning milk into a stone-hard substance and using yeast and hydrogen peroxide to make a never-ending foam snake, we hope to bring to light the wonders of science to young minds.

The MacArthur Elementary School of the Binghamton City School District has shown great enthusiasm in this program and the vice principal, Mr. Gerald Lynch, has even contemplated involving a few hundred students spanning several grade levels. This is far from the audience of one or two classes we initially envisioned. Hosted on May 8th, 2013, we had a 2 hour presentation to an audience of over sixty 5th graders. Following the program, I took a glimpse at the surveys and one particular response really struck me. The student said, “I loved the experiments. I hope I can do the same thing when I get into college!” As the pioneer of this program for the Biochemistry Club, I was very happy to read this comment as it was an indication of our success in what we set out for in hosting this event. As a result, I hope to continue to inspire many new minds in the coming semesters through the miniBridge program.

It has always been our goal, as the Binghamton Biochemistry Club, to provide outreach and services to the University. The creation of the miniBridge program is simply an extension of this goal to not only contribute to the campus, but also to the Binghamton community. We occasionally look back at all the people that have inspired us to go the distance. Now as college students, we look at this program as an opportunity to reciprocate that gesture and inspire the bright minds of the future.
Last summer, I stared coldly into my MCAT book and wondered how I could encourage myself to begin studying. No matter how hard I tried, hours would pass without any progress. Ultimately, my thoughts brought me back to my high school days and I thought how nice having a light workload was. Of all the memories from high school, the time I spent with the academic trivia team stood out the most. While I was a part of the academic trivia team, I found myself enthusiastically taking measures to read and learn more about subjects that I did not fully comprehend. The memories from high school then inspired me to hold an academic tournament, not only to help students share their knowledge on various subjects, but also to encourage them to study effectively for the challenging exam.

For the first tournament, I decided to run a small competition amongst the Executive Board Members and general body members. Mirroring the science sections in the MCAT exam, the competition was divided into rounds of general chemistry, general physics, organic chemistry and general biology. Each round had 20 questions, worth 1 point each that increased in difficulty every 3 questions. The four rounds were followed by an extra round that posed challenging analytical questions worth 5 to 10 points each. Although some questions were donated from faculty, many of the questions were made by me and my Vice President Lance Kong.

The two competing teams were led by Travis Lageman’s (Team Piggies in a Blanket) and Jenny Tse (Team Croissant). Team Piggies in a Blanket had three other members: Morgan Zhao, Sophie Russ, and Jackie Xiang. Team Croissant’s members included Betty Chu, Roshni Khilnani, Stephanie Jiang and Jessica Curtin. Although Team Piggies in a Blanket were leading by a considerable amount of points for most of the first four rounds, Team Croissant mounted a furious comeback in the extra round. Although Team Croissant was able to close the score margin within 10 points, they were defeated in the last question, making Piggies in the Blanket the winners of a $20 gift card.

For future Academic Tournaments, I envision the event to be larger with improved running of the program. A four team bracket will be implemented to accommodate larger number of participants. With increased participation, more upperclassmen will also be employed to create questions for the tournament. Ultimately, a buzzer system will be purchased to more accurately tell which participant was the first to call out. With dedicated membership, I am confident that the Academic Tournament will become an important part of the Binghamton Biochemistry Club’s culture.
A cold sensation slowly ran down my back as I looked to the room with the audience and examination committee members. It was almost 11 AM and my Honors Thesis defense was about to begin. Before my professor Dr. Ming An came to introduce me, I briefly closed my eyes and saw a quick flashback of my undergraduate research career. In that brief moment, my memories carried me away to a special moment that changed my views forever. It was a moment that taught me the most beautiful lesson that I could learn not only as a researcher, but as a person, as well.

My memories brought me back to my first day of lab. At the conclusion of my freshman year, I joined Dr. Ming An’s Lab. Back then, I naively believed that simply committing many hours to research would provide positive results. This belief, however, was quickly crushed within a couple of weeks of running experiments. Instead of striving to learn why they were failing, I became overwhelmed with confusion and frustration. Dr. An quickly noticed my tendencies and called me into his office. He stated, “In research, the most important quality that you can have as a person is not necessarily intelligence—it is patience.” Although I did not believe his statement at first, he subtly showed my mistakes caused by impatience. For example, I once attempted to purify my peptide without turning on an important switch. During my frustration, I was unable to see why the machine was not performing its duty. Then, Dr. An came into the room and turned on the switch. Although he did not say anything to me, I knew from that moment that the biggest discoveries in science require tremendous patience. If I cannot sacrifice a little patience to turn on a switch, how could I ever pursue my dream career in research?

The clock hit 11 AM and Dr. An began introducing me to the audience. After he finished, I smiled as I knew that the countless hours of lab work required for my thesis would not have been possible without his mentorship. With each passing presentation slide, I became ever more appreciative of the quality of patience. Like the central cog that turns a clock, I realized that patience is the primary key that drives science forward. Aside from all scientific knowledge or successful lab experiments, having patience was the most beautiful lesson that I ever learned.
William Marsiglia, a recent graduate at Binghamton University, double majoring in biochemistry and music, is nothing less than an exemplary student who has demonstrated great ability and diligence throughout his college career.

Upon recounting his years at Binghamton, he stated that "they haven't been easy, but I think they were good for me." Marsiglia easily has an average of over 20 credits per semester alongside with working in Dr. Grewer's research lab since his freshman year and participating in the musical fraternity, Mu Phi Epsilon (ΜΦΕ). He is now the president of this fraternity. Very few individuals can match such a level of accomplishment. When asked how this was all possible, he simply stated that he was simply following his philosophy: to make the most of his time and learn as much as possible.

Time and time again, Marsiglia has gone above and beyond what the average college student could and would do, taking many upper level classes that were not required for him to graduate, but simply because of the information that it would impart on him. Some of these classes include: advanced organic chemistry lab, chemical synthesis, bio-organic chemistry, organometallic chemistry, stereoselective synthesis and many more too numerous to list. Out of all these classes, he especially recommends organometallic chemistry and bio-organic chemistry.

With all these chemistry courses, it is a wonder that Marsiglia is not a chemistry major. In fact, when he first came to Binghamton University, he was originally a biology major because of his interests in biology. However, upon taking organic chemistry during his freshman year, he "fell in love with it" (which he admits is not what most people would say). Pairing that with the fact that he worked in the part of a research lab dedicated to synthesizing organic compounds really shifted his views and caused him to rethink his major, eventually compromising with biochemistry to satisfy his innate interest in biology and to augment his proficiency with all the chemistry he was working on. As an additional bonus, this has allowed him to apply a lot of what he has learned in class and transfer it into a practical setting, such as his research lab.

Even before college, Marsiglia was not new to research, having participated in numerous science fairs and summer research programs throughout his high school career. When asked how this all started, Marsiglia replied with two primary sources of motivation: a project on the immune system during his 5th grade and a teacher in high school who inspired and supported him to do science fair projects. His interest in science has never really changed since then and caused him to apply for research during the summer before his freshman year. After looking through a few professors, he eventually gained audience with Dr. Grewer and worked for him in his research lab, initially following orders and then developing ideas of his own to finally planning out experiments of his own. His participation in a research lab has without a doubt helped him to apply what he has learned in his classes and quash some of the disconnect that he believes most students have with what theory they learn in class and the material's application.

In the fall, Marsiglia will be attending graduate school at New York University with an undecided degree, but most likely chemistry with a concentration in chemical biology. As for his future career plans, he would like to continue doing research as well as teach as a professor at a university.
Interview with Kurnvir Singh

By Travis Lageman

I sat down in the library on a Wednesday afternoon with my good friend Kurnvir to learn about the research he does for the well-known and respected Dr. Christof Grewer. I was lucky enough to be given a detailed explanation of Kurnvir’s role in the lab. It was easy to identify the passion that Kurnvir has for his work; a passion he radiates to others.

Kurnvir, a Junior Biochemistry major, will be graduating with the Class of 2014. He plans on attending medical school, which is another passion of his that would take another whole page to talk about. Until Kurnvir graduates, however, he will be found in the lab working and studying hard.

Kurnvir started doing research as part of the BU-HHMI program this past year. The Howard Hughes Medical Institute (HHMI) is an interdisciplinary research program in which undergraduates work full time over the summer and part time over the following school year. For those of you who do not know what BU-HHMI is, Kurnvir and myself would strongly urge you to look into the program if you are interested in doing research.

As a student researcher, Kurnvir is working on an electrophysiology project titled “Glutamate Transport and Nociception.” His work involves the patch clamp technique in which he studies glutamate transport in the Excitatory Amino Acid Transporter proteins (EAATs). Kurnvir transfects HEK293 Human embryonic kidney cells with EAAT2 DNA, then incubates those cells to allow the EAAT2 to be expressed. He then places the cells in a bath where he uses a micropipette, connected to an electrode, to pick up the cell. Finally, he flows glutamate and measures the current response. When glutamate is introduced, the EAAT2 undergoes conformational changes resulting in an ion transaction with the glutamate being transported into the cell. This transfer of ions creates a current on the scale of pico-amps, which is then analyzed. If there is a high current, it is a result of a large ion exchange and thus the protein is working very well.

Currently, Kurnvir is studying the effects of Beta-Lactam Antibiotics on glutamatergic activity of the EAAT2 protein.

Kurnvir does not work alone, and a crucial part of his research and any project is collaboration with others. His post doctorate and graduate student mentors, Armanda Gamerio and Rose Tanui play a very important role in progressing his research. As a part of the BU-HHMI project, he is also working with undergraduate Nicolas Thompson and assistant professor Jilla Sabeti on an interdisciplinary effort to study glutamate homeostasis.

While his research sometimes seems daunting and heavy, Kurnvir thoroughly enjoys what he does. The part he loves the most is “Actually getting results… Once you do research you realize how many times you have to be unsuccessful at what you’re doing to finally be successful.” Kurnvir continued by explaining the initial challenges he had with learning the patch clamp technique and all the things that could go wrong, but that these all paled in comparison to achieving the desired results. He said it was the best feeling to know he earned the results, and it was not something that was just given to him.

When interviewing Kurnvir, I saw the same passion that I see in the many professors of this great university. It is obvious that this desire to learn, challenge and succeed in the laboratory is perceptible early in a student’s academic career. This desire should be acted upon as early as possible to ensure that passion does not decline over time, leading that person to succeed eventually. I know that Kurnvir feels the same way about research and learning as I do, the experience of research is invaluable and it is always a pleasure talking to someone about it.
Balance, Enlightenment, and Keys to Success
By Karen Fu

Behind the mind of any early undergraduate student lies a frightening yet important question: What will I do with my life? Whenever we envision our path to the future, topics such as careers, graduate school, professional school exams, and other major decisions can be overwhelming for students to face on their own. One simple but key piece of advice to finding the answers is to “do what you like.” These are words from Dr. Susan Bane, one of Binghamton University’s most motivational and accomplished professors of biochemistry and research. Once students figure out what they truly like, they are well on their way to achieving their passions and goals.

Dr. Bane finished her undergraduate education at Davidson College in 1980, earned her PhD at Vanderbilt University in 1983, and completed her postdoctoral research at the University of Virginia in 1985. She is currently the program director of Binghamton University’s Biochemistry Department and oversees her own research lab. Dr. Bane discovered her compelling interest in pharmaceuticals while in graduate school. From there grew an overlapping interest of the development of cancer drugs, specifically anti-microtubule medicines. Bane states:

“Many effective cancer drugs target the microtubules, but we don’t know why. I was studying microtubules in graduate school at the time, so anti-microtubule drugs such as Taxol really drew my attention.”

We don’t know enough about anti-microtubule drugs on a molecular level and critical thinking is required to work around this lack of knowledge. Although Dr. Bane stresses the importance of critical thinking in a research environment and in school, she also believes that having these skills can apply to anything you do in life. “Being able to approach different situations, use good judgment based on what you have, and analyzing to make the right decisions is crucial in everyday life” says Dr. Bane. For example, students can learn every “nitty gritty” detail they can about chemistry, but the information may not necessarily be helpful as you go on. Students forget at least about a quarter of what they have learned within a couple of months if the material is not reviewed!

“No matter what job you pursue when you get out of school, you will still have to figure things out for yourself and solve problems,” Bane adds.

We all use some degree of these skills every day without realizing it, but it is really important to further develop these skills to help us reach a successful future.

Some final words of advice from Dr. Bane: she believes that undergraduate students should remember to have fun. The best thing about Binghamton University is that it is a liberal arts school that allows students like us to appreciate things that have nothing to do with our planned careers or majors. Being at a liberal arts school allows us to become more well-rounded people. Once you graduate, you move onto bigger things and are set free to venture into the “real world,” but students should take advantage of as much as they can during their undergraduate years. Once they find out who they are, they are ready to take on the world.
This year, Binghamton’s Biochemistry program had the pleasure of receiving Dr. Callahan as an additional member to its staff. Being one of the few undergraduates to conduct research under his wing, I can safely say that I have never met someone so genuinely interested in his work. He always seems to be thinking and trying to figure out different techniques and methods for our next projects. He also keeps us on top of our game by asking us to draw reaction equations for the experiments we are going to run and encouraging us to read several literature reviews. This might seem intimidating for students who have never done research, but it is exciting to see exactly how each mechanism works and understand the outcomes of such experiments. Without a doubt, working under Dr. Callahan has been one of the most valuable experiences of my Binghamton education.

Dr. Callahan graduated from the University of North Carolina at Chapel Hill where he received his Ph.D. in biochemistry and biophysics. After graduating, he spent most of his time in a research laboratory at the University of Albany developing the skills and intuition to conduct his own research in Binghamton. He is also teaching one-half of the BCHM 302 course at Binghamton.

Currently, he is studying the mechanisms of protein biogenesis associated with the Hedgehog protein. This particular protein is important in early development and is pathologically active in adults. It is at first an inactive compound but turns into a functioning molecule through a self processing reaction. It has autocatalytic activities, almost acting as a protease, which cleave it into two pieces. It also modifies one of its departing fragments with cholesterol. If this reaction were inhibited, it could have disastrous consequences for the developing embryo. However, inhibition of this reaction would at the same time be beneficial in trying to stop cancer cells, which are driven by the hedgehog. This method is now a validated drug target for various cancers.

One piece of advice Dr. Callahan has for students who wish to enter graduate school is to get into research and build the necessary experience to acquire a future job. All the years he put into working at research facilities enabled him to witness what it took to obtain a Ph.D. He also saw that not every Ph.D. student was successful. The process of getting a Ph.D. is a very serious undertaking and some valuable lessons can be learned from just working with other people in research. Motivation and genuine interest are also key factors while in graduate school. This, he explains, is what gets you through the long days and the tough times. Dr. Callahan spent almost every day in the laboratory and as a result, the hours he spent in lab exceeded the hours he spent in actual graduate-level classes. However, he loved being in the lab for those extra hours and he still does.

Research has taught me how to think analytically and creatively. I plan on applying these skills to a few of my classes next semester, particularly Dr. Callahan’s BCHM 302 class. BCHM 302 is a core requirement for biochemistry majors and he will be teaching this class in the fall of 2013. So for students who are interested in biochemistry or are pursing the biochemistry major, be sure to get on his good side!
Dr. Anthony C. Fiumera, an associate professor in the Department of Biological Sciences, is one of few professors at Binghamton University whose research focuses on conservation and evolution genetics. In addition to instructing graduate level courses, such as Advanced Evolution and Behavior, Quantitative Genetics, and Conservation Genetics, he teaches the undergraduate level course, Genetics Lab, and will be teaching Genes and Heredity in Fall 2013.

After earning his bachelor’s and master’s degrees in zoology at Ohio State University, he earned his PhD in genetics at the University of Georgia in 2001. He then completed his postdoctoral research at Cornell University and started teaching at Binghamton as an assistant professor in 2006.

Dr. Fiumera’s interest in genetics developed during his undergraduate education, when working as an animal trainer at the zoo stimulated his desire to find the relationship between genetics and social behavior. He first began researching genetics in freshwater fish. However, during his post-doc research at Cornell, he learned to work with *Drosophila melanogaster*, commonly known as the fruit fly, with his mentor, Dr. Clark. Though he intended to apply the genetic techniques to freshwater fish, he found that he enjoyed working with *Drosophila* so much that he decided to focus his research on them. He states, “I didn’t expect I would be so fond of them.” *Drosophila melanogaster* is an ideal model organism for genetics because they are easily cultured in the lab and have a fast development cycle. In addition, they possess a wide array of traits that could be analyzed, such as seminal fluids and balancer chromosomes.

With these fruit flies, Professor Fiumera seeks to discover how genetic and environmental factors affect the variation present in nature and to understand the interaction between genetics and the environment. He is interested in insect reproduction, specifically in how genes affect the behavior of males and females in courtship, mating, and remating. Recently, his research has involved analyzing how the environment, particularly toxicants, in which the fruit flies are raised impacts their genes and reproductive success. In studying how genes from males interact with the genes in females, this research can be applied to strategies for biological control of insects, such as pests and invasive species.

Dr. Fiumera plans to continue to work with *Drosophila*, but shift towards understanding the susceptibility of genes to multiple environmental toxins. He wants to find out if exposing fruit flies to a certain toxicant will have the same result as exposing them to a different toxicant. Is susceptibility to toxicants correlated? What makes certain individuals more susceptible? These are some of the questions he plans to investigate.

On a final note, Dr. Fiumera advises undergraduates to experience as much as possible, to learn the things we enjoy, as well as those we don’t because both are valuable experiences. He adds, “If you think you’re interested in a research career, I strongly encourage you to try it out.” Professor Fiumera encourages undergraduates to get the most out of our undergraduate education and to take action in discovering the paths we want to take.
Messages from the Biochemistry Graduates of 2012

I chose to be a biochemistry major because I believe that biochemistry serves as a platform for integrating concepts from many different fields. During my last two years as an undergraduate, I realized that as a biochemistry major, I could quickly learn about many subdisciplines such as neurobiology, cancer biology, and chemical biology. With a wide variety of research opportunities on campus, students are not limited to just biochemistry research in a strict sense; they can explore other related interdisciplinary research interests such as chemical biology, neurobiology, and even biological anthropology.

Getting involved with research on and off campus really allowed me to apply what I learned in the classroom. Getting lab experience is very important whether one wishes to pursue a career in research (fundamental and clinical), medicine or other healthcare related fields. I worked for Dr. Susan Bane in chemical biology research. Her lab is a good example of how biochemistry truly is an interdisciplinary major. Her lab utilizes novel chemical probes synthesized by the organic chemists in the lab for application in biological systems handled by the molecular biologists or microbiologists in the lab. My project involved modifying tubulin with a site specific tag that could be used to explore protein interactions between tubulin and its associated proteins via Amplified Luminescent Proximity Homogeneous Assay (ALPHA). This biological tool can be used in elucidating certain cancer pathologies. Doing research with Dr. Bane got me interested in cancer research and, along with other factors, helped solidify my decision to pursue a career in medicine.

Research today, both fundamental science and clinical research, has evolved into a multidisciplinary effort. Biochemistry will continue to play a paramount role in the many facets of research. Now, a few words from me about being a biochemistry major at Binghamton. Biochemistry is not exactly an easy major. There is a significant time commitment from taking classes, doing research and other activities, but let me tell you, medical school is even more difficult. The prospect of being a biochemistry major seemed daunting at first, but I got used to it and it really forced me to develop good study habits, which was a plus during my first semester at medical school. In addition, medicine has become more if not entirely molecular based, thus being a biochemistry major exposed me to some of the most essential foundations in medicine. Biochemistry isn’t for everyone, but I felt that my education at Binghamton as a biochemistry major was very fulfilling and that I was prepared to take on the rigors of medical school. Don’t let people scare you away from becoming a biochemistry major. However, if you do choose to become one, be prepared to work hard. It will pay off in the end. I guarantee it.

Whatever major you end up choosing, get interested in it. You will not learn something well if you are not interested in it. Good luck, work hard, don’t give up and have blast; your undergraduate years will be the best four years of your life. A note to premeds: Have fun; it’s a long road ahead. I’m looking forward to being one of your colleagues in the future.
Binghamton University’s Biochemistry Program provided an excellent foundation for my career as a scientist. During my undergraduate studies, I was exposed to a variety of educational and hands-on experiences within and outside of the classroom. The program’s flexibility allowed me to define my own education.

Professors working on high profile projects made a substantial effort to meet with students or answer questions via email with haste and completeness. Additionally, there are a significant amount of positions open for undergraduate students to do research. I had the liberty of figuring out whose research I liked and was afforded the opportunity to work in the lab of my choice. With my advisor’s guidance, I spent two years performing independent research, where I garnered valuable hands-on laboratory experience and learned how to develop and carry out my own methods and protocols. My academic research experience and solid educational background enabled me to land a formidable summer internship at Boehringer Ingelheim Pharmaceuticals, Inc., where I was able to see research from a new perspective.

Binghamton University’s Biochemistry Program gave me the competitive edge I needed to attain my position as a Scientist I at NSF International. In my current position I have received FDA recognition as a GLP and GMP bioanalytical chemist. I work in a fast-paced, research environment with state-of-the-art instrumentation on a daily basis. This program’s curriculum has prepared me for the challenges that I encountered as a scientist and I urge anyone studying Biology to consider the Biochemistry Program at Binghamton University.

Choosing to major in Biochemistry at Binghamton was one of the best decisions I made during my undergraduate career; it allowed me to take a wide variety of classes while at the same time giving me a strong foundation in both chemistry and biology. As a result of my coursework, I became intrigued with applying this knowledge to solving research problems. This has led me to pursue a doctorate in Chemical Biology; likely with a focus in Biophysics.

The main reason I decided to major in Biochemistry is because after taking introductory chemistry freshman year, I realized that I was much more interested in the chemical side of biology than I was in the traditional biology major’s coursework. However, my favorite aspect of being a Biochem major was after finishing the core classes, there was a wide breadth of upper level chemistry and biology classes to become immersed in. Beyond that, I always felt that Dr. Bane did a wonderful job making herself available to students, coordinating all aspects of the program, and even attending annual student-faculty mixers with the Undergraduate Chemical Society.

I enjoyed my time being a Biochemistry student in Binghamton. I picked this major in my sophomore year because I wanted to know more about the chemistry behind living organisms. It turned out to be a challenging major with a lot of work during every semester, but every effort I put into it gave me fruitful returns. I gained the essential knowledge to understand biology and chemistry, and what I learned in this major was the stepping stone to enter my PhD program now at Rensselaer Polytechnic Institute. I learned quite a lot in my major courses. I am now able to understand the language they speak in this field. Besides that, there are many other opportunities in this major, too. I gained hands-on research experience in a nano-material chemistry lab for two years and finished my Honors Thesis in Nano-platinum Synthesis. I also took some elective classes in fields that I was interested in, such as Bioinformatics and Bioorganic Chemistry. They helped me to clarify what I would love to do in the future. In a few words, it is a major that is fun, challenging and full of opportunities.
Recent Publications by Undergraduates in the Biochemistry Program*


*Publication citation is presented in a informal fashion for the purpose of recognizing Binghamton students.

Faculty and Students Presentations at Research Conferences


Connor Kinslow, Kamalika Mukherjee, Susan Bane. Cytotoxicity of Tubulin Tyrosine Lygase Substrates. *Sixth Annual Undergraduate Research Symposium of the American Chemical Society of Western New York*, Niagara University, NY, April 2013.


Graduates of the Class of 2013 with Honors in Biochemistry

Michael Chung  
Thesis Title: Fine Tuning the Insertion of pHLIP Peptide  
Research Advisor: Dr. Ming An

Adaeze Azie  
Thesis Title: Some Chickens Want to Fight and Others are Just Too Chicken  
Research Advisor: Dr. Koji Lum
With a bachelor’s degree in biochemistry, there are various paths you can follow to reach success. Biochemistry is defined as a science in which the principles of chemistry, biology, genetics, mathematics and physics are combined to explain life processes. Biochemistry provides the basis for skills ranging from biomolecular computation and modeling to regulation of gene expression. These skills allow you to excel in numerous areas of science, medicine, agriculture, and industry. If you are majoring in biochemistry, it can definitely assist you in preparing for entry into diverse fields in the future, and sometimes, science does not even have to be the dominant element.

Some popular and promising career choices for those who decide to major in biochemistry are described below. Prior to establishing a role in most fields, however, you should gain experience through volunteering or taking part in special programs that you are interested in, such as shadowing a doctor or in a specific science department. This will simplify the path to whatever career you wish to pursue.

**Biochemist**

Biochemists work mostly within the field of biotechnology, which usually involves studying and understanding the complex chemistry of life. They do a wide variety of tasks, from investigating how cells and proteins work, to developing new vaccines, to discovering new biofuels that can provide alternative sources of energy. A lot of the developments come from experimentation in labs and researching specific topics. Biochemists usually work indoors, especially in laboratories. Other kinds of work biochemists do include purifying, refining, and preparing pharmaceutical compounds for commercial distribution and analyzing foods for nutritional values and the effects of cooking, canning, and processing.

**Research Scientist**

Study and investigation are the main jobs of research scientists, but they can take on many forms, depending on the type of science with which you are involved. For example, biological researchers spend more of their time in the laboratory, studying biological samples, and conducting experiments. On the other hand, they can also travel out into the field, collecting specimens, and observing wildlife in its natural habitats. Geoscientists analyze rock strata or computer survey information in an indoor office setting, or even collect it on deep ocean voyages or expeditions into slightly populated areas. These scientists can work for companies, government agencies or colleges and universities. Many research scientists have a masters or doctoral degree, although a bachelor’s degree may be sufficient for employers looking for researchers. Most of the time, you would need experience with laboratory techniques, computer analysis, and setting up and implementing experiments. Likewise, field researcher positions usually require prior work experience with field techniques, data collection, and observational studies.

**Research Assistant**

Research assistants work in government or private laboratories, pharmaceutical companies, hospitals, or facilities that are linked to the growing field of biotechnology. Some jobs do require advanced degrees to cope with the higher levels of research; however, there are numerous jobs at the assistant or technician level in which those with undergraduate degrees can get involved. Under general supervision, research assistants contribute to general office management, technical assistance (collecting, processing, coordinating samples, specimens, information, and data), and sometimes the position may serve as the clinic receptionist or phlebotomist (qualifications apply, though).

**Pharmacist**

Pharmacists are health practitioners. They provide patients with information about drug use and possible side effects. In order to qualify for this job, pharmacists must understand the composition of medicines and the laws that control their manufacturing and sale. They have to order and store medicines and ensure that they are safe, pure, and effective. Most pharmacists work in community pharmacies. However, some do work in nursing home pharmacies or hospitals. Some pharmacists tend to focus on the dispensing of drugs, while others handle entire stores, even combining pharmacy and business careers. Pharmacists must have at least six years of education beyond high school. After two or three years of college, students enter four-year programs that result in pharmacy degrees. Students can choose to continue higher education to earn a master’s degree or doctorates specializing in areas of pharmacy.
Medical Doctor
A medical doctor performs examinations and tests on patients to diagnose conditions. Nearly all doctors regularly work in teams, with nurses and aides assisting them in their work locations. Doctors prescribe treatment and medications in attempt to heal illnesses or injuries. There are numerous types of doctors; one may choose to be a general practitioner while another may choose to become a pediatrician—it all depends on one’s interest. Doctors indeed do have long hours and sometimes they can be unpredictable. In addition, doctors may need to travel to various places, such as offices, hospitals and clinics, in order to provide patient care. The doctors who take part in healthcare organizations or groups possess less work freedom, but may, as a result gain more time off from patient coverage.

Dietitian
Dietitians usually manage food service systems for institutions including hospitals and schools, encouraging healthy eating habits through education. They also conduct research. The common areas of practice are clinical, communities, management, and consultant dietetics. Dietitians also plan food and nutrition programs and supervise preparation and the serving of meals. They assist in avoiding and treating illnesses by endorsing healthy eating habits and recommending dietary transformations. An example would be to encourage the consumption of less salt for those with high blood pressure, or the cutting out of fat and sugar intake for those who are overweight.

Nutritionist
Nutritionists mostly work as a defensive role on a one-to-one and a group basis with patients of all ages. They usually work with those who are healthy. Having a postgraduate qualification in nutrition will definitely be helpful and is sometimes necessary for those who do not have a suitable first degree in nutrition or dietetics. Employers may also ask for specific science A levels. In terms of the jobs of nutritionists, they research how the body's functions are affected by nutrient supply, find the connections between genes and nutrients, study how metabolism is affected by diet, provide health advice, and endorse healthy eating habits, and educate health professionals and the public about nutrition.

Quality Control Technician
A graduate with a biochemistry degree may find work as a quality control technician, who spends most of the career in labs, manufacturing plants or other facilities. These technicians review products that include pharmaceutical drugs, and food in order to make sure that manufactured goods are safe and approved within industry and health codes. Quality control technicians may inspect items for discoloration or test products in varying environments looking for any chemical changes that may occur. Their work may include using microscopes and other equipment to observe and monitor physical and chemical properties of products.

Business Analyst
Business analysts usually work for biotechnology firms or within the food and health care industries. Analysts with a background in biochemistry are able to use their knowledge and experience with complex laboratory equipment to research in order to suggest the type of new equipment to obtain for labs. Besides that, they can also review business costs, such as electricity or heating expenses in order to minimize expenses and increase profitability. Biochemistry majors in other positions can help market products and streamline vendor or client relations.

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Please email binghamtonbiochem@gmail.com to opt in. Feel free to add any alumni news for our next newsletter or just say “hi”!
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Dear Fellow Students, Faculty, and Alumni,

It has been a true honor to have had the opportunity to serve as the President of Binghamton Biochemistry Club. The 2012-2013 school year has left many unforgettable memories that our club will cherish forever. At the beginning of fall semester, many executive board members and I were unsure how far our club could expand our outreach. We quickly learned that our potential was vast, as our service oriented club attracted many students through seminars, publications, and weekly workshops. We were also able to reach many more students through our mentorship programs in the local elementary school and on campus.

Turnout for most of our events were mostly positive. Our most successful event was the Student Faculty Mixer which had an audience of about sixty students. Our advising seminars also had strong attendance of about twenty five students. The volunteer opportunity seminar and other information seminars also brought in about twenty students. Our outreach also remained strong through our publications. Three issues of Titin, our club magazine, garnered hundreds of views per issue on our issuu.com page.

Outside of Binghamton University, our club began the miniBridge program to provide mentorship to local elementary school students. For the first meeting, our club demonstrated basic science experiments, while encouraging the students’ desires to pursue careers in science. On campus, we created a peer mentorship program to match underclassmen with upperclassmen. Throughout the course of the year, the program was able to provide both guidance and friendship to underclassmen.

Although our club was able to both expand and find success this past year, our club still has many more projects and dreams that could not be fulfilled in the duration of one year. With the continuation of our club in the hands of President Elect Lance Kong, I am confident our organization will continue to grow stronger and fulfill the dreams and expectations set this year. In order to aid with the continued growth of the club, I will be returning as a graduate mentor for the 2013-2014 school year to provide advice and guide club publications. With the election of a dedicated executive board for the following year, I doubt that my presence will be heavily required.

Sincerely,

Michael Chung

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Letter from the Newsletter Coordinator

Dear Students, Faculty, Alumni,

It has been an honor to serve as the Newsletter Coordinator for the Binghamton Biochemistry Club for the 2012-2013 school year. I would like to thank the following: Dr. Daniel Pan, Binghamton PhD graduate in Plant Biochemistry, for contacting alumni to contribute to the newsletter, the Chemistry Department for printing, and Dr. Bane for her administrative and academic support. Thank you: Robert Kozma, Anna Alcott, Roshni Khilnani, and Steve Kwon for editing; Lance Kong for the cover; the writers, the interviewees, and all the members of the Biochemistry Club! I hope you all enjoyed the newsletter and I look forward to working on next year’s Biochemistry Newsletter!

Sincerely,

Betty Chu

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Binghamton Biochemistry Club

E-board 2012-2013

Back row (left to right): Steve Kwon, Travis Lageman, Morgan Zhao, Dan Sha Li, Jenny Tse, Betty Chu

Middle row (left to right): Kurnvir Singh, Roshni Khilnani, Stephanie Jiang

Front row (left to right): Sophie Russ, Michael Chung, Lance Kong