



# JHU DEPARTMENT OF IOPHYSICS

## UNDERGRADUATE NEWSLETTER

**Welcome to the Biophysics Department undergraduate newsletter. We have articles about courses, alumni, department programs and senior student profiles.**

### Biophysics Mentoring Program

The Biophysics Mentoring Program is designed to connect students considering the biophysics major with current biophysics majors. If you are interested in learning more about biophysics, and would like to hear a current student's perspective, email Dr. Fleming ([karen.fleming@jhu.edu](mailto:karen.fleming@jhu.edu)) to sign-up for the Biophysics Mentoring Program. She will connect you with a current student, so that you can learn more about the major, ask any questions you may have, and get inside advice from current majors. All mentors and mentees meet at least once a semester as a group. Check out a picture from our last Mentoring party!



Fall 2009 Undergraduate Mentoring/Pizza Party

### Undergraduate Research Guidelines

#### *Interested in joining a research laboratory?*

Students often have many questions regarding independent research. How do I contact professors? What kind of research satisfies the Biophysics major requirement?

To make the process easier for undergraduate students the department has assembled a comprehensive online guide for students. The guide elucidates key procedures for obtaining research credit and explains the Department's research philosophy.

<http://biophysics.jhu.edu/ResearchRequirements.pdf>

### Course Profile

**Biophysics 250.353**  
**Computational Biology**  
**Taught by Patrick Fleming, PhD**



The structure of a protein we view in a molecular graphics image can project a false impression of the underlying structural diversity of that protein. Biomolecules such as proteins experience enormous conformational fluctuations. One must appreciate this structural diversity to understand the cellular function of biological macromolecules.

In this course we examine the dynamic nature of proteins and how this dynamics impacts on the experimental determination of protein structure and function. We explore how dynamic systems are generated computationally and how they are analyzed, especially with regard to how these analyses relate to experimental data.

An overarching theme of the course is that students learn to appreciate biological systems in terms of Boltzmann distributions. This way of looking at systems can be applied usefully to a wide variety of scientific fields.

### Alumni connected by Linked-In

Join the JHU Undergraduate Biophysics Alumni group on Linked-In to connect with other 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. Check it out online at:

[http://www.linkedin.com/groups?gid=1776717&trk=hb\\_side\\_g](http://www.linkedin.com/groups?gid=1776717&trk=hb_side_g)

### Young Alumni Interview

**Name:** Molly Plovanich  
**Hometown:** Hamlin, NY  
**Graduated:** 2009



#### **What are you doing now? How has your biophysics background come in handy?**

I'm in my first year of medical school at Harvard. I've noticed that a Biophysics background has been tremendously helpful in understanding the mechanisms of Pathophysiology. For example, I just went to a seminar on the genetic basis of hypertension in the kidney. Although I haven't completed a course on renal physiology, I understood most of the lecture because of my Biophysics background. In addition, it has also

prepared me to work in a laboratory. Right now, I'm working in a lab to characterize mitochondrial disorders with proteomics and genomics.

#### **What was your favorite thing about the Biophysics Major?**

When I came to Hopkins, I loved science and math, but biomedical problems fascinated me most. Biophysics provided a rigorous, multi-disciplinary framework for understanding life on a molecular level. Biophysics was broader than molecular biology, chemistry, or neuroscience, so I it gave me a chance to explore. I was also struck by the intimate nature of the department. I never doubted my decision.

#### **What was your favorite Biophysics class?**

Advanced Seminar in the Structural Biology of Chromatin—reading science papers is the best!

#### **Where do you see yourself in 10 years?**

Hopefully, I will be a practicing physician-scientist, pursuing research to develop novel therapeutics.

#### **What is an interesting fact about you?**

I am a yoga enthusiast, and I also studied anthropology at Hopkins.

## **Senior Profiles**

### **Alex Satin**



Alex is from Muttontown, New York. He decided to major in Biophysics after taking the freshman course Topics In Biophysics Research. While he originally took the course to learn more about biomedical research, Alex quickly became enamored with the Biophysics department and all that it offered undergraduate students. For his research project, Alex studied the bacterial protein BmrR under Dr. Herschel Wade at JHMI.

Alex's favorite Biophysics courses were Computational Biology, Biophysical Chemistry and Molecular Biophysics Lab. "These courses epitomize the nurturing academic environment Biophysics professors create for their students", reflects Alex. He has particularly enjoyed the department's small class sizes: "the one-on-one interaction with professors makes the major a truly unparalleled experience".

Outside of the classroom, Alex enjoys listening to music and going to the gym. He is an avid golfer and car enthusiast. For the past two years, he has been a Resident Advisor for freshman students. Alex will be attending medical school in the fall.

### **Jimmy Tooley**



Jimmy decided to major in Biophysics after taking Bioinformatics his sophomore year. He realized that the Biophysics department would allow him to fulfill his desire to study biological problems from a physical point of view. He

feels if you're interested in becoming involved in basic science research this is the best department for you. Jimmy's research is in Blake Hill's Lab in the Department of Biology where he studies proteins associated with mediating mitochondrial morphology. He feels the most rewarding aspect of his education at Hopkins has been the relationships he has formed with the outstanding faculty and students. The Biophysics department is filled with amazing professors that are passionate about their work and care about their students, which creates a great environment for learning. At first it was a challenge for Jimmy moving from suburban Arizona to Baltimore, but he has grown to appreciate the diverse city and loves being a part of the Hopkins community. Next year Jimmy will attend medical school.

### **Deepak Atri**



Deepak's attraction to the Biophysics major was due, in large part, to its well-balanced science education across fields. He remembers noting class titles such as "Computational Biology", "Physical Chemistry" and "Biological Physics" when browsing the major. After having met other Biophysics majors and Professors, whose brilliance was matched only by their personal qualities, he was sold. His favorite classes have been Biophysical Chemistry with Prof. Doug Barrick and the Advanced Seminar with Prof. Garcia-Moreno, not only for the content of the course, but for the profound insights that the professors shared.

Away from the classroom, Deepak has tried to make the best of Baltimore's opportunities. He has done research in the fields of neural stem cells and brain cancer, been active in community involvement, and found Baltimore to be a great running city when the weather permits.

Deepak's suggestion for incoming students is follow Mark Twain's advice:

"Never let your schooling interfere with your education."

### **Kevin Rhie**

Kevin is from Glastonbury, Connecticut. Kevin decided to major in Biophysics at the end of his freshman year. Biophysics offered him the opportunity to study Biology while continuing to explore mathematics. For his research project, Kevin worked with Dr. Robert Schleif in the Department of Biology. His work focused on different mutations of the protein AraC.

Kevin's favorite course was Computational Biology, which is taught by Patrick Fleming. The course examines the dynamic nature of proteins and allowed Kevin to further his programming skills. He has particularly enjoyed working in the Jenkins Hall computer lab, which is one of the many perks offered to Biophysics majors.

Outside of the classroom, Kevin is an avid Ultimate Frisbee player. He has played competitively since high school and is a member of the team at Hopkins. Kevin's other hobbies include rock climbing and photography. During his time in Baltimore,

Kevin has enjoyed “exploring the city”, in particular its restaurant scene. Some of his favorite restaurants are Holy Frijoles and Brewer’s Art.

For students considering the major, Kevin recommends pursuing research early and often. Kevin is currently applying to medical school.

### Jean Suh



Jean is the only Biophysics major that has not grown since 5th grade. She decided to join the major sophomore year because of its quantitative approach to describing biological systems rather than “brute memorization of facts.” She has enjoyed the small class sizes that have allowed her to build relationships with her professors and classmates. Bioinformatics has been her favorite class while at Hopkins because of its use of computer programming, which provides a hands-on approach to learning. She got involved in her research on the role of Neuropilin-2 in melanoma metastasis after contacting the PI with her interest in the work. She thinks the new members of the major should get to know their professors as soon as possible because they truly care about each individual student. She is currently applying to service corps positions and plans on attending medical school afterwards.

### Sarah Kwon



Sarah was initially attracted to the Biophysics major just from the name. “It just sounded cool,” she admitted. But it was really the major’s interdisciplinary approach that encouraged her to stay with it from the beginning of her sophomore year. But aside from the classroom theory, she has found that the camaraderie between the students and the professors to be a great dynamic, allowing for a spirit of cooperation in our characteristically small classes. On the subject of interdisciplinary, Sarah’s favorite class was Biophysical Chemistry because of the intuitive insight it provided into the nature of Biophysics and the clarity with which Prof. Doug Barrick presented the material.

Outside of class, Sarah has been involved in research on membrane proteins in the lab of Prof. Karen Fleming in the Biophysics department, whom she emailed purely from interest in her research topic. She also has enjoyed exploring Baltimore’s different restaurants and its surprisingly good music scene.

As for advice for those considering the major, Sarah says, “Be prepared to work!”

### Mythri Reddy

Mythri’s path to Biophysics began during her second semester of general Physics. She enjoyed the challenges that Physics presented. Additionally, Mythri wanted to study Biology. However, she hoped “to take classes that included math, not just memorization”. Mythri credits the advice she received from Biophysics upperclassmen at a department party as one of the factors that led her to the major. Mythri worked in the

lab of Dr. Robert Schleif in the Department of Biology. There, she worked on mutating and crystallizing AraC protein.

Mythri’s favorite parts of being of Biophysics major are “the small classes and the one-on-one interaction with professors”. She particularly enjoyed Dr. Garcia-Moreno’s course Advanced Seminar on Virology. The reading and discussion based course gave Mythri the skills to “think more critically about what she had learned in other classes and apply it to viruses”.

Since arriving in Baltimore from Bettendorf, Iowa, Mythri has enjoyed exploring Baltimore’s dining scene. Using JHMI shuttle route as her guide, Mythri has sampled cuisine from all corners of the globe.

Mythri encourages students considering the major to take an introductory level Biophysics course. She believes that while challenging, these courses help “you learn to think critically about science”.

### Lisa Kizub



Lisa, who was born in Kieve, Ukraine, decided to major in Biophysics after joining Dr. Bowman’s lab as an undecided freshman. By the winter of her first year she was already setting up crystal trays and designing her own experiments. This experience along with her love of the small department helped her realize that the Biophysics department was where she wanted to stay. She feels, “Picking a favorite class is a bit difficult as each of them had their own amazing aspects,” but admits if she had to choose one it would be either Cellular and Molecular Physiology or Advanced Biophysics Seminar. What she liked most about these classes was how they used complex physical principles to explain basic processes of nature. Her research in the Bowman Lab has focused on a family of proteins responsible for chromatin remodeling. She enjoys the relatively fast pace of life in Baltimore compared to her Midwest roots and the opportunities that come with it. She advises to people considering the major to take Biophysics electives to get to know the department.

### Aaron Moore

Aaron’s interest in Biophysics came from his combined passions of math, physics and biology. He found it really interesting that numbers and physical principles could be applied to solving biological questions. He was really sold on the major after taking the “Topics in Biophysics” course offered in the fall of his freshman year. Since that point, Aaron has really enjoyed the department’s small class sizes in classes such as Bioinformatics, which catered to his interest in computing and molecular evolution.



For his research, Aaron worked in a lab where he used fluorescently-labeled single molecules to study the lambda phage. When he wants a break in academics, he attends Baltimore Orioles baseball games and enjoys occasional

home-cooked meals from with his grandparents who also live in Baltimore.

Aaron will be headed to medical school after college.

### **Kenny Chiang**



Kenny is from Fairfield, Ohio. While some students take a circuitous path to the major, Kenny decided on Biophysics after graduating from high school. His interest in protein folding and his desire to become a doctor made Biophysics the perfect fit. For his research project, Kenny worked with Dr. Sarah Woodson in the Department of Biophysics. In Dr. Woodson's laboratory, Kenny analyzed DsrA using molecular beacons.

Kenny's favorite Biophysics course was Bioinformatics, which is taught by Dr. Patrick Fleming. Kenny found the course to be "very rewarding" because of his interest in the computational aspects of protein folding research.

In his spare time, Kenny enjoys building computers. Since moving to Baltimore, Kenny has become a fan of the city's NFL team the Ravens. For those considering the major, Kenny offers a few words of advice: "If you're interest in doing research, this is the major for you".

### **Ian Whitford**

Ian decided to major in Biophysics because of his interest in both Molecular Biology and Physics. He feels that studying Biophysics has been a great preparation to continue his education in any scientific discipline. He has particularly enjoyed the students and faculty that make up the department. His favorite Biophysics class—what he calls "a true Biophysics class"—has been Cellular and Molecular Physiology with Dr. Cone because it applies physical principles to describe many of life's biological processes. Ian's research focuses on computer simulations of the bacteria *E. coli* to gain a further understanding of chemotaxis. He became involved in his lab with the help of the department and his research advisor. His suggestion to the new members of the major is to try to take at least one Biophysics elective per semester. These classes were usually his favorites and it helped him to get to know the department early. Ian is planning to attend medical school next year.

### **Derrick Jeon**

Derrick decided to major in Biophysics after attending an open house meeting that was held during his freshman year. "I was fascinated by the people I met there," Derrick recalled. It was obvious to him that the professors treated students as friends while having true passion for their work and science in general. This was best evidenced to him in Prof. Richard Cone's course—Cellular and Molecular Physiology—where he saw how physical ideas were able to clarify complex biological phenomena.

Derrick's research project is not in the Department of Biophysics at Homewood, but at the School of Medicine. He works on an MRI contrast agent composed of iron oxide

nanoparticles, which he arranged by speaking with faculty members after writing several emails. When not working on school work or in the lab, Derrick has most enjoyed the diversity that is endemic to Baltimore and Johns Hopkins.

If you're planning to choose the major, Derrick suggests that you take one or two courses from the department. Because this major is so distinctive, taking a class is best the way to find out whether it's right for you. Next year, Derrick will be working toward a Master's degree and then headed to medical school.

### **Dustin Himmerich**

Dustin's track through college has been different from many Biophysics majors due to his passion for music. As a freshman, he followed his passions and took a music theory class along with science classes. Since that time he has tried to live the double life, pursuing a minor in music in parallel with the Biophysics major. He takes voice lessons, plays guitar and sings in several choirs.



From the beginning of college, Dustin has been taken with the sort of research that goes on in Biophysics. Dustin's own research concerns a protein involved in the invasion machinery of *Plasmodium Falciparum*, the bug that causes malaria. He got a spot in the lab at the suggestion of Prof. Karen Fleming, the Director of Undergraduate Studies in Biophysics.

As far as his college education was concerned, Dustin loved the small classes that were offered, where he really got to know the professors personally. He only suggests that you spend some time thinking about what *exactly* is Biophysics. He's lost track of the number of times he's been asked about it, but it's been quite a few.

### **Janine Lin**

Janine decided to major in Biophysics during her sophomore year. She wanted a major that was not limited to a single area of science. Rather, Janine hoped to gain a strong foundation in all of the basic sciences. For her research project, Janine worked in Dr. Bertrand Garcia-Moreno's laboratory. There, Janine worked to create an acid insensitive SNase by altering specific amino acids that may contribute to the electrostatics and stability of the protein.

Janine has thrived in the department's "small, close knit undergraduate environment". Janine's favorite course was Cellular and Molecular Physiology, which is taught by Dr. Richard Cone. "It was the most interesting course I've ever taken", remarks Janine. Dr. Cone's ability to offer a new perspective on mundane details introduced in previous courses gave Janine a new appreciation for science: "many times we take what we read for granted, but Professor Cone's insight connected everyday activities to the fundamentals of biology".

During a gap year before medical school, Janine will be working at the Kennedy Krieger Institute in Baltimore.

**Karun Arora**

Originally from Chandigarh, India, Karun came to Johns Hopkins from Budapest, Hungary. When he first arrived on campus, Karun sought an engineering degree with the plan to enter industry. However, after deciding to pursue a career in medicine, he decided to switch to a major that fulfilled his passion for the science underlying biological phenomena. For his research project, Karun studied tissue engineering in the Department of Biomedical Engineering.

During his time in Biophysics, Karun has especially enjoyed the faculty's passion for teaching undergraduate students. His favorite classes were Bioinformatics and Biophysical Chemistry. These small classes introduced Karun to many interesting scientific concepts that he was previously unfamiliar with.

Outside of the classroom, Karun enjoys lifting weights and playing racquetball. For the past two years, he has been a Resident Advisor and an Organic Chemistry Lab Teaching Assistant. During a gap year before medical school, Karun will be working in a research laboratory.

**Phil Lim**

Phil was born and raised in Memphis, Tennessee. While selecting colleges, Phil hoped to find a school that would allow him to combine his passion for mathematics with his interest in Biology. After learning about the Biophysics major at Hopkins, his choice was obvious: "Biophysics just seemed like the perfect balance". For his research project, Phil studied pancreatic cancer under Dr. James Eshleman at JHMI. There, he has been part of two published papers and currently has a first-author publication submitted for review.

Phil's favorite part of the major is the "down-to-earth and approachable" faculty. His favorite course was Advanced Seminar, which is taught by Dr. Garcia-Moreno. Phil found the discussion based course to be perfectly suited to his personality. "Dr. Garcia-Moreno allows his students to understand that certain scientific statements and illustrations should rarely be taken at their face values", reflects Phil.

Since moving Baltimore, Phil has embraced the city's rich ethnic and social diversity. The experience has allowed him to appreciate different cultures and become comfortable with urban life. Outside of class, Phil enjoys music, athletics and is an active member of his Church.

Phil is currently applying to the Masters in Health Science program at the Johns Hopkins School of Public Health. After finishing this program, he plans to pursue a career in medicine.

**Josh Tabak**

Josh Tabak was born and raised in sunny Los Angeles, CA. At some point in his young life he decided that 72 degree weather year round was exceedingly boring and that he wanted to go to college somewhere that had not only four distinct seasons, but a place that really hit you over the head with its seasons. After doing some light research Josh discovered that this location was beautiful Baltimore, with its

hot humid summers and its bitter winters. When deciding upon a major at Hopkins, Josh was unsure what to pick. He had always been drawn to the natural sciences but beyond that he wasn't sure on which he'd like to focus. In the end he decided on Biophysics, since it seemed the most balanced between different sciences; that and they mentioned the propensity for having free pizza. Also, how could Josh turn down being in a major so enigmatic that nearly no one outside the major knows what it entails?

His first year at Hopkins was filled with the standard battery of courses, and it was his sophomore year that really solidified to Josh that he had made the right decision about Biophysics. Josh enrolled in Bioinformatics, a class that allowed him to work with another of his passions, computers, and was quickly enthralled with all that a terminal window could do for him. Not to mention that it also let him pretend that he was in the classic 80's flick, War Games. Josh continued to take courses in Biophysics that each focused on a new idea, each of which interested Josh based on its unique perspective of the physical world.

Josh has thoroughly enjoyed living in Baltimore these past 4 years. His advice to the freshmen is really not to wait to go out into the city and explore all that it has to offer and imbibe. Next year, Josh intends on working in Biotechnology, a field he is currently pursuing job opportunities in the Boston or Palo Alto areas.

**Diana DeAndrade**

Diana DeAndrade was born in São Paulo, Brazil but currently lives in St. Louis. She chose Johns Hopkins because of her interest in medicine and a desire to do undergraduate research. During her time at Hopkins, she has enjoyed working in Dr. Karen Fleming's laboratory. Diana looks forward to starting medical school in the fall of 2010 at Washington University School of Medicine in St. Louis.

**Alumni Updates**

**Will Chang** (2008) lives in New York City now and is in his first year in the PhD program for Physiology, Biophysics and Systems Biology at Weill Cornell Graduate School. He is currently in his third rotation; all three have been in the department of Computational Biology at Memorial Sloan-Kettering Cancer Center. He says "Computational biology is great fun so far; I am getting to do a lot of the programming and math that I'd always hoped to do more of". **Claudine Jones** (2009), **Geoff Nunns** (2009) and **Leanne Stunkel** (2008) will be starting medical school next year. **Neil Neumann** (2009) plans to enter an MD/PhD program in the fall. **Chris Avedissian** (2008) is a research associate in Washington, DC. *Attn Alumni: Send your updates to Karen.Fleming@JHU.edu.*