Growing Ideas: Career paths you can pursue with a biochemistry degree.

FALL 2010

biochemistry club
Dreading the hassle and expense of buying next year’s textbooks? Not anymore! Borrow your books from the…

**Biochemistry Book Swap**
Each Semester, the Biochemistry Advisory Board will loan out textbooks for Biochemistry courses, prerequisites and electives (including select courses in Biology and Chemistry). In exchange, the student will be asked to put down a deposit at the beginning of the semester, most of which they will be refunded upon returning each book to the Biochemistry Advisory Board. **We reserve the right to keep your deposit if you do not return the book.** Books should be returned during finals week of the semester they are borrowed, the exception being the textbooks borrowed for year-long courses (such as Organic Chemistry).

**How to borrow:** Keep an eye on your inbox at the beginning of next semester for more details about how to get involved.

**How to donate:** If you have an old copy of any Biochemistry, Biology or Chemistry textbook, and are willing to donate it to the Book Swap, please send an email to Maura Loew (mloew1@binghamton.edu).

**Example:** The used 7th Edition of Organic Chemistry (Carey)
You pay $135
You get back $125 upon returning the book

Are you an **alum** with experience working in the pharmaceutical or biotechnology industries? We would love to hear from you!

**Students involved in research:** We would like to include your work in our next issue. **Contact us if you are interested!**

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**Find out the most recent Biochemistry information or read the newsletter online at:**

**BIOCHEM.BINGHAMTON.EDU**

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**Are you a Junior or Senior?**

**Do you have a passion for Biochemistry?**

**Are you interested in helping your Peers?**

If you answer yes to all of the above then becoming a Biochemistry Peer Advisor may be right for you. As an advisor you will be able to help your fellow peers with questions and concerns that they have towards a degree in Biochemistry.

If you are interested, please contact Nicole Arana at narana1@binghamton.edu
LETTER FROM THE BIOCHEMISTRY DIRECTOR

Welcome to the fall 2010 edition of Binghamton’s Biochemistry newsletter!

We wanted to do something a little different this year -- break the newsletter into fall and spring editions. We really want to emphasize the importance of getting hands-on experience during your undergrad years, and now is the time to start looking for a summer research experience or internship. So this newsletter will hopefully help you to begin your search. See the article on page (#) to get started.

This newsletter will highlight research that is going on at BU and experiences of several recent grads. Getting research experience while an undergrad can be a fairly grueling experience, but rewarding for those who enjoy working in a lab. The recent graduates can tell you what to look forward to if you decide to follow their footsteps.

The fall semester has been a busy one for the biochemistry club (formerly the Biochemistry Advisory Board). This year’s president, Anthony Kashou, has done a great job at coming up with ideas, organizing activities, and keeping the club motivated. The club had T-shirts printed -- email Anthony at akashou1@binghamton.edu if you are interested in one! The club also has continued its light-hearted rivalry with the chemistry club, engaging them in a trivia night at Cyber Cafe West. Both teams were thoroughly trounced by the locals! To get involved with the club, send an email with your name to Kelly Curran (kcurran1@binghamton.edu), who has been an amazing secretary.

If you haven’t attended activities that Maura has organized this past semester, you are missing out! Her talk on how to get a summer internship or research position was very helpful. Thanks also to Emily Greene and Dan Pan for helping with the presentation. If you missed the talk you can get in touch with Maura at mloew1@binghamton.edu. Maura also was contacted by a biochem alumnus, Scott Obach, and invited him to come speak. Dr. Obach has worked for Pfizer for 18 years, and does research on the metabolism of drugs that effect the central nervous system. He came to BU to talk about careers for biochemists and organic chemists. Stay tuned for the spring issue, where we plan to have an article about his talk!

This newsletter was compiled in record time by our faithful editor, Stefano Quarta. I have him to thank for making this a reality. His artistic vision definitely shows through on the cover! I also have to give a special thanks to Dan Pan for helping us find contributors. And of course, thank you to all the contributors! We could not have a newsletter without you.

Please do let us know if you have feedback for the newsletter. You can email your ideas to Stefano at squarta1@binghamton.edu. Thanks for reading!

Susan Bane
Biochemistry Program Director
FOUR PATHS
GRADUATE SCHOOL

Amanda Monahan
Alum ‘07
Currently a graduate student at University of Maryland Baltimore County

I came into Binghamton University as a transfer student from LeMoyne College in Syracuse, NY where I was a biology major and scholarship athlete. Once at Binghamton, however, I decided to hang up my soccer cleats and focus on school and research. After my first year, I had a conversation between my chemistry TA and professor and it was suggested to me that instead of being a biology major, I amp it up to a biochemistry major. The decision to do so, I dare say, has made a huge difference in my present life. With such a diverse and well-rounded training in biology, chemistry, and biochemistry/proteomics and functional genomics, I am in the position to go any number of routes, including some rarely traveled. I just started my second year in a PhD program at University of Maryland, Baltimore County, where I am doing my research in a developmental/cell lab. In our field you rarely see people reach out to chemistry and "hard-core" biochemistry, and if/when it is done, it is sparse. I am currently working on bringing a large amount of biochemistry and chemistry into my thesis projects and hopefully opening a door into my field that will expand our realms and what we are able to do with our model systems. My progress in this feat, will be largely supplemented by the fact that I am a member of the National Institutes of Health (NIH) training grant toward the highly selective (in both school and student) Chemistry and Biology Interface (CBI) program. Through this program, I have “secondary mentors” in chemistry departments, wide access to chemistry labs, and I am expected to have chemistry play an important role in my PhD research. A large reason my Primary Investigator (PI) allows me to go in areas rarely traversed in our field and the reason I was accepted into the CBI program was because of the widespread and in depth range of study and my comprehension in the various fields that all began with my studies for my Bachelors degree at Binghamton University. The doors are wide open for me because of my choice, with a little push, to expand my studies to biochemistry.

Bogdan Ionescu
Alum ‘06
Currently a student at Drexel Medical School

The reason I picked biochemistry is because I wanted a major that combined both the facts and knowledge of biology and the complex understanding and problem solving needed in chemistry. I wanted a major that was balanced and that would provide me with the best background possible for science in general and medicine specifically. The major is tough and you learn to be very adaptive to switch between the different learning styles needed in the required classes. This has translated very well in my medical school learning as I not only am more familiar with the mechanisms behind a lot of biological concepts but have many of the tools needed to quickly learn and understand things I have not seen before. Medicine also requires keeping up with current literature and the senior seminars and upper level classes I took in my last year have introduced me to a lot of the techniques used in research, how to read and understand scientific writing, and how to find and critique papers on topics of interest. Overall the biochemistry major has prepared me very well for the level of learning required in medical school and allowed me to focus on digesting the massive amount of content rather than having to stop and figure out smaller fundamental concepts that most of my classmates have never seen before.
Christopher Anson  
Alum ‘06  
Currently a student at Campbell University College of Pharmacy and Health Science

As I continue on my journey through the ranks of higher education it is impossible to forget how I got to this stage. I am currently a 4th year, of 5, joint degree student pursuing a Doctorate in Pharmacy and have already completed a Masters in Clinical Research at Campbell University in Buies Creek, North Carolina.

Looking back at the beginning of it all brings me back to my senior year of high school. I was a late blooming student with a developing thirst for knowledge and looking for a challenge. My applications to different universities lead me to the locally named and famous Binghamton University. My brother, Jonathan Anson, B.S. Biological Sciences 2004; who was already in attendance and enjoyed the school immensely, highly recommended their science programs. I decided on Binghamton University as my avenue of education as I wanted a challenging, yet concrete major that would enable me to access multiple disciplines in science. I dove right in and worked hard, moving through the multitudes of classes including science, math, English and philosophy, among others, and honed my skills that defined what I wanted to do with my life. It was also through the personal relationships I developed with my peers that helped me through some of the tough classes and semesters of the program. Relationships and friends are just as important as studying as they keep you relaxed, level headed and focused on your work. Binghamton offers such a diverse population of students and faculty that making friends is very easy and you find it difficult to not enjoy your free time.

With the help of my Biochemistry degree I scored well on my PCAT, the pharmacy college acceptance test, and was accepted to multiple schools. After much deliberation I chose the dual degree program offered by Campbell University. If it wasn’t for molecular biology, biophysical Chemistry, and general biochemistry courses offered at Binghamton I wouldn’t have discovered my passion for the practice of pharmacy and be where I am today. In hind sight I would do it all again and enjoyed every moment of expanding my knowledge of biochemistry at Binghamton.
John Donohue  
Alum 07

Going into college I wasn't quite sure what I wanted to study, all I knew was that I loved the sciences, all of them. Science really fed my curiosity about how things work and why they work the way they do. I loved biology for all of the variety of life, complex interactions that occur in every ecosystem, the wide variety of adaptations and the evolutionary story of how it all came to be. I also loved chemistry for explaining how matter reacts and behaves in the universe; a set of overall rules that governed how even the most complex reactions occur.

Still, I was still more fascinated with how life was even possible. How did photosynthesis occur, how does the electron transport chain actually work, how were traits inherited, how do we go from a molecule of DNA to an entire organism with complex traits. Enter Biochemistry.

It was kind of a fusion for me, two of my favorite topics coming together to feed my fascination about how life works. The classes I took were challenging, but very interesting. I enjoyed learning about Drosophila in Molecular genetics and how all proteins were made from a simple set of building blocks in Biochemistry with Dr. Anna Tan-Wilson.

Despite my love for the material, I was not sure what I wanted to do with it. A lot of the people in the class had dreams of medical school or research, which didn’t exactly appeal to me for one reason or another. I had always really liked working closely with people. I had tutored in the past and had always thought ‘Well I could always teach’ if I hadn't thought of anything else. During my time as an undergrad at BU, I got involved with TA'ing some intro chemistry classes, and I had a blast. I loved working with the people in the chemistry department, as well as the students who were taking the class. It was a thrill to help people understand how this crazy universe works a little bit at a time. Towards the middle of my senior year i had decided that teaching was what I wanted to do (at least right now), so I applied to the MAT program at BU and the next year I was back, learning about education and how to be a good science teacher.

Since then, I have had the great fortune of finding work as a science teacher and loving every challenging moment of every long day.

Have you considered...

Accelerated Degrees: http://www2.binghamton.edu/grad-school/combined-degree-program/index.html
Masters in Art of Teaching Program: http://www2.binghamton.edu/grad-school/combined-degree-program/index.html
Double Majoring or taking on a Minor?
   A relatively new minor available to Harpur students that fits the Biochem track fairly well is general engineering: http://www2.binghamton.edu/watson/programs/academic-departments/engineering-design/academic-programs/general-engineering-minor.html
My road to becoming a biochemistry major started back in high school. I was involved in the science research program there and did a study on the correlation between headaches and obesity. This opened my door to the world of science, but I still wasn't quite sure what I wanted to major in.

Simply put, I came here and took introductory biology and chemistry with a pre-med track. I enjoyed them both immensely and said to myself, "Hey, why not become a biochemistry major?" After looking over the courses required, I couldn't find one I wasn't interested in taking. I also enjoyed that they are very lenient with electives, allowing majors to choose almost any upper level chemistry and biology courses. Looking back, my experiences in the biochemistry program were fantastic. All my professors were knowledgeable and very approachable. It was an enjoyable four years of undergraduate education and I feel I learned a vast amount.

I wanted to become a doctor because I was very passionate about helping people and interested in the sciences. I volunteered at a hospital as well as shadowed two oncologists and I loved it. However, the MCATs were a different story, a test I did not want to prepare for or take ever again.

So that led me to my next great passion that I've had for years and that is education. It may seem like a 180 degree turn to some, but in my medical school personal statement I acknowledged the fact that after 20 years of medical practice I would want to go back to school for education. After taking an education course here, I realized I loved the classroom environment and the scientific knowledge I can bring to it. After hearing about Teach for America, I decided to apply.

That entire process took a few months and included essays, phone interviews and about a 5 hour in person interview/group activity. After all of that, I was met with another rejection letter. Instead of beating myself up, I held my head high and started contacting the School of Education here at Binghamton University. My current advisor, Dr. Andy Cavagnetto, informed me there were still spots open in the Fall semester and that I should apply if interested. I ended up applying, was accepted, and here I am today!

Currently, I am enrolled in the MAT program for adolescent Biology education. I am also planning to obtain a certification in Chemistry. The program is three semesters long and my first one is almost over already! It's been a long road to where I am today, but I am happy to say that in less than two years from
SUMMER RESEARCH INTERNSHIPS

Pavel Tishchenko
Alum ‘07

I graduated Binghamton University in 2007 with a Bachelors of Science in Biochemistry and I began my research career at Memorial Sloan Kettering Cancer Center in 2008 as a research technician. While there, I was exposed to the world of immunology. To be honest, I didn’t have much in depth knowledge of immunology besides the basic things such as T-cells and B-cells. However, part of being in the Biochemistry program, you have the chance to take many scientific electives and that’s why some Biochemistry major may have a diverse set of exposures through different courses. Taking a variety of courses in my undergrad curriculum made the jump into immunology seem as another class with lots of practical work. I went to the library and just researched on my own to understand what I was doing with occasionally asking investigators on “Why we are doing it this way?”, “What’s the point of this?”. Sure, it may seem that you are annoying people but you are still growing as a researcher even after college and need to take every opportunity to learn more.

After working there for 1 year and 7 months, I entered the Master of Biotechnology Program at University of Pennsylvania. The program is there is very flexible in terms of the classes you can take which reminded me of the Biochemistry program at Binghamton. While there I was exposed to small molecule discovery and more immunology in different independent studies. It wasn’t easy but that is what I’ve have learned at Binghamton, to adapt and do your best to excel in the subject matter. Over the summer I had the opportunity to experience a taste of the pharmaceutical world when I was selected to do an internship at Regeneron Pharmaceuticals in the Pre Therapeutic Target Discovery Group.

Once again, I was doing things that were completely new such as embryonic dissection, cryosectioning, immunohistochemistry, and fluorescence microscopy on mouse embryos and adult mice. My objective was to characterize a potential drug target and its expression in mouse embryos and adult mouse tissue. Unfortunately, I didn’t get to fully characterize it to receive a solid answer but that is the way science is, sometimes you don’t get good results. One thing that some people might have in mind is to know whether the job is 9-5. Well, it depends on what you do in the company and what department you are in. Sometimes you will have to come in to feed cells over the weekend but that is nothing new for those who have done lab work. Another question people might have is whether there is a discrete difference between the pharma and academic world. So far, the only difference that I saw between academic/hospital and pharmaceuticals environments is that the goal of a company is towards the development of a drug, whereas in academia (not in all cases) it may be to discover a pathway and eventually publish a paper that may or may not be used as evidence for a potential drug target.

Overall it was a good experience and something that I can add to my scientific tool belt of skills. The company, in my opinion, has a solid pipeline that actually has a few drug candidates coming out of Phase III trials.

Getting Started: Applying for Summer Internships

Apply for a summer internship. It’s a great opportunity to put a notch on ya’ belt, meet new people, see new things; might even help you make decisions on your future. Heads up, most deadlines are circa January 1st, so best ta get in the groove early!

Where to start looking inta internships? I strongly recommend: http://biochem.binghamton.edu/internships.html

It’s a mighty informative site on how and where to apply for summer internships. Wahhou! Its out there for ya’, go get it. Get on the good foot! http://www.youtube.com/watch?v=4DAtBZbz3tI&NR=1 -JB
SUMMER RESEARCH INTERNSHIPS

Stefanie Devito
Alum ’10

Last summer (2009) I participated in an NSF funded Research Experience for Undergraduates at the Wadsworth Center at the NYS Dept. of Health in Albany NY. I worked on a project involving chromatin modification in *S. cerevisiae* with another REU student. I really enjoyed my summer there. I got to attend a lot of seminars, meet graduate students and see what graduate school would really be like. Even though I was in a yeast lab like my research lab at Binghamton, a chromatin project was totally different from any other research I'd ever done and a great way to branch out into new research.

My experience at the Wadsworth Center was really the determining factor in my decision to go to graduate school. I really liked the research I was doing at Binghamton, but was worried that I wouldn't like another lab in a different setting. It was a great experience and I realized grad school for a PhD in biochemistry was exactly what I wanted to do after Binghamton.

This summer I started my PhD work at the University of Rochester School of Medicine and Dentistry early with a summer rotation. I decided to start early to get used to Rochester before classes and to get an extra rotation in for the first year, and it was a great choice. Every aspect of research is different and I believe the more labs a student has a chance to work in the more they can explore different areas of research and gain a better idea of their career goals.

Anthony Kashou
Senior

The extraordinary experience of participating in the Summer 2010 Internship at the Center for Reproductive Medicine program is unrivaled in terms of quality and intensity of research, amiable environment and professionalism. The program offers interns such rewarding and valuable experiences as writing research papers, attending insightful lectures, observing lab tours and demonstrations, shadowing physicians and scientists, as well as partaking in bench research. The support and encouragement from the entire staff and visiting mentors exceeded my expectations and contributed significantly to my motivation to become actively involved. The skills and knowledge gained at Cleveland Clinic has provided me with the experience needed for future research in clinical medicine as an academician, physician and writer.

Binghamton University-HHMI Program
Fueling interdisciplinary undergraduate research

Binghamton University recently received a four-year, $1.4 million grant from the Howard Hughes Medical Institute (HHMI) to fund undergraduate interdisciplinary life science research. The HHMI grant joins undergraduates studying in the fields of life science, physical science, mathematics, computer science and engineering to work on collaborative interdisciplinary life science research projects. Undergraduates participating in the HHMI program will receive a stipend of $4,000, starting in the summer of 2011, and continue working throughout the following academic year on eligible projects. Prospective applicants should check out the following link:
https://applicationlink.labworks.org/applicationlink/default.htm
Adam Hill (BS in biochemistry, 2010) was the recipient of the Dale B. Terry Memorial Award and the Award for Excellence in Biochemistry at the May 2010 commencement. Adam is currently pursuing a PhD in neuroscience at Yale University.

Solomon Dawson (BS in biochemistry, 2010) was the recipient of the Awswad Family Award to a Graduating Senior Going on to Medical School at the May 2010 commencement. Solomon is currently at University of Virginia Medical School.

Michael Miller (BS in biochemistry and psychobiology, 2010) was the recipient of the John L. Fuller Memorial Award for Excellence for Undergraduate Research in Psychobiology at the May 2010 commencement. Michael is currently a M.D/Ph.D. student at Mount Sinai School of Medicine.

Faculty and Students Present Research Results at Conferences

Dr. Susan Bane, Dr. Ozlem Dilek, Dr. Abhijit Banerjee, graduate students: Maura Loew, Kamalika Mukherjee, and undergraduate student Adam Blanden presented posters at the National American Society Meeting in Boston, MA this past August.

Dr. Karl Wilson, with graduate student Daniel Pan and undergraduate student Anthony Kashou presented two posters at the 74th Annual Meeting of the Northeast Section of The American Society of Plant Biologists in Garden City, NY last April.

Dr. Heather Fiumera, graduate students Mei-Yi Zheng, Swati Paliwal and undergraduate students Stefanie Devito, Piyal Alam, Naomi Tam, Fatima Nagaya and presented posters at the Northeast Regional Yeast Meeting in Buffalo, NY last May.
Students,

A biochemistry-rich curriculum is a wise course of study for several reasons. Every life science specialization has adapted strategies and techniques of biological chemistry, biochemistry and molecular biology. Health care and other professions that you will aim for are based on studies in the life sciences. You are establishing a conceptual foundation and developing skills that you will keep building on in the future.

What is this course of study preparing you for? Look at where Binghamton alumni are. They are in top scientific and executive positions in the pharmaceutical and biotechnology industries. They are doctors, dentists, optometrists, veterinarians and other types of health care professionals. They are in education at all levels—K-12, community college, four-year colleges and universities, medical, dental, optometry and veterinary schools. They are nutritionists and genetics counselors, or work for the government in positions relating to public health or forensics. They are lawyers involved with the biotechnology industry and health care fields, science writers, artists who create animations and diagrams to convey complex scientific concepts. The list is long and keeps expanding. Read C&EN, join Science Careers.org to learn more.

Select a path that you, not your parents or friends, are interested in. Notice I don’t say that you have a “passion for”, which is what you will hear others say. Most successful scientists are absorbed in what they do, are creative, and enjoy carrying out the responsibilities of their position, without career being their one and only all-consuming preoccupation. They have families and are very much involved with their children. Lower the bar. Just choose a path that matches your talents, and that does not only mean what courses you do well in. For those of you who have done independent research, do you like everything involved, or do you only like the lab work, only the intellectual challenge? Do you pay attention to detail or do you look at the big picture and leave details to others? Are you better than the average person in developing social contacts? Do you have talent for art? Can you turn a humdrum essay written by someone else into a story that comes alive? Many students postpone selecting a career path because they are afraid to commit. You are not choosing a mate for the rest of your life. Employment data show that you will change your career several times in your life. Just choose a path you want to follow for the next two, five or ten years. If you want to explore, prepare for a shorter duration. Do not delay because students with a career goal do better in class than others with similar capability. Reach high, but be realistic. If the program you aim for emphasizes grades and high scores on standardized tests that you fall far short in, aim for a program that looks for experience that you do well in, or plan a circuitous route to your dream. Past the Bachelor’s degree, students get financial support for only a few graduate programs, the Ph.D. in the sciences being one of them. Will you be able to earn enough to pay your student loans? Are the economic foundations of that career shifting? If the work can be done as well and at lower cost in another country, plan on the work only as a short-term stepping stone.

You worked very hard to gain admission to Binghamton, one of the top-rated undergraduate institutions in the country. Take advantage of that. Here, faculty members know where their science is headed and work at preparing students not just for the present but also the future. For instance, application of mathematics and computer science to the life sciences is a growing expectation. If you have the space in your curriculum, learn statistics and computer programming. BU’s new HHMI-funded program was designed to fill such a need. Apply here and elsewhere for such experiences. As difficult it might sound now, it is easier than having to learn it totally on your own later. Work hard in courses with faculty members who challenge you to solve problems and think logically. Learn by working with classmates. With hard work and a genuine interest in a career path, you can achieve just as much as the alumni that have come before you. Binghamton faculty, staff, graduate students and peers are here to give you the tools, so strive to make the most of it!

Anna Tan-Wilson, Professor of Biology
Letter from the President, Mr. Anthony Kashou

Dear Fellow Classmates, Teachers and Friends,

Happy holidays and best wishes for the upcoming new year! I hope you have all had a pleasant semester filled with joy, laughter, and unforgettable memories. As we head towards the closing stages of the semester, we have the opportunity to reflect, give thanks, and recognize others, as well as to look forward.

Students continue to work diligently day in and day out, striving to meet new goals that are set each semester. With that in mind, we have also sought to advance our group in ways that have not been accomplished in recent years. At our first meeting of the semester, we predicted the year would be one of tremendous growth and expansion. However, we were faced with a significant challenge – lack of experience, with many on last year’s e-board having graduated. Gratefully, everyone stepped up to the plate and took on new responsibilities and roles. We have journeyed along a path that has astonishingly exceeded our proposed expectations for the year!

This semester, we have organized a number of weekly meetings leading to numerous successful projects, events and activities. We have published the first fall semester newsletter, organized the bake sale fundraising event, and competed in a trivia challenge against the Chemistry Club (a decisive 51–0 victory). We have had a guest speaker give insight on the potential for a career in the pharmaceutical field, organized workshops for applying and becoming acclimated to the summer internship process, and offered a ‘plan B’ for the years following graduation. We have designed and manufactured our own shirts that have become a big hit all across campus. Our relationships with one another continue to grow through time spent together that has led to fun-filled memories. Let us not, in the meantime, forget to give credit to the excellent instruction passed down from seniors, graduates and the educational leadership, all wrapped around an ethos of care, professionalism and collegiality.

Snow and ice will be our constant companions as we approach the winter season. Planning during this time will help ensure a rewarding and memorable upcoming semester. Our spring newsletter will reach out to assist those students seeking research opportunities, and will also include words from alumni and news about the novel research happening here at our own university.

Let me end by recognizing and admiring the creative talent, intelligence and passion of our members that have made this semester a success. We should all be proud of our collective efforts, while understanding that our best work as a group and family lie ahead. As your president, I look forward to the upcoming challenges and invite everyone to get or remain involved. I thank you for your continued support and time.

Sincerely,

Anthony Kashou
President
From the Newsletter Coordinator,

So many people to thank, but most of all to YOU!

To Dr. Tan-Wilson for writing a tremendous heart-filled letter and for working hard to bring the HHMI Interdisciplinary Student Research Program to Binghamton. To Amanda, Bogdan, Christopher, Douglas, John, Mark, Pavel and Stefanie. You all rock! I wish you the best in life. Thanks for taking that time to write us your blog and filling us in on your experience. To the dedicated members of the Biochemistry Club, thank you for your ideas, comments and group collaboration. To Daniel C Pan for ‘doin’ it BIG each and everyday, the world is a much better place due to your efforts. To Kalle for a round pound kickin’ newsletter template. Thank you to Maura for your crafty ways and helping the Biochem Club grow with great success, the newsletter wouldn’t have made it without you. And last but definitely not least, to Dr. Bane for supplying Binghamton Biochemistry students with never-ending support on the administration and academic level. On behalf of the Biochemistry Club, thank you so much for reading this year’s newsletter.

The Biochemistry Club is seeking new members! If you are interested in meeting people with similar interests, taking on leadership roles, creating next year’s newsletter, peer advising, or just chatting about life as a Biochemistry major, this is the club for you! Contact us if you would like to join!

Contact Information:

E-mail: Maura Loew
mloew1@binghamton.edu

Contact Us

Give to the Biochemistry Program!

Your gift is tax deductible as allowed by law.

A copy of the Binghamton University Foundation’s latest annual report may be obtained from the organization or from the Charities Bureau, Department of Law, 120 Broadway, New York, NY 10271.

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☐ I have enclosed a matching gift form from my/my spouse’s employer.

Send to: Binghamton University Foundation, PO Box 6005,
Binghamton, New York 13902-6005
YOUR FUTURE

Careers in Industry for Biochemistry Majors

You may know that your biochemistry degree can lead to a career in the pharmaceutical industry. Did you also know there is a burgeoning industry that is highly related to biochemistry? It is called the biotechnology, or “biotech,” industry. This industry uses biological macromolecules, such as proteins, RNA, or DNA, to treat diseases. An example of a biotech drug is an antibody that binds to cancer cells specifically, triggering the patient's immune system to attack the cancer.

The book Career Opportunities in Biotechnology and Drug Development, by Toby Freedman, can be a valuable resource for those of you considering working in industry. This book is available at the Science Library. The route to drug discovery and FDA approval is similar for biotech drugs and traditional ones, so the information below applies both to biotech and traditional pharmaceutical careers. There are specialized careers for each step along the way. The BS in biochemistry can make you a candidate for any of the fields below, but your opportunity for advancement may be limited if you only have a bachelor's degree.

Drug Discovery

The scientists who discover or develop potential drugs work in “Drug Discovery” research. This initial step requires scientists to identify a potential target for a given disease. This target could be a receptor, enzyme, or other protein which is thought to be responsible for the disease's effect. After a drug target is identified, an assay must be developed to measure whether a potential drug binds to the target. For small-molecule drugs (traditional drugs), the assay will usually be used to screen thousands of molecules called a “library.” For biotech drugs, a more deliberate, rational approach is usually used. The “lead” compound that is found from these efforts is then modified for potency, solubility, toxicity and other properties.

If this sounds like a field you would be interested in, you should try to get research experience (http://biochem.binghamton.edu/honors.html) and/or an internship (http://biochem.binghamton.edu/internships.html) during your undergrad years. You would also be wise to take biology electives that are lab-based and will teach you experimental techniques, such as microbiology or cell biology lab.

Pre-Clinical Research

Clinical trials evaluate the safety and efficacy of a drug candidate in humans. Because this is very expensive, and potentially dangerous, drugs are tested as much as possible in animals and cultured humans cells before clinical trials begin. Pre-clinical researchers will study the “ADMET,” or pharmacokinetic, properties. ADMET stands for absorption, distribution, metabolism, excretion and toxicity.

A major function of the pre-clinical research division is to file an application with the FDA to get approval to begin trials in humans. Efficacy and safety must be demonstrated before any human can take the drug. Employees in preclinical research can hold bachelors, masters, PhD, MD or veterinary doctoral degrees.

Clinical Research

Once a drug is approved for testing in humans, it is tested in humans. It is tested first for safety, then for efficacy. These clinical trials take several years. Every step of clinical trials in humans requires regulatory paperwork to be filed with the FDA. This stage of drug discovery has many positions that do not require lab work. Some careers require travel to monitor clinical trials which are being held all over the country. Most of the positions in clinical research go to employees with medical degrees (MD, PharmD, MPH, RN) but there are also careers for those who hold a PhD, MS or BS. A medical doctor will find higher-paying, but higher-responsibility positions.

The field of drug discovery is one that many biochemistry majors would enjoy. Due to the state of the economy, many pharmaceutical companies are laying off workers, but conditions are expected to improve. Consider pursuing an advanced degree to increase your marketability. Students with an MS or PhD in pharmaceutical science are highly sought. If you want to take a break from science, an MBA would also improve your prospects. You can read much more about careers in drug discovery in Toby Freedman’s book. He provides snapshots on a wide variety of careers, including ones that might not be obvious from this article—writing, marketing, business, law, and computer science-related careers. Now is the time to learn about careers that your