Brandeis is committed to giving undergraduate students in the sciences opportunities to engage in graduate-level research at the edge of discovery. The Biochemistry major with honors requires students to work on a research project in a lab of a faculty member in any of the life sciences. Performing research in biochemistry is an exciting experience, and all those who are interested should try their hardest to find a lab in which to carry out research. Do not confine your search to Biochemistry faculty, since many faculty in the departments of Biology, Chemistry, and Physics work in life-science areas. And also remember: professors don't bite—they will be glad to talk with you about your hopes for conducting lab research.

The first step in finding a research lab is to read through the websites of life-science faculty to see what type of research might interest you: [www.bio.brandeis.edu/faculty](http://www.bio.brandeis.edu/faculty).

Come up with a list of five or six faculty as possibilities to explore. Not every faculty member will have openings for undergraduates in any given year, so don't put all your eggs in one basket. Before contacting faculty members, make sure that you have a rough idea of the kind of research they do. **The best time to look for a lab is in the early spring of your sophomore year.**

You should contact faculty members about possibilities for joining a research project by sending a well-thought-out email. What should this email include?

First of all, address the recipient as “Dr.” or “Professor” and be sure to get to your point in the first two sentences. Faculty members are busy and don’t want to read a novel. Your entire email should be no more than a paragraph in length. Once you state who you are, your year, and your interest in the lab, it’s time to start to grease the wheels. **Why do you want to work in the lab? Are you particularly interested in the proteins or mechanisms in question? Why? Are you particularly interested in the method of research (x-ray crystallography, bioinformatics, computer modeling, NMR, etc.)? Why?**

Next, talk yourself up! **Why would you make a good member of the lab? What would you bring to the table? What is your past experience? Your drive? Your creativity? What sets you apart from the others? This is a beauty contest—make them want you!** Finally, thank them for their time, and end the letter with a short sign-off. **Never say “Have a nice day,”** Professors don’t want to be told what to do, and that phrase sounds so cheesy to the older generation. Then attach a resumé, proofread your work, and hit the send button.

**“But I don’t have a resumé, nor do I know how to write one!”**

Well, luckily, we have the Hiatt Career Center here on campus with experts and professionals whose only job is to get you a job. Make an appointment and get help! We all need it, and most Brandeis scholarships and jobs you’ll want to apply for will require you to get your resume “Hiatt Approved” anyways.
Make sure to customize each letter to each faculty member. Professors talk to each other, so copying and pasting will not do. Your resumé, though, does not need to be customized; a Hiatt-approved resumé should fit for any lab. You should expect an answer within two weeks of sending the email.

However, faculty members are always busy and often distracted. If you do not get a response, don’t take it personally, but if you are really interested in the position, try visiting them in person. As we said: they don't bite!

Good luck! Remember that the faculty here at Brandeis are not monsters. They enjoy talking to students, and not just about working in their lab, but about life in general; it’s very easy to start a dialogue. Your parents are paying a lot of money for you to have that kind of attention! Also, if you have any questions, do not hesitate to contact any of your UDRs:

- **General Advising**  [biochemistry.udr@gmail.com](mailto:biochemistry.udr@gmail.com)
- Sophie Travis ’13  [btsophie@brandeis.edu](mailto:btsophie@brandeis.edu)
- Jessica Friedman ’13  [jessf13@brandeis.edu](mailto:jessf13@brandeis.edu)
- Padraig Murphy ’14  [padraigm@brandeis.edu](mailto:padraigm@brandeis.edu)

[www.bio.brandeis.edu/undergrad/biochem/](http://www.bio.brandeis.edu/undergrad/biochem/)
Current Undergraduates in Lab:

Nate Shammay and Abby Knecht

Favorite Class to Teach:

“I like all the classes I teach; I don't think I have a favorite. Each has its own challenges and rewards.”

Primary Research Focus:

Uses single-enzyme dynamics to discern enzyme mechanisms that cannot be detected through more traditional static structural studies (such as crystal structures). Research topics include motor proteins, RNA splicing, and transcription.

Laboratory Mission Statement:

“We use single-molecule techniques to discover the mechanisms of complex biochemical processes.”

Philosophy on Undergraduate Education:

“Life is uncertain and you never know where your career and interests will take you. My advice to undergraduates interested in biochemistry is to get as broad an education in mathematics and all the sciences (and in other areas!) as they can.”
Current Undergraduates in Lab:

Olivia Levine, Juhee Park, and Ashleigh Zambada

Favorite Class to Teach:

SG: Research Internship (93a)/other research-intensive mentoring
LP: Neurobiology of Human Disease (NBio 146a)

Primary Research Focus:

The laboratory explores how ion channels operate in health and disease with a focus on the heart and nervous system. Ion channels are protein pores that catalyze the selective flow of ions across membranes with exquisite timing. Ion channels are central to physiology because they orchestrate electrical signals and mediate electrolyte homeostasis; they are important in the clinic as targets for medications. Remarkably, most fundamental questions remain to be answered. What is their architecture? How do inherited variations produce cardiac arrhythmia, seizures, or paralysis? How do drugs act to produce beneficial outcomes or harmful side effects? Our research uses biophysical, genetic and biochemical methods (including single molecule and ensemble electrophysiology, spectroscopy, and microscopy augmented by protein, phage display and other molecular tools). We now pursue these four directions: (1) the normal role and disease-association of potassium channel accessory subunits, (2) K2P background channels, (3) the SUMO ion channel regulatory pathway, and (4) development of new methods and reagents to study ion channels (such as, de novo synthesis of designer neurotoxins).

Laboratory Mission Statement:

Seek answers to important questions. Only use methods that can give you the answer. Challenge your own assumptions. Keep it simple.

Philosophy on Undergraduate Education:

Empower each student to reach their potential and pursue their dreams; engage each student in the effort to improve the world for others.
Current Undergraduates in Lab:

Tuen-Wing (Erin) Fan and Yixuan Liao

Favorite Class to Teach:

BCHM 153b

Primary Research Focus:

Our laboratory uses high-resolution electron microscopy (EM) to study the three-dimensional (3D) structure of proteins and protein complexes. We generally focus on proteins and their assemblies that are difficult to study by more traditional techniques such as X-ray crystallography and nuclear magnetic resonance (NMR).

Laboratory Mission Statement:

The lab seeks to push the boundary in imaging technologies using electron microscopy.

Philosophy on Undergraduate Education:

Undergraduates will have the opportunity to learn a broad range of skills, ranging from protein biochemistry and molecular biology to working with large instruments, such as electron microscopes, and performing advanced data analysis on the computer.
Dorothee Kern
Email: dkern@brandeis.edu
Office Location: Volen 444

Dr. Kern is the Department Chair for Biochemistry

Current Undergraduates in Lab:

Lien Phung and Padraig Murphy

Favorite Class to Teach:

BCHM 102

Primary Research Focus:

Primarily uses nuclear magnetic resonance (NMR) spectroscopy whereupon magnetic frequencies are measured from various elements (often hydrogen). This is performed to discern the movement of enzymes as they catalyze chemical reactions as well as to analyze how proteins convert to and from their active conformations.

Laboratory Mission Statement:

“Do things in life with passion and joy.”

Philosophy on Undergraduate Education:

“For me, undergraduate students, graduate students, postdocs, professors are all scientists. I do not believe in hierarchy, we try to discover how biology works together as a team. One never stops learning.”
Current Undergraduates in Lab:

Lily Ji

Favorite Class to Teach:

Physical Chemistry (CHEM 141 or BCHM 104a,b)

Primary Research Focus:

Studies the generation of cellular electricity through elucidation of the mechanisms regulating the opening and closing of ion channel proteins in order to understand the mechanisms that underpin selectivity for certain ions over another. The main proteins being researched are $K^+$ channels and CLC Cl$^-$/channels.

Laboratory Mission Statement:

“We try to understand how membrane proteins manage to select and move specific molecules across cell membranes.”

Philosophy on Undergraduate Education:

“You've got to keep students (1) interested in what you're trying to teach and (2) working hard to internalize the concepts.”
Dr. Oprian is the Undergraduate Advising Head for Biochemistry

Current Undergraduates in Lab:

Sonya Entova and Andrew Mui

Favorite Class to Teach:

BCHM 100 and BCHM 104a

Primary Research Focus:

Determining the active site structure of the major visual pigments in the human eye and understanding how structural amino acids influence light absorption in order to elucidate the biochemical mechanism of some genetic retinal diseases.

Laboratory Mission Statement:

“My laboratory is trying to understand the molecular mechanisms underlying phototransduction in the vertebrate retina.”

Philosophy on Undergraduate Education:

“I think it is most important that undergraduates gain a very solid and broad based education in the fundamentals of their field. For a Biochemistry major this would mean emphasis on the chemical and physical principles underlying biology.”
Dr. Ringe will be on sabbatical until Spring 2013 but can be reached via email

Current Undergraduates in Lab:

Mehraj Awal, Sarah Azarchi, Tomi Jaiyesimi, Andrew Jung, Christina Klinger, Tom Phan, Sam Kim (joint with the Agar lab), Sophie Travis, Tianchi Tu, and Bren Veziroglu

Favorite Class to Teach:

“I would say Critical Thinking, but I don't get to teach it very often. I also enjoy any chance to teach a liberal arts course (I've taught a few), because it's such a great change of pace.”

Primary Research Focus:

Using x-ray diffraction to analyze protein structure and enzyme mechanisms. Exploring structures of enzymes and enzyme-substrate complexes. Recent publications on Lou Gehrig’s Disease (ALS) and Parkinson's.

Laboratory Mission Statement:

“That's easy: Focus on training and creating an environment in which learning is fun and people develop the confidence that they can learn. Everything else (research accomplishments, publications, etc.) is just the report card on how well you do that.”

Philosophy on Undergraduate Education:

“I'm not a believer in having people memorize facts (though some have to be learned, of course). I try to teach concepts, and then give students opportunities, in tests and problem sets, to apply those concepts to cases they haven't seen before. It's challenging for them, and can be frustrating, but in the end, when it works, they emerge with a confidence that they can never get from regurgitating stuff they will only forget soon afterwards. I also believe it's essential for science students to take lots of courses in the arts, humanities, and social sciences. Most of my success and nearly all of my creativity can be traced to things I learned in those courses, not my science courses. The idea of undergraduate education, especially at a place like Brandeis, should not be to produce specialists (at least not most of the time), but rather to produce broadly-educated people who are best equipped to deal with a rapidly-changing, unpredictable future.”
Current Undergraduates in Lab:

Yonatan Meschede-Krasa

Favorite Class to Teach:

“BCHM103b: ‘Information transfer mechanisms’. This class covers the structure of nucleic acid-proteins, nucleic acid-protein interactions, and the structure and mechanism of the proteins involved in packaging DNA, DNA replication, RNA transcription, RNA processing, and translation. The class integrates use of a 3-D projector to illustrate the structure-function relationship in detail.”

Primary Research Focus:

RNA-protein interactions; eukaryotic RNA processing mechanisms.

Laboratory Mission Statement:

“We are interested in understanding various aspects of eukaryotic gene regulation. Specifically, the mechanism of the pre-mRNA splicing machinery (the spliceosome) and how a cell regulates RNA function when exposed to stress.”

Philosophy on Undergraduate Education:

“The student must bring forth with him/her an open mind and an interest in the subject. The instructor/professor’s role is to assist/guide a student in becoming well grounded in the fundamentals of a subject and to ‘feed his/her fire.’ In a laboratory setting, student and mentor engage in a dialogue, a more personal exchange so as to see to his/her development in the oral, written, and experimental aspects of research. Well rounded intellectually and experienced experimentally, the student will be ready to become independent, to fly on his/her own.”
Current Undergraduates in Lab:

Joe Jacobowitz, Adam Drake, Emily Chen, and Judy Kaufmann

Favorite Class to Teach:

BCHM 104

Primary Research Focus:

Evolution of the structure-function relationship in macromolecules (proteins and nucleic acids). Four main research projects:

1. Ancestral sequence resurrection of malate and lactate dehydrogenases to elucidate both evolutionary and biophysical mechanisms of substrate specificity

2. Biophysical constraints on fold evolution in prokaryotic and eukaryotic rhodopsins

3. Improved bioinformatic/phylogenetic methods for membrane proteins

4. Structural bioinformatics methods for analysis and comparison of macromolecular conformations using Bayesian probability theory. This takes into account molecular evolution, enzymology, kinetics, and structure-function studies. Work also integrates X-ray diffraction of protein crystals for structure determination.

Laboratory Mission Statement:

“We want to acquire a detailed, mechanistic, atomic resolution understanding of how macromolecular structures (and the functions they perform) have evolved.”

Philosophy on Undergraduate Education:

“Give students the ability to be mitigated skeptics. This is something that has to be learned and practiced (or rather, it involves a considerable amount of un-learning). The key is balance, in ascertaining the difference between skepticism and cynicism. In practice, this involves giving my undergrads real research projects—difficult problems/questions that currently have no solution/answer.”