HAMPDEN-SYDNEY COLLEGE

Tiger Tracks

Biochemistry and Molecular Biology

ASBMB
American Society for Biochemistry and Molecular Biology

Hampden-Sydney's biochemistry and molecular biology program is one of 28 nationwide collegiate programs which are provisionally accredited by the American Society for Biochemistry and Molecular Biology (ASBMB), the nation's premier organization for scientists in these fields. The accreditation is recognition of the professional-grade biochemistry and molecular biology education that Hampden-Sydney students receive in these fields, including access to high-quality research experiences.

PREPARING FOR A CAREER IN Biochemistry and Molecular Biology

MINDSET

- Biochemistry and Molecular Biology are exciting developing fields that encompass careers in academic, industrial, and government positions. A career in Biochemistry or Molecular Biology is a career that demands a broad scientific background across several disciplines in the life and physical sciences, including genetics, cell biology, and organic chemistry, among others. To prepare for a career in Biochemistry or Molecular Biology, you will need to develop extensive experience as a scientist…this does not mean just memorizing facts, but rather learning how scientists think and work both independently and collaboratively to solve complex problems.
- Biochemists and Molecular Biologists do not shy away from academic challenges and from tackling problems that require collaboration with experts from other fields. Therefore, you will want to have a strong academic background across the sciences but also the ability to work well -- socially and diplomatically-- and to develop the professional relationships across disciplines that are necessary for scientific success.

COURSES

- Students interested in a career in Biochemistry or Molecular Biology will obviously require a significant amount of coursework drawn from the departments of Chemistry and Biology. While there is no single checklist for a list of courses to take to prepare for a Biochemistry or Molecular Biology-based career, there are several courses that are necessary to provide a foundation for future success. From the Department of Chemistry, students will need at minimum a year of General Chemistry, a year of Organic Chemistry, and a semester of Biochemistry. For a more concentrated study in biochemistry, an additional semester of coursework in this subject as well as a semester of Physical Chemistry is suggested. In Biology, the College's Principles of Biology lecture and lab plus Genetics and Cell Biology are essential courses. Depending on the student's particular interests, additional coursework in Anatomy and Physiology, Molecular and Cell Biology, Developmental Biology, Microbiology, Immunology, or Virology may be selected.
- A successful scientist amoung others can effectively communicate and defend his findings in both written and oral presentation. Therefore, coursework above and beyond the College's requirements in Rhetoric, including Public Speaking, may be considered as solid preparation for a future in Biochemistry or Molecular Biology.

PROGRAMS AND EXTRACURRICULAR ACTIVITIES

- Seek out independent research experience—one of the most important things to do in preparation for a career in Biochemistry and Molecular Biology is to obtain experience conducting independent research. While Hampden-Sydney classwork certainly provides an avenue for this, graduate and professional schools will be looking for independent experiences gained over the summer or during the academic year in addition to classwork.
- Talk to faculty in the Biology and Chemistry departments about developing research projects that can be developed over a long period of time. For instance, a project could be started in the summer between sophomore and junior years and developed throughout a student's junior and senior years, potentially culminating in a thesis paper and presentation. Summer research opportunities are available through both the College's Honors Council and Professional Development Committee, but both require the student to be proactive in making contact with a faculty mentor and developing research proposals during the spring semester.
- Several off-campus opportunities also exist to gain research experience in support of a career in Biochemistry or Molecular Biology. Talk to faculty about how to locate these opportunities and develop applications.

GRADUATE STUDY

The type of graduate study a student would pursue following graduation from Hampden-Sydney depends on the career he wishes to pursue. A student can obtain a laboratory technician position immediately after graduation with his bachelor's degree; however, career advancement in Biochemistry or Molecular Biology fields is difficult without a graduate degree.

Many permanent laboratory scientist positions require a master's degree, which usually requires 2 years of additional study beyond Hampden-Sydney and potentially the generation of a thesis. While group leader positions are often not available to master's level scientists, many stable and well-paying positions that enable one to pursue a fulfilling career in laboratory research are available at this degree level.

Jobs in research and teaching at colleges and universities will require a doctoral degree, which entails 5-6 years of research after Hampden-Sydney and the generation of a dissertation. A doctorate is also required for research group leader positions in the biotechnology and biochemistry industries. In Biochemistry and Molecular Biology disciplines, students do not pay to go to graduate school for a doctoral degree but rather receive tuition grants plus a modest living stipend and health insurance for the duration of their time in training. Increasingly, a doctoral degree is followed by a postdoctoral assistantship of 1-3 years in which newly-minted Ph.D.s further hone their research skills prior to entering a permanent position.

PREPERATION FOR EMPLOYMENT

Many times, a student will not discover a passion for Biochemistry or Molecular Biology until it is too late to gain the necessary experiences in time to enter a graduate program immediately after graduation from Hampden-Sydney. In this case, a common scenario is to take a laboratory technician position or a teaching position in a setting where a masters degree is not necessary. This path provides the necessary time to fully assess one's career interests and to come to a fully informed decision as to what type of graduate degree, if any, is right for them.

There is no reason to be concerned about not having a definite long term plan prepared before graduation from Hampden-Sydney. Graduate school is not something to be entered into lightly since it entails a considerable investment of time as well as a considerable delay in lifetime earning potential. One should pursue a graduate degree in Biochemistry or Molecular Biology only as a means to expand one's skill set and experiences in support of a developing career, not as a "holding tank" to figure out if these fields are interesting. Again, prior research experiences during a Hampden-Sydney education or afterwards in a laboratory setting are the best means of discerning whether graduate school is a good option. Take whatever time is necessary to build those experiences to make a careful decision about what pathway in Biochemistry or Molecular Biology will provide the greatest level of personal satisfaction. Take advantage of the resources available at Hampden-Sydney among faculty and senior students…they can provide invaluable insights on career interests and serve as an informed resource to develop a tailored plan for preparing for a career in Biochemistry or Molecular Biology that best fits one's specific interests.

HAMPDEN-SYDNEY COLLEGE

MAJORS AND MINORS

While it is not in theory necessary to major in Biology or Chemistry to complete the coursework necessary for a career in Biochemistry or Molecular Biology, the course suggestions listed above lend themselves to these two choices. Both departments have utilized the guidelines developed by the American Society for Biochemistry and Molecular Biology (ASBMB) to offer courses to best prepare Hampden-Sydney students for careers in these fields. It is important to mention that a double major in Biology and Chemistry is not advisable. There is no value added to one's resume by completing a double major and the amount of time and work necessary to accomplish this feat has historically hurt a student's academic record more often than helped. The Departments of Biology and Chemistry both offer minors to facilitate students who are interested in concentrating in both disciplines. Seek advice from the faculty of both departments when making your plans for a major and potentially a minor.

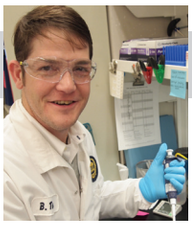
The Department of Chemistry offers a certification from the American Chemical Society (ACS) in Biochemistry upon completion of a specific regimen of coursework and research activities as recommended by the ACS. While this is not a "major" in biochemistry per se and does not appear as such on the Hampden-Sydney transcript, it does provide a nationally recognized standard in Biochemistry that can be used on a student's resume when pursuing graduate school or employment.

While the Department of Biology does not have an equivalent of the ACS-certification program, it has carefully developed a suggested curriculum for students who show a particular interest in Molecular Biology. This curriculum has been proven through the experiences of Hampden-Sydney alumni to be successful in preparing students for post-graduate work in Molecular Biology. See a faculty member in the Department of Biology to get more details on pursuing this curriculum.

ROBERT GEIGER '94

Ph.D., MBA, Vice President of Quality and Co-Founder of AmbioPharm, Inc.

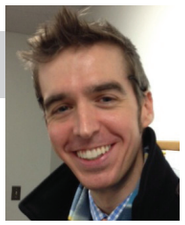
Robert was chemistry major and a member of Phi Gamma Delta fraternity. He attended Georgia Tech and earned a Ph.D. in Analytical Chemistry. After graduate school, Robert joined the biotech industry. In 2007, he and four business partners founded AmbioPharm. AmbioPharm is a contract manufacturing organization that focuses on producing peptide active pharmaceutical ingredients. Robert is responsible for quality assurance and control both in the Company's China and United States facilities.



THOMAS BRYAN TIMS '98

M.S., Senior Scientist for the Commonwealth's Molecular Laboratory

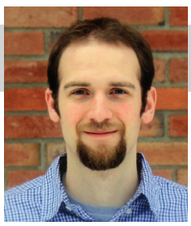
At Hampden-Sydney, Bryan was president of both Omicron Delta Kappa and Alpha Chi Sigma. He was a pre-med student until he took Dr. Anne Lund's Micro class, which inspired him to pursue a research-based career. He decided to attend the University of South Florida, where he earned a M.S. in Microbiology by developing rapid detection methods for food-borne and bio-threat agents. After graduation, he returned to Virginia to work, first as a Scientist, and then as a Senior Scientist for the Commonwealth's Molecular Laboratory. The lab provides rapid testing in support of public health through PCR, sequence-based, and other rapidly emerging technologies on a variety of sample types and pathogens, ranging from bio-threat and food-borne agents to emerging and novel infectious diseases. He credits H-SC for providing him critical thinking skills and the understanding of the fundamentals of biology that he can apply on a daily basis in his current position. He also credits H-SC's dedication to quality instruction and the great professors there for motivating him to seek out a part-time position where he teaches biology and microbiology to students at Reynolds Community College.



ZACH RAMSEY '01

Clinical Pharmacy Specialist in Pediatric Cardiology at The Children's Hospital of Philadelphia

A *magna cum laude* graduate in chemistry, Zach was president of Alpha Chi Sigma fraternity and an active member of Omicron Delta Kappa service honor society and the pre-health society while at Hampden-Sydney. Zach received his doctor of pharmacy degree in 2005 from the Medical College of Virginia and did a residency at the University of Kentucky before obtaining his current position as a Clinical Pharmacy Specialist in Pediatric Cardiology at The Children's Hospital of Philadelphia. He also has faculty appointments at the Nesbitt School at Wilkes University, Wilkes-Barre, PA, and Thomas Jefferson University, Philadelphia, PA. His research focuses on sedation and analgesia of critically-ill pediatric patients, pulmonary hypertension, and pharmacokinetics specifically associated with therapeutic hypothermia. Zach credits the strong framework and background in basic sciences, math, and humanities provided to him at Hampden-Sydney along with the opportunity to do extensive independent research work as factors that have gotten him to where he is today in his profession.



DAVID TAYLOR '10

Candidate for the Genetics, Genomics, and Development Ph.D. at Cornell University, Ithaca, NY

During his time at H-SC, David was president of the Union Philanthropic Society and a member of the Phi Beta Kappa, Chi Beta Phi, and Omicron Delta Kappa academic societies. He graduated *summa cum laude* with a major in biology and minors in chemistry and rhetoric. After graduation he entered the Genetics, Genomics, and Development Ph.D. program at Cornell University studying epigenetics in the mouse model organism. His investigations cover diverse fields of study including how DNA methylation affects gene regulation and what epigenetic effects might result from in vitro fertilization technologies.

KRIS MILLER '13

Research Associate at Synthetic Genomics Vaccines, Inc.

Kris, a brother in Alpha Chi Sigma, graduated *magna cum laude* in biology. In his time at Hampden-Sydney College, he undertook several research projects on the subject of bacteriophage genetics. Following graduation, Kris moved to San Diego, California to pursue a career in the biotechnology industry. At his current position as a Research Associate at Synthetic Genomics Vaccines, Inc., Kris uses genome editing tools to engineer and improve bacteriophage as a treatment for *Pseudomonas aeruginosa* infections, particularly those that are resistant to multiple antibiotics. In his free time, Kris enjoys helping his friend to launch a startup drone company, Inova Drone. The rhetoric and research skills that Kris learned at Hampden-Sydney College allowed him to create a convincing cover letter and appealing résumé to set him apart in a city filled with science graduates.

IF YOU WOULD LIKE TO SPEAK WITH MEN LIKE THESE, PLEASE CONTACT THE CAREER EDUCATION AND VOCATIONAL REFLECTION OFFICE AT (434) 223-6105 OR VISIT WWW.HSC.EDU/CAREER-EDUCATION.HTML