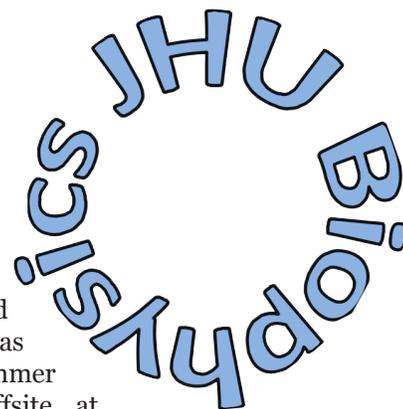


## JHU Department of Biophysics Undergraduate Newsletter



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### SENIOR PROFILES

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The Spring issue each year highlights our graduating seniors. Congratulations to the Biophysics class of 2014!

#### Katia Charov

Katia is a senior from a small town in the woods of central Connecticut called East Haddam. She has been playing volleyball since her mom and brother taught her at age nine and currently plays for the Hopkins women's club team.



Katia chose biophysics because she was miserable studying chemical engineering and wanted a major in which there were more options for electives and a greater degree of freedom in scheduling classes. When she read about the *Protein Engineering* class, she investigated the biophysics major - having never heard of it - and decided to switch at the end of her sophomore year. She stayed for the small class size, approachable professors and tight knit cohort of undergraduates. Her favorite thing about the biophysics major was the relationships students formed with their professors. She attended Hopkins for the research environment and anticipated becoming just another face in a sea of students and never expected to be able to interact with her professors on a more personal level as she has in biophysics.

From biophysics professors she has found open doors and a wealth of advice and encouragement. Her favorite class was *Spectroscopy* with Dr. Juliette Lecomte. Although it was one of the hardest classes she's taken at Hopkins, Katia felt that under Dr. Lecomte's guidance, she challenged herself to dig into the material and, as a result, grow as a student. Also, Katia thinks spectroscopy is super cool and some of it still blows her mind.

Katia has worked in a few different labs on both the Homewood and medical school campuses, as well as having had two summer research experiences offsite at Iowa State University and Pfizer, Inc. in 2011 and 2013, respectively. Her current project is with Dr. Caren Freel Meyers in the JHMI Department of Pharmacology and Molecular Sciences. The Meyers lab focuses on mechanistic studies of bacterial enzymes with respect to inhibitor design, combining Katia's love for organic chemistry with the intrigue of biology. She joined the lab in the fall of 2012 after emailing and meeting with Dr. Meyers, whose research page she found on the JHMI website.

Katia would encourage newcomers to the biophysics major to seek out their professors and fellow students early. Katia's worst classes in biophysics were the ones where she tried to "go it alone", while her best classes were the ones where she worked with other students on problem sets and interacted with the professor as much as possible. She also warns that biophysics classes are not about memorizing information but more about understanding how particular equations and concepts are derived. It is important to understand what assumptions are being made and how those affect the final result.

Katia is taking a gap year between graduation and graduate school. She plans to apply to umbrella PhD programs in chemical biology and synthetic chemistry in the fall and hopes to study something along the lines of drug design but knows that she is easily distracted by cool science and could end up studying something completely different but equally awesome. During her gap year, Katia may continue to do research at a university (at the time of writing she is waiting to hear back from NIH programs to which she has applied). If all else fails, she would be happy to spend the summer as a volleyball camp counselor and the winter as a snowboard instructor.



The T. C. Jenkins Department of Biophysics Undergraduate newsletter is published twice yearly. The articles are predominantly written by current Biophysics majors and alumni. Announcements about the major are included, too. The Newsletter is coordinated by Prof. Karen Fleming, Biophysics Director of Undergraduate Studies. Contact her at [Karen.Fleming@jhu.edu](mailto:Karen.Fleming@jhu.edu) to contribute articles. Previous issues can be found at [http://biophysics.jhu.edu/undergraduate\\_newsletter.html](http://biophysics.jhu.edu/undergraduate_newsletter.html)

## George Alvarez

George Alvarez was born in Uniondale, New York on Long Island. George is an avid football (soccer) player and has seen every match of the FIFA World Cup since France 1998. He is extremely excited to see the upcoming World Cup in Brazil this year.

George originally came to Johns Hopkins intending to major in biology until he attended the biophysics open house in the fall where he was immediately intrigued. At first he was hesitant about becoming a biophysics major, but the loving and caring students and professors won him over. Through trials and tribulations, he one day realized that although the major is difficult, the work and the results were extremely satisfying.

George's favorite thing about biophysics is the camaradery students have in the major. The size of the major and the professors help with this a lot, encouraging working together on assignments and making sure no one falls behind. George asserts that there is no such thing as a favorite class in biophysics. Each and every class had some amazing feature that gave him a newfound sense of wonder, in a variety of subjects. But if he had to pick one... it would be *Advanced Seminar in Virology* taught by Dr. Bertrand Garcia-Moreno because it combines all of the knowledge acquired over the last 7 semesters and applies it in ways that stir the mind and forces you to think outside the box.

In addition to courses, George conducted research under the guidance of Dr. Elijah Roberts using molecular dynamics simulations to simulate activities of hexokinases in different organisms. The project all began with the interest George had to combine both his passion for biophysics and his hobby of playing with technology. It was here where he combined both and to fulfill his degree requirements and learn more.

Baltimore was the perfect combination of city and suburbia for George. Through visiting all the museums and eating all of the food, all within easy reach, George found it to be the ideal location and hopes to return or to continue to live in Baltimore.



George offers this bit of advice for any new students.

*"Make friends not just with your cohort, but also with the upperclassmen, the lowerclassmen, the professors, the teaching assistants and basically everyone. It turns out to be an extremely loving major, so much so that lab meetings become more like dinner with your family, and classes become something that you enjoy going to because you will learn from your peers and might teach them something as well. Everyone reading this is a unique individual and everyone has a story to tell: don't be afraid to tell it, don't be afraid to ask others for it. Communicate thoughts, ideas, stories, and work will seem more fun."*

The future for George is bright, yet uncertain. He is taking two years off and will then attend medical school.

## Karen E. Woods

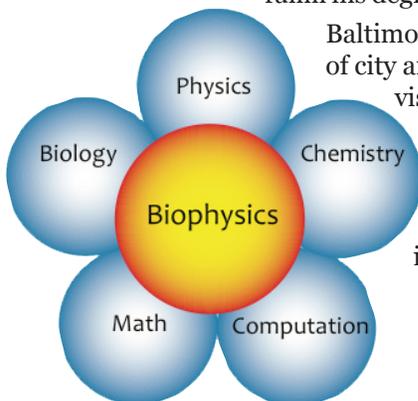
Karen is originally from Schenectady, NY but went to high school in Charleston, SC. Her favorite ice cream flavor is mint chocolate chip and she loves country music.

Karen knew she wanted to be a biophysics major ever since her senior year in high school. Physics was her favorite subject, but she wanted to be a doctor, so it seemed like the best of both worlds. Since being at Hopkins, Karen has been assured that she made the right choice. Karen thinks that Biophysics is the best major ever and that it's just the right mix of difficult and interesting. She loves how she has become close friends with the other undergrad Biophysics majors and how supportive the professors, TAs, and classmates are. Her favorite class was *Cellular and Molecular Physiology* because of how interesting the topics were and how Dr. Cone explained everyday things that normally people don't notice.

Karen's research was in the Mucosal Protection Lab with Dr. Richard Cone where her project was to determine whether vaginal epithelial cells could be used as a reservoir for anti-STI and anti-sperm antibodies. Karen loves research and she believes it has made her experience at Hopkins much fuller.

About Baltimore, Karen loves that the Hopkins campus and the surrounding areas have everything she could ask for. She thinks the urban life mixed with nearby parks makes Hopkins unique.

Karen advises younger students to seek help from classmates or professors whenever they need it; as



everyone in the department is very friendly and approachable!

Next year she will be working toward a master's degree in Physical Chemistry at Mississippi State University. She hopes to go to medical school in the future.

### Daniel Firester

Daniel was born and raised in New York City, moving only once when he was two years old to a building across the street. Upon arriving at Hopkins, Daniel began the typical pre-med route to follow his love of biology and medicine. Yet, after taking his first college physics course, he soon became enthralled by the prospect of applying the techniques and quantitative nature of physics to systems in biology. After a discussion with Karen Fleming, who confirmed that the department would offer just the right balance of disciplines, Daniel joined the biophysics department in the spring of his freshman year. Since then he has also taken up a double major in physics after enjoying the biophysics classes offered in the physics department, namely Dr. Mark Robbins' *Wave Phenomena with Biophysical Applications* and Dr. Robert Leheny's *Biological Physics*.



Biophysics offered Daniel the unique opportunity to explore the molecular mechanisms behind biological processes. As Dr. Richard Cone teaches in his *Cellular and Molecular Physiology* class, asking questions is the foundation of good science, and the field of biophysics asks fundamental questions about what underlies the overarching behavior of cells and organisms. Daniel's favorite classes in the department include Dr. Pat Fleming's *Bioinformatics* (teaching the basis of DNA sequence comparison and protein structure prediction) and Dr. Doug Barrick's *Introduction to Biophysical Chemistry* (teaching the physical chemistry of the cell and practical application to biophysics experiments). If he could give one piece of advice to new biophysics majors, it would be this – learn to love Boltzmann!

Since his sophomore year, Daniel has worked in Dr. Robert Leheny's lab in the physics department studying the rheology (mechanical properties) of unfolded protein at air-water interfaces using ferromagnetic nanowires. He recently submitted his first paper on the topic to *Softmatter*, which is currently under review.

Daniel's favorite parts of Baltimore include Mt. Vernon and Hampden. In particular, he suggests that

all freshmen check out Hampden (it's only a 20 minute walk away from campus!) for their great restaurants and eclectic stores, a piece of advice he wishes someone had given him his first year at Hopkins. He's also an avid bread baker, a passion he discovered after boiling/baking his own bagels to quell the longing for his hometown's specialty.

After graduation, Daniel will be moving back to New York City to attend the PhD program at Rockefeller University.

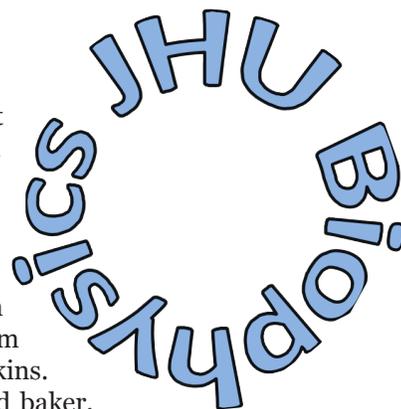
### Brittany Ashe

Brittany is from Walkersville, MD, a small farming town about an hour west of Baltimore. She came to Hopkins planning to be a chemistry major, but soon switched to biophysics after taking the freshmen *Topics in Biophysics* course and her first semester of organic chemistry. Over the next few years, she came to love biophysics more and more through courses like *Cellular and Molecular Physiology* (taught by Dr. Cone) and the *Advanced Seminar* courses (taught by Dr. Greg Bowman and Dr. Karen Fleming). However, the class that really sealed the deal was *Biological Physics* taught by Dr. Leheny. She loved learning about the mathematical descriptions of entropy and diffusion (the basis of everything we learn in biophysics!) and also Dr. Leheny's engaging teaching style.



Brittany insists that the greatest part about the biophysics major is its wonderful students and faculty. She can recount many a night staying up until 4 am, eating pizza and working on problem sets with her fellow biophysics classmates... and actually having fun while doing it! All of the faculty are so kind and willing to listen or advise and genuinely care about their students.

While Brittany will be sad to leave Hopkins and the biophysics department, she's excited to take the upcoming year off to serve with Christian Appalachian Project. She then plans to return to school to pursue either an MD or Ph.D.



## Nick Frame

Nick Frame grew up in Westborough, Massachusetts located 35 minutes outside of Boston. Besides being interested in science, Nick is an avid sports fan of the Boston Red Sox, New England Patriots and Boston Celtics.



After working at UMass Medical School over the summer it became clear that he enjoyed working in a lab setting. Johns Hopkins was his first choice of college and he applied early decision because of the breadth of scientific research that was being conducted.

Nick decided to major in biophysics after attending one of the perspective students' days as a senior in high school. The major brought together his favorite high school subjects; biology chemistry, calculus and physics and gave the opportunity to pursue research in many different fields. Another appeal was the small class sizes gave the opportunity to get to know each of the professors. One of Nick's favorite classes within the program was *Introduction to Biophysical Chemistry* taught by Dr. Doug Barrick. He really enjoyed the quantitative approach of the class and the fact that it tied in with some of the research he has been conducting made it even more intriguing.

Nick's research project was with Dr. Ernesto Freire and Dr. Arne Schon in the department of biology trying to understand the thermodynamics involved with the binding event of the HIV-1 virus to the host cell. He was able to approach Dr. Freire his sophomore year after reading about his research and was excited when he was presented with the opportunity to work on the project. As a member of the lab Nick focused on running Isothermal Titration Calorimetry (ITC) experiments as well as chemical denaturation experiments to try and better characterize these events.

Outside of the classroom, Nick enjoyed life at Johns Hopkins University and living in Baltimore. He played on many intramural teams, was a member of the Spring Fair Committee and was very involved in Sigma Phi Epsilon where he has held the positions of President and Vice President of Finance. He also took advantage of the student nights at Camden Yards to watch the Red Sox for much cheaper than back at home.

Nick's decision to major in bio-

physics was the best one he made as an undergraduate. The faculty and the curriculum has provided him with a strong background and understanding to continue in the field.

Next year Nick is going to continue his education pursuing a Ph.D. in the Biomedical Sciences and is excited for the new research projects that will arise.

## Daniel Lee

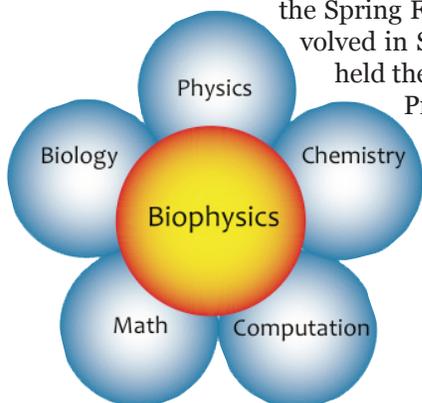
Daniel crossed the country from the small town of Camas, WA to explore all that Baltimore and Hopkins had to offer him. As a nervous little freshman, he started his college career paddling through the rivers of Pennsylvania by participating in the white-water kayaking pre-orientation program.



Over the next four years, he found himself building homes in West Virginia, organizing medical clinics in Honduras, spending a year abroad at Oxford, and falling in love with all of Baltimore's hidden gems.

Biophysics first became a reality for Daniel after taking Dr. PC Huang's *Introduction to Biomedical Research and Careers* course his freshman spring. The seminar series showed him the diverse applications of Biophysics and that it was a field that appealed to his many interests. His favorite courses during his time at JHU included Dr. Cone's *Cellular and Molecular Physiology* and Dr. P. Fleming's *Computational Biology*. He particularly enjoyed these courses because it focused on asking questions (yay questions cards!) and deducing answers through experimental evidence and problem solving skills, rather than pure textbook memorization. Daniel also had the opportunity to study under a different academic structure at the University of Oxford. With Oxford's tutorial system, he was able to work one on one with many professors and researchers to dissect and construct scientific arguments that challenged him to think critically.

Returning home, he enjoyed continuing his involvement with the Hopkins and Baltimore community through Club Swim, Habitat for Humanity, and Global Medical Brigades. He also started an internship with the Henderson-Hopkins Charter School, which motivated him to pursue a path in education next year in DC. Teaching science at a 7-12th grade level, he will be able to implement many of the teaching methods that Biophysics and Oxford has shown him, while also working alongside children and their parents. Afterwards, he plans to apply for medical school and pursue



a path in pediatrics.

To all prospective Biophysics enthusiasts- Get outside of the Hopkins bubble. Baltimore has plenty to offer, whether it's visiting some top-notch museums, Bike Party, or just feasting at all the plentiful and delicious restaurants. Don't be afraid to get out and explore!

### Chris Montoya

Born in El Paso, TX, but raised in Philadelphia, Chris Montoya is a pre-med student and rabid basketball fan. A life-long fan of math, Chris - initially only a biology major - became bored with the lack of numbers in his curricula. He took a *Linear Algebra and Differential Equations* combination class his sophomore spring in order to declare into the math major only to find out that the Department of Biophysics was the only Arts & Sciences major that accepted it. Although unintentional, it was a pleasant switch.

After declaring as a double major in biophysics and biology his junior fall, he became an instant fan of the biophysics department's small class size, familiarity, and focus on quantitative reasoning. Under the direction of Dr. Elijah Roberts, Chris used computer modeling and simulation software to study the dynamics of hexokinases of different species for his research project.

By far his favorite class was Dr. Robert Leheny's *Biological Physics*. Engaging, comprehensive, and just difficult enough to be interesting, he found the course to be a remarkable glimpse at the infinite molecular mechanisms that allow life to thrive.

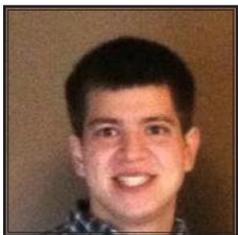
His favorite parts of Baltimore are the small town feel to its neighborhoods and the quiriness each neighborhood brought.

His biggest advice to those considering the major: give it try. The students and staff are always helpful, if there is one thing he learned in college, declaring a major late in your career can be stressful.

Next year Chris will be attending a gap year program either Georgetown or Temple University, with the intention of applying in the 2015 Med School Cycle.

### Alex Polyak

Alex Polyak grew up in sunny Southern California. He still sometimes wonders how he was able to leave the awesome weather, but Johns Hopkins is just as awesome. He enrolled in the Topics class his freshman year for no reason except for that Biophysics sounded



cool and impressive, and soon knew this was the right department to be a part of because of the great faculty and free printing.

Alex has enjoyed the variety of classes he was able to take as a Biophysics major. His favorite class is anything taught by Pat Fleming (he took all three!). He also enjoyed *Biophysical Chemistry* taught by Dr. Barrick because it combined many ideas he had learned in his chemistry classes with more physics.

Alex worked in the lab of Dr. Marc Greenberg for a year after taking his class Organic Chemistry. He now works with Dr. Allan Gottschalk at the medical campus on modeling nerve action potentials. He's happy he got to be involved in two very different research projects and learn about both subjects.

Alex enjoys the food of Baltimore (crab dip is amazing everywhere) and likes to drink Baltimore's own Natural Bohemian in his free time.

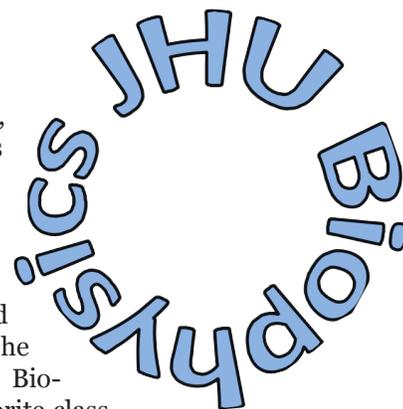
Next year he will be teaching kids with the organization City Year Chicago as he applies to med schools. He thinks anyone who wants to be in the best department at Johns Hopkins should join Biophysics. The faculty are always trying to help you succeed and the classes are just the best.

### Bryan Kohrs

Bryan is from Half Moon Bay, California, a small coastal town near San Francisco. He is a die-hard San Francisco Giants fan and skipped a few days of school during junior year to attend a World Series game back home.

He initially decided to major in biophysics because it sounded interesting from the description, and Bryan ended up loving the smaller feel of the major as well as the opportunity to get to know every professor. Among his favorite things about the major are the Thai food at the end of year party, and of course all the professors. Bryan really enjoyed taking the *Advanced Seminar in Membrane Proteins* with Dr. Karen Fleming because it allowed the students to develop an experimental intuition and critique scientific articles.

Bryan worked at Dr. Herschel Wade's laboratory at the JHMI studying multidrug resistance from sophomore to senior year, and the experience made him



want to pursue a career in science.

His favorite part of living in Baltimore has been the amazing restaurants all around town. His favorite is Alchemy in Hamden and implores everyone to try the pizza from Isabella's in Little Italy.

He would advise underclassmen considering or already in the major to get to know the professors – Biophysics is made special by all of the professors and their love of their students and the subjects they teach. He is currently applying to Biotech jobs in the Baltimore/DC area and plans to end up at a graduate school sometime in the future.

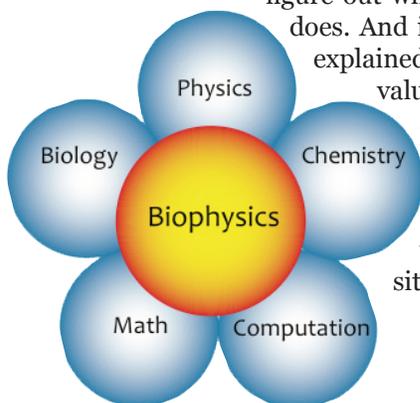
### Mike Yamakawa

Mike is from a northwest suburb of Chicago called Hoffman Estates, where he lives next to the 6th hole of a picturesque golf course. He began his college career at Saint Louis University, but decided to enter Johns Hopkins as a transfer student after his freshman year. He has a younger brother, Sean, who also happens to attend Hopkins, and Sean is a biophysics major, too!



Almost on a whim, Mike chose to join the biophysics crew. He remembers going through the departmental website and finding the cartoon images of proteins to be strangely enlightening. Having learned about but never looked at proteins before, he found biophysics to be something he can use to learn biology through a unique scope.

Although it does not have a reputation as a particularly favored subject in college, *Biochemistry* was among Mike's favorite courses. Not to be mistaken: this is the *Biochemistry* offered by the biophysics department and taught by Dr. Patrick Fleming, an inspiring coding and sailing enthusiast. Dr. Fleming's catch phrase for the class was: "If you don't know what the answer is in this course, it's most likely Free Energy!" Dr. Fleming taught students that biology doesn't just happen. He urged us to look at amino acids, physical features, and general concepts like hydrophobicity to figure out why nature behaves the way it does. And it turns out that a lot can be explained by looking at the free energy values of reactions! Now, after almost two years after taking the course, Mike still looks back at the lecture notes to refresh on some concepts that can be applied to other situations.



Throughout his time here at Hopkins Mike actively advocated for the biophysics department to anyone looking for a new major to pursue. While he appealed to the intellect in Hopkins students, he mainly focused on the excellent camaraderie formed between the teachers and students in biophysics. Not a lot of college students get to say that working on late night problem sets is actually fun.

When he transferred to Hopkins, Mike was immediately able to work in a research lab at the Johns Hopkins medical campus after contacting a few professors via email. To his surprise, he was given his own, independent project despite his lack of research experience. While his freshman courses barely grazed the surface of what macromolecules were, by the first month he was already conducting experiments to determine macromolecular mechanisms. Specifically, his job was to figure out the molecular function of two proteins that confer multidrug resistance to bacteria. After a year of working on his project, he branched out further into investigating the drug resistance of fungal systems at Northwestern University for a summer project.

Beyond the walls of classrooms, Mike has found plenty of other projects to keep him busy. He has designed websites for multiple student organizations, entered business competitions, volunteered at the emergency department, and edited for the school newspaper. He hopes to use every ounce of experience that he has had to make a difference in health care.

Mike is in the process of applying to medical school now and hopes to share his knowledge in biophysics as much as possible for scientific and medical progress.

### Hyunsup Kim

Hyunsup Kim is from Seoul, South Korea and came to the US for the first time only 8 years ago. He really enjoys playing the piano, and he's been taking lessons at Peabody since his freshman year.

Hyunsup chose to major in biophysics because enjoys both biology and physics, and he thought biophysics was a natural major for him since he could study both. His favorite aspect of the major is the small classes because it makes it easier to get to know his classmates and the professors.

His favorite course was Dr. Cone's *Cellular and Molecular Physiology*. It taught him a very interesting and different perspective on biology and how things in our body



work.

His research project involved studying the pathway of various proteins and miRNAs involved in memory and learning in mouse hippocampal neurons, and he started working in this lab after a friend who works in the same lab recommended it to him.

About Baltimore: Hyunsup thought there were a lot of good, hidden restaurants, and he likes exploring new parts of the city.

To students considering biophysics as a major, Hyunsup thought it was important to go to every class and take notes. In addition, he advises not to be afraid at all to go to your professors' office hours and ask for help.

Next fall, Hyunsup is headed to law school.

### Michael Martin

Michael Martin comes from a small town in the northeast corner of Connecticut called Brooklyn. He chose to major in Biophysics because of the small class sizes, close faculty/student interactions, and the multidisciplinary aspect of many of topics covered in the major. Mike's favorite class was definitely *Computational Biology* with Dr. Patrick Fleming. It's a topic he knew little about going into the class, but soon found himself really excited about.

For his undergraduate research experience, Mike studied proteins responsible for erythrocyte egress of *Plasmodium falciparum* in Dr. Jurgen Bosch's lab at the JHMI Bloomberg of Public Health. He was working on finding a crystal structure of one of these proteins.

Mike highly recommends the Biophysics major to prospective students granted they are dedicated, hard working, and passionate about scientific research. Outside of the Hopkins community, his favorite aspect of living in Baltimore has been the diversity of cultures. Despite common perception, there is so much positive energy throughout the city and many people doing great things in art, food, music, and other cultural endeavors. It truly is "charm city."

Next year Mike will be working at a small healthcare consulting firm in Boston, MA called Boston Biomedical Consultants. While consulting may be a slightly unorthodox path for Biophysics majors, he believes that it's a challenging career step which will open up many doors for the future.

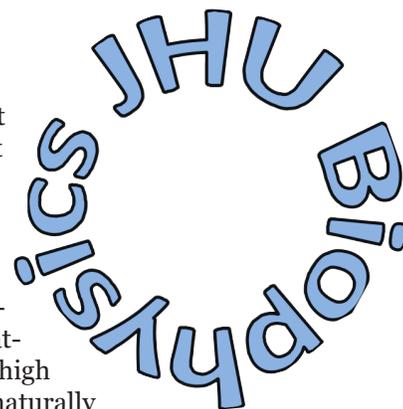
### Sam Chirtel

Sam hails from Springfield, VA. He began his personal investigation of scientific topics at a very young age by attempting to obtain all known information about the giant squid between kindergarten and first grade.

He still maintains that it is the most magnificent animal ever to exist. This obsession developed into a deep fascination with living creatures, which, combined with his discovery of the joys of mathematical modeling through high school physics, led him naturally to an interest in biophysics.

His favorite class in four years of the major was definitely *Molecular Interactions Laboratory* with Dr. Karen Fleming because it allowed him to examine a wide variety of current analytical techniques while focusing on a particular theoretical problem. His research project (also with Dr. Fleming) focused on the thermodynamic implications of mutating a central amino acid residue in the protein OmpW.

After graduating, Sam will be pursuing studies in creative writing, a second love he discovered fairly late in his college career. Nevertheless, he feels that his studies as an undergraduate in biophysics have still prepared him well for this by teaching him how to construct and navigate complex logical structures and, more importantly, how to translate these structures into simple narratives with broad explanatory power.



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### ALUMNI NEWS

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Congratulations to Leanna Owen JHU Biophysics '12 and Joshua Riback JHU Biophysics '13, who were both awarded NSF Predoctoral Fellowships in April 2014. Leanna is a PhD student at Stanford Univ. in Alex Dunn's lab working on mechanosensing. Josh is a PhD student in the University of Chicago Biophysics Program. Gabe Salzmann Biophysics '12 is a classmate of Josh pursuing a joint MD/PhD at the University of Chicago.

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### JHU BIPHI ΦΦ GROUP ON FACEBOOK

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Contact Aravind Krishnan a current junior, to be added to the BiPhi ΦΦ Facebook page, where you can see first hand the fourier transform of a cat.

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### GRADUATION RECEPTION FOR SENIORS & PARENTS

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Wednesday, May 21, 2014 3:30-5:00 PM, UTL Atrium. Biophysics Reception for seniors and their parents. Student accomplishments will be recognized, and awards will be announced.