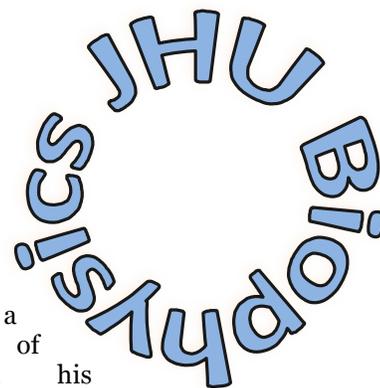


Spring 2011

JHU Department of Biophysics Undergraduate Newsletter



SENIOR PROFILES

Congratulations to the class of 2011!

Steven Cardinali

Steven grew up in the small town of Pequannock, NJ. He decided to become a Biophysics major his sophomore year during the spring semester. While he was pledging Beta Theta Pi, he had a long conversation with two brothers, Siavash Raigani and Neil Neuman (Biophysics '09), who enlightened him on the benefits of Biophysics over Biology.



His favorite part of the biophysics major is the fact that you learn a lot about the underlying physics of biological systems, something you tend to miss while majoring in only Biology. Because of his enthusiasm for physics, *Cellular and Molecular Physiology* with Dr. Richard Cone, was his favorite Biophysics class. It was the first class which introduced the importance of physics in the behavior of biological systems. For three years Steven did research for Professor Leheny in the Physics department, studying protein membrane formation.

Steven has a few pieces of advice for people considering the major. Biophysics is a unique combination of Physics and Biology, and because of the inherent difficulties of each, the major is not easy. However, it is extremely fulfilling and enlightening. He promises you will get a lot out of it. Next year Steven will be attending U.C. Berkeley where he will be studying to obtain a Master's in Mechanical Engineering.

Yong Hee "Will" Chung

Will Chung is an international student originally from Korea, but his family now lives in Seattle, WA.

Will's favorite undergraduate class was *Computational Biology* with Dr. Patrick Fleming because it allowed him to see a different side of protein studies, namely molecules as ensembles. In addition, he enjoyed learning python programming.



Will decided to major in Biophysics because the subject gave a more detailed view of biology. Will did his undergraduate research Dr. Peter Privalov's lab in the Biology Department working on IRF3 linker structures using NMR.

An interesting fact about Will is that he enjoys badminton, which he played through the JHU Badminton club. Will is also completing the Biophysics major in only three years. This will allow him to hone his research skills by working in a research lab next year. Eventually, Will wants to pursue a graduate degree in Biophysics or a related discipline.

Kevin Doxzen

Kevin is from Ellicott City, MD, right outside Baltimore. In addition to studying Biophysics, Kevin was part of the Ultimate Frisbee team, Habitat for Humanity, an RA, and Jazz Ensemble.

Based on interest in physics and math in high school, Kevin decided to pursue Biophysics at Hopkins because of their honored faculty and close relationships between students and professors. Kevin's favorite qualities of the Biophysics major are the class sizes and ability to get to know each professor personally. The students of this major tend to work together with each other rather than being competitive.

Kevin's favorite undergraduate class has been the graduate course called *Nucleic Acid Chemistry*, taught by Dr. David Draper. This course covered many different topics and allowed for students to write an in depth research paper at the end of the semester. Kevin also enjoyed this class because it coincided well with his independent research in Dr. Sarah Woodon's lab. Since the summer of 2009, Kevin has been investigating the protein chaperone Hfq, which is involved in RNA annealing. Kevin presented his research at conferences in Albany and Baltimore and is submitting a paper to the *RNA Journal*.

For those who are considering Biophysics, Kevin suggests spreading out the difficult classes over the four



The T. C. Jenkins Department of Biophysics Undergraduate newsletter is published twice yearly. It is written for and by current Biophysics majors and alumni and is coordinated by Prof Karen Fleming, Biophysics Director of Undergraduate Studies. There are articles about student research, courses, professors, departmental programs, and the Spring issues highlight the graduating seniors. Contact Karen.Fleming@jhu.edu to contribute articles. Previous issues can be found at http://biophysics.jhu.edu/undergraduate_newsletter.html

years and becoming invested in a specific research project. "Take time to get to know your other Biophysics classmates and work as a team." Since Kevin is from the Baltimore area, he had an opportunity to experience the city before coming to Baltimore, and his favorite aspect was the music scene. The different small and large venues offer all genres of music.

After graduation Kevin will do another year of research and then apply to graduate schools.

Emily Holthaus

Emily is from Rocky River, Ohio. She decided to major in Biophysics because she liked the idea of applying physics, math, and chemistry to the study of biology, and she was impressed by the wide range of classes available to Biophysics majors. Her favorite part of the major has been the close-knit community among students and professors.

Emily's favorite class in the department was Dr. Doug Barrick's *Introduction to Biophysical Chemistry*, because it tied together a lot of the concepts introduced in lower level biology and chemistry classes.

One interesting fact about Emily is that she is a Spinning Instructor at the Rec Center. This has proved to be a great way to wind down after a day of studying (or gear up for a night of studying).

To those students who have just declared a Biophysics major, Emily encourages you to take some of the lower level biophysics classes as soon as you can, and try to meet the other students in your biophysics graduating class. She says, "My Biophysics classmates have turned out to be my best friends at Hopkins, and I recommend that you establish your study group as soon as possible!"

Emily will be attending medical school this fall.

Yagmur Muftuoglu

Yagmur was born in Ankara, Turkey and grew up partially in Turkey, Holland, and the United States. She went to high school in a small suburb outside of Pittsburgh, Pennsylvania. An interesting fact about Yagmur is that she works as a stage actor in her spare time.

Yagmur decided to major in Biophysics upon matriculation to Johns Hopkins University because it combined a subject she liked (physics) with a subject - she says she was horrible at (biology). How could she go wrong if she combined the two? She is also fascinated by the application of engineering and the physical sciences to real-world and/or medical problems and has double



majored in Chemical and Biomedical Engineering.

Yagmur's favorite aspect about biophysics is how a lot of topics blend into each other such that she feels like she has pursued a cohesive, profound education here.

The most challenging class for Yagmur in biophysics was *Spectroscopy*, but she very much appreciated Dr. Juliette Lecomte's logical manner in approaching the (it seemed) incredibly complicated topic. However, the class she found most interesting was *Computational Biology* with Dr. P. Fleming because it gave her ideas for her research project. It was also the only class that touched on drug design, which is her intended area of graduate study. She also loved taking Dr. Barrick's *Intro Biophysical Chemistry* course because he has such an interesting teaching style and because this was most like her other engineering courses. Out of those three classes, she really couldn't choose one she liked best: they were all great!

Yagmur's undergraduate research was aimed toward discovering classes of less toxic, and more effective drugs for breast cancer treatment, targeting the aromatase system. In the end she found four new chemotypes that worked, i.e. successfully inhibited this breast cancer target! She was also able to test these by developing an *in vivo* model for aromatase inhibition and breast cancer treatment using zebrafish embryos. Her later projects also dealt with the subset of drugs used to treat epilepsy and the similarity between antiepileptic drugs and nonsteroidal aromatase inhibitors and the biological implications of this.

Yagmur's favorite aspect of living in Baltimore was the theatre scene and the opportunities available to students in the performing arts. Baltimore also has an amazing number of quaint little cafes that she loved visiting before and after rehearsals.

The piece of advice Yagmur gives to new majors is this: follow your heart (or brain, whatever you tend to go by) and do so *boldly*. Hopkins is truly an amazing environment, and you should be fearless in exploring it. Regarding the Biophysics major, Yagmur says that it has helped set her up for exactly what she wants to do following graduation.

Next year, Yagmur will either be attending an MD/PhD program or the PhD program in Pharmacology at Yale University under an NSF graduate research fellowship. She also plans to continue her involvement and education in the performing arts!

Siavash Raigani

Siavash is an international student from Toronto, Canada. He entered Hopkins as a Biophysics major because it was a subject that he had not only never heard of before, but it was a field that sounded very interesting. It was a mix of subjects that he very much enjoyed,



especially math, so the decision was a smart one. His favorite thing about the major is the extremely small class sizes; he says he knows almost all of the students in his graduating year and several of them have become his closest friends over the past couple years.

Siavash also found the open opportunities for pursuing research to be fantastic; he spent two years working on female reproductive health research in Dr. Richard Cone's lab. Siavash's advice for future Biophysics majors is to become immediately acquainted with your fellow students because working in a group with my Biophysics friends has helped him survive these four years, especially in the upperclass courses.

Siavash will be a first year medical student in the fall at Case Western School of Medicine in Cleveland.

Renato Rapada

Renato is from Jersey City, New Jersey. He decided to major in Biophysics during his freshman year after taking *Topics In Biophysics Research*.



Renato's favorite biophysics class was *Molecular Biophysics Laboratory* with Dr. Karen Fleming. He exclaims that it is "the best lab course offered at Hopkins" due to its small, intimate class size and its investigative, hands-on approach to learning. For the first time, Renato was able to truly apply the scientific principles he has learned in lectures and employ different laboratory methods to investigate a biological problem. Taking it only as a sophomore and with little research experience, Renato found it very challenging, but extremely rewarding as it sparked his interest in Biophysics.

Outside of class, Renato has been involved in research in Dr. Richard Cone's Mucosal Protection Lab in the Biophysics Department, where he investigates bacterial vaginal microbiota.

An interesting fact about Renato is that he is an ROTC cadet and will commission as a Second Lieutenant in the United States Army at the end of May. Renato is currently applying to medical school and sees a medical career in his future.

Chris Razavi

Chris is from Rochester, NY. He decided to major in Biophysics after taking the freshman course *Topics in Biophysics Research* during which Chris became enamored with the Biophysics department and all the opportunities it offered undergraduate students. For his research project, Chris completed various Epigenetic studies with Dr. Steve Baylin at JHMI.



Chris' favorite biophysics courses were *Computational Biology* and *Introduction to Biophysical*

Chemistry, due in part to the combination of subject matter and instructor effectiveness. He has particularly enjoyed the department's small class sizes that allow for one-on-one interaction with professors.

Outside of the classroom, Chris is a four-year letterman of the varsity swim team, and served as a team captain this year.

Chris will be attending medical school in the fall.

Justin Silverman

Justin is from Winnipeg, MB, Canada, but it was so cold that his family moved to Toronto, and then to Los Angeles, CA. An interesting fact about Justin is that he got into Hopkins because he showed "passion" through welding, metal working, and rock climbing even though he says his grades and SAT scores were marginal.



Justin decided to major in Biophysics as soon as he heard the word "Bio" concatenated with "Physics". Justin's favorite thing about the major is just that: it merges two of his greatest interests *Bio* and *Physics*. What kept him in the Biophysics program is the professors. He says, "Every professor seems to genuinely care about undergrads. Many of the professors have taken significant time helping me with my outside research and applications for scholarships and medical schools."

Justin's favorite classes have been *Intro Biophysical Chemistry* from Dr. Barrick and the *Bioinformatics* and *Computational Biology* courses by Dr. Pat Fleming. Dr. Barrick's great attitude permeated throughout his course and made thermodynamics fun, and Justin learned that he loved statistical mechanics! *Bioinformatics* and *Computational Biology* both just struck a chord with him, and he plans to pursue these subjects in grad school.

An interesting fact about Justin is that he is also a Physics double major, and he conducted research for two years in the Markovic lab in the Physics department and will continue to do so for one additional year.

Justin's favorite aspect of living in Baltimore is the restaurant Tambers, specifically the Saag Meat and Garlic Naan. Justin has three pieces of advice for those considering the major:

(1) Make sure you don't press "Reply-all" if you only want to reply to one person; (2) Take Modern Physics; and (3) Love Boltzmann

Following graduation, Justin will be continuing his research in the Markovic lab for a year and then attending either an MD/PhD program a MD program.

Lauren Thomaier

Lauren hails from Bruce Springsteen's hometown, good ole Freehold, NJ. She enjoyed her four years living in Baltimore because there are so many great restaurants, quirky bars and interesting neighborhoods. Lauren was originally a Chemical and Biomedical Engineering major and switched to Biophysics in the middle of her sophomore year because she wanted to have more problem solving in her major. Biophysics was the perfect mix of biology, chemistry, physics and math!



Lauren's favorite thing about the Biophysics major has been the professors. The professors in the Biophysics department truly care about you learning the material and are very passionate about what they do. She also loved the Jenkins Computer Lab – she says a lot of good laughs were had there with fellow Biophysics seniors. Her favorite class was *Reproductive Physiology*, and she thinks she'll probably end up pursuing research in medical school related to the topics covered in the class. Lauren's advice for future Biophysics majors is to become friends with your classmates!

Next year, Lauren will be attending the NYU School of Medicine.

RESEARCH HIGHLIGHT

Gabe Salzman, Biophysics '12

Gabe Salzman is completing his undergraduate research in Dr. Doug Barrick's lab working on cellulases, which are naturally occurring enzymes that catalyze the hydrolysis of a cellulose chain into molecules of smaller polysaccharides. Because of their potential for use in the synthesis of biofuels, particularly ethanol, the study of these enzymes is important.

A particular cellulase, *Thermobifida fusca* Cel6A, is being studied in Gabe's experiments. This wild-type endo-cellulase has been characterized in the literature and its activity on various substrates has been documented. An important aspect of the structure of cellulases is that, like Cell 6A, they can have three domains: an N-terminal catalytic domain (CD), a C-terminal carbohydrate-binding module (CBM), and a linker between the two. It has been shown that the activity of the CD of most cellulases (including Cel6A) is significantly lower when the CBM has been removed. It was hypothesized that varying the length as well as primary and secondary structural elements of the linker (between the CD and CBM) would affect the activity of the cellulase. The goal of this research is to understand what kinds of modifications of the linker will increase cellulolytic activity and what kinds will decrease activity.

The first step of the experiment was to reproduce the published data and confirm that the activity of the wild-type enzyme was higher than that of the CD alone (as well as unlinked CD and CBM together

in solution). This was done by separately cloning the three different constructs (wild-type, CD, and CBM) into vectors, expressing and purifying the enzymes, and assaying their activity. Colorimetric assays that detect the presence of glucose were done using a variety of cellulose-based substrates; a more active cellulase will convert more cellulose into glucose which will be detected by the assay. Along with the above-mentioned three constructs, several others were also cloned into vectors including an attached CD-CBM with no linker, a half-wild-type length linker, and a double-wild-type length linker. These enzymes - once expressed and purified - will be assayed in a similar way as previously described.

What Gabe likes the most about working in Dr. Barrick's lab is having his own research project. He says, "I consider it a great privilege as an undergraduate to have that opportunity, and I believe that my work in lab has given me a very concrete, practical foundation for understanding all of the research and experiments that are consistently discussed in all of my science classes. Before my lab work, I had a much more difficult time grasping all of the important facets of designing and interpreting scientific experiments."

DO YOU WANT TO GET INVOLVED IN RESEARCH?

Check out the guide for how to get involved in research written for Biophysics undergraduates at:

http://biophysics.jhu.edu/research_in_biophysics.html

KEEP IN TOUCH WITH THE JHU BIOPHYSICS GROUP AT LINKED-IN

Join the JHU Undergraduate Biophysics group on Linked-In to connect Biophysics majors, past and present. The group was created to facilitate networking, reference requests, and staying in touch. This group is not only for Alumni, but for current students, as well. Be sure to register before you graduate. Check it out online at:

http://www.linkedin.com/groups?gid=1776717&trk=hb_side_g