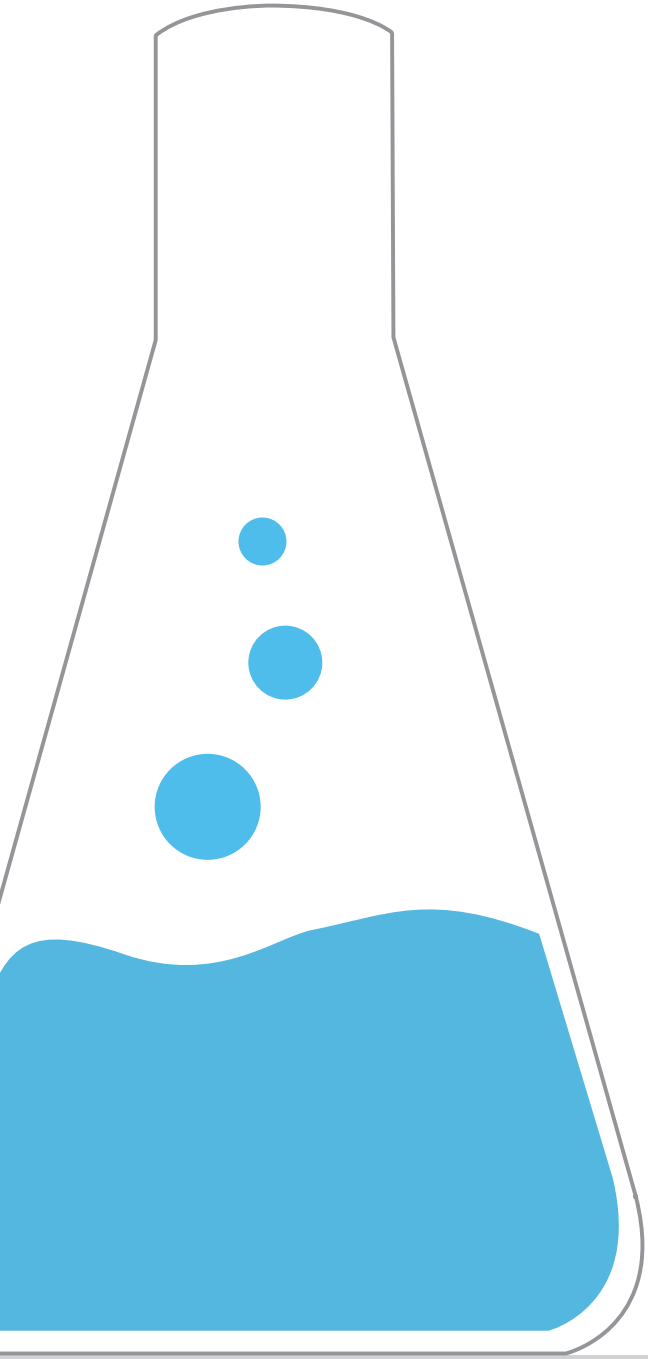

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Biochemists and molecular biologists study life at every level, from individual molecules to ecosystems. Biochemistry is the study of chemical properties of biologically important molecules and of chemical reactions in living organisms. Molecular biology is the study of life at the molecular level, with a focus on understanding how genetic material leads to life. While these two disciplines developed separately, they are now very closely related with overlapping skill sets and career paths.

Biochemists and molecular biologists are interested in the structures and chemical functions of cellular components such as proteins, carbohydrates, lipids, nucleic acids and other biomolecules. They are also interested in interactions among

CA EE IN BIOCHEMI AND MOLEC LA BIOLOG

Dr. Michael Snyder is the fifth of three boys and

C ►►: professor at a primarily undergraduate institution

N : Takita Felder Sumter, Ph.D.

►► ►: B.S. in chemistry from the University of South Carolina

G► ►: Ph.D. in biochemistry from the University of South Carolina

Dr. Takita Sumter's interest in science started in seventh grade when she won the science fair. She said, "I was excited. I don't think I realized I was good at science." The experience encouraged Takita to take more science classes in high school, including chemistry, which she loved and chose as her undergraduate major.

Takita was initially interested in a career in the pharmaceutical industry and completed a postdoctoral fellowship in order to pursue that path after earning her Ph.D. However, after mentoring undergraduates in the lab, she realized she found teaching and working with younger scientists most enjoyable. Today, Takita leads a research team of undergraduates in studying transcription factors, supporting her work with funding from the National Institutes of Health and the National Science Foundation. Takita also teaches several chemistry courses, including biochemistry, and works to improve biochemistry education across the U.S.

Takita recommends that undergraduates pursuing graduate education develop a general career plan before going to graduate school. She said, "If you know what inspires you from the beginning, it will keep you going when times feel more difficult than they should be." Although your plan may change over time, she said, "Getting the Ph.D. will open up so many opportunities that you may never have considered." – Erica Siebrasse

CA EE IN BIOCHEMI AND MOLEC LA BIOLOG

C : industry scientist [4]

N : Saurabh Sen, Ph.D.

: B.S. from the University of Calcutta

G : M.S. from the Indian Institute of Technology, Bombay, and Ph.D. from the University of Helsinki

Dr. Saurabh Sen harnessed his biochemistry training to build a successful career in industry. Saurabh was born and raised in India. After completing a Ph.D. in Finland, he went to the United States to complete postdoctoral research. In graduate school and during part of his postdoctoral training, Saurabh worked with G-protein–coupled receptors (GPCRs). "To transform a GPCR project into a success story is my dream. These receptors are the broadest target in the pharmaceutical industry. More than 50 percent of the currently available prescription drugs target GPCRs, making them the most sought-after drug class," said Saurabh.

His interest in GPCRs led him to Lucigen Corporation. Remarking about his feelings on working in industry, Saurabh said, "One of the things that I love best about working at Lucigen is the chance to participate in innovative and exploratory research projects, marketing efforts and business development. Being a small company, we are a well-built, cohesive family -- all working together to do good science and deliver novel products to the scientific community." He continued, "Coming to work every morning with the challenge of discovering a novel solution for an unsolved scientific problem keeps me on my toes for the whole day." –*ASBMB Today* staff

Dr. David Wilson is director of American Indian Affairs & Policy for the Society for the nonprofit Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS). He grew up in rural New Mexico, nestled in the Navajo Nation Reservation. While David's grades earned him a full ride to major in mechanical engineering, a summer spent chasing and researching butterflies hooked him on biology.

After earning his bachelor's degree, he worked at a startup company. David later applied to the Ph.D. program at Arizona State – and nowhere else. No one in his family had gone to graduate school, he explains, so he didn't know that he should apply to several schools. As a postdoctoral fellow at the National Institutes of Health, David participated in a summer leadership institute offered by SACNAS. "My career came to a crossroads," he explains. "I was wondering whether it was more beneficial for me to be the lone Native American scientist doing elite research at the government or whether it was more important for me to help promote opportunities and share my experiences with upcoming Natives who were going through the same struggles."

He chose the latter, and today David regularly serves on federal and White House roundtables, weighing in on policy matters in the interest of scientists both young and old. David is living proof that skills and knowledge learned in the lab are transferrable. –Angela Hopp4e struggla[illegible]ng a[illegible]e 4[illegible]

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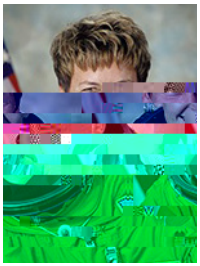

C : astronaut [6]

N : Peggy A. Whitson, Ph.D.

: B.S. in biology and chemistry from Iowa Wesleyan College

G : Ph.D. in biochemistry from Rice University

Dr. Peggy Whitson is one of very few U.S. astronauts with biochemistry or molecular biology backgrounds. She grew up in a small farming town in southern Iowa, and, like many others, she watched awestruck on July 21, 1969, as humans first walked on the moon. "I wanted to be an astronaut from a very young age," Peggy recalls. The January before Peggy graduated from high school, NASA selected the first female astronauts, including Shannon Lucid, a biochemist.

After finishing her Ph.D. in Houston, Peggy went to work at the nearby Johnson Space Center as a research biochemist. There, she studied urine biochemistry, focusing on the increased risk of forming kidney stones during spaceflight. A potassium citrate therapy she developed is used today as an on-orbit countermeasure in those astronauts with a propensity to form kidney stones.

In 1996, after almost 10 years working at the space center, Peggy's chance came. She was selected as a member of NASA's 16th class of astronauts. Since then, she has been to space several times. Peggy says, "It was a blast for me, because I enjoy being the hands of different investigators and making their experiments work on orbit." –Mollie Rappe

Agricultural scientist

Beer and wine maker

Bio-animator and filmmaker

Bioethicist

Bioinformatician

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Year 1

Fall - Consult with a faculty adviser or career counselor who is familiar with careers in biochemistry and molecular biology to begin developing your personalized career plan.

Fall – If you plan to transfer from a two-year institution to a four-year institution, begin planning early and ensure your credits will transfer.

Complete introductory courses in biology, chemistry and math.

Explore extracurricular science activities, such as the ASBMB Student Chapters program.[12] If a Student Chapter is not available on your campus, consider starting one.

Begin looking for and applying to science-specific scholarships and awards.

Year 2

Fall - Meet with your adviser to continue developing your career plan.

Fall - Explore options for starting independent undergraduate research, either through an on-campus internship or at an external research institution. The ASBMB has a national database of research opportunities.[13]

Spring - Decide on a major. Many institutions have interdisciplinary "biochemistry and molecular biology" majors. However, majors in chemistry or biology also can provide a solid foundation.

Continue introductory courses from year one. Also consider completing physics coursework.

Get involved in science-related extracurricular activities on your campus or in the local community.

Apply for science-specific scholarships and awards.

Consider doing internships, shadowing experiences and informational interviews to explore your career options. (see "Resources" section on page 18)

If you will be transferring to a four-year institution in the fall, complete any necessary paperwork.

Year 3

Fall - Meet with your faculty adviser to finalize your career plan.

Fall - Begin or continue conducting independent undergraduate research. Discuss the possibility of attending a scientific meeting and presenting a poster with your research adviser. The ASBMB annual meeting has a poster competition exclusively for undergraduate research.[14]

Begin taking advanced courses in biochemistry and molecular biology. Complete physics coursework if not already done.

Complete internships, shadowing experiences and informational interviews as desired. (see “Resources” section on page 18)

Decide if you will apply for graduate or professional school. If so, begin developing a competitive application packet. (see “Graduate training” section on page 14)

Begin studying for the Graduate Record Exam (GRE) or other required standardized tests, depending on your career plans.

Consider taking electives to strengthen writing and public speaking skills and learn general business skills.

Year 4

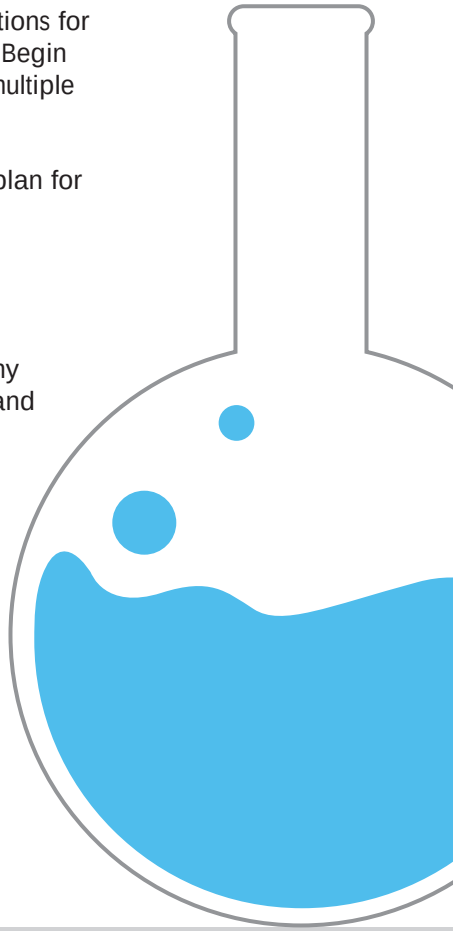
Summer / fall – Complete applications for graduate or professional school. Begin early and solicit feedback from multiple advisers and / or mentors.

Fall – Meet with your adviser to plan for your final year of college.

Spring – Begin submitting job applications.

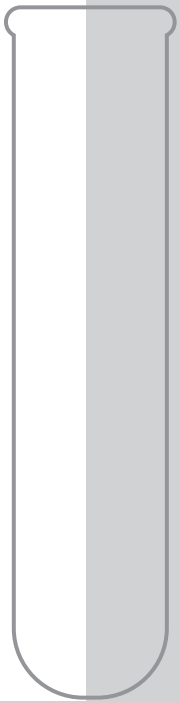
Finish major requirements and any elective advanced biochemistry and molecular biology coursework.

Complete your undergraduate research experience and present results at a local, regional or national scientific meeting.



After the qualifying exam, students assemble their thesis committees, groups of experts in their fields, and propose their dissertation research. Over the next several years, students will continue their dissertation research, which culminates in written dissertations and oral defenses. A complete dissertation represents original research leading to significant new scientific information. The average time to completion of a biological sciences Ph.D. in the U.S. is 6.7 years.[16]

Some students choose to pursue professional studies such as medical, veterinary, law or dental degrees. In addition, joint programs, such as an M.D./Ph.D., are available. For more information on these paths, please see the "Resources" section on page 18.



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After completing a Ph.D., 70% of graduates pursue postdoctoral training before they seek permanent jobs. [17] Postdoctoral training typically is required when a scientist wishes to lead his or her own independent research lab at a university or in industry. This type of training does not lead to a formal degree and requires no coursework. Postdoctoral positions are full time, and the typical starting salary was $47,484 per year in 2016. [18] Postdoctoral positions vary in length; however, they are generally capped at five years at any one institution.

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A biochemist's or molecular biologist's education is never complete. There are constantly new scientific discoveries to learn about and new skills to master. Professional societies offer a number of benefits, including professional and career-development resources that are helpful to scientists at all career stages. For biochemists and molecular biologists, the American Society for Biochemistry and Molecular Biology is of particular relevance.

For undergraduates, including students interested in health professions, there are a number of benefits to joining a professional society such as the ASBMB:

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As a member of the ASBMB, undergraduates are part of an organization of nearly 12,000 biochemists and molecular biologists. ASBMB meetings bring undergraduate scientists together with more experienced researchers. In addition, through the Student Chapters program, [19] undergraduates meet other students interested in biochemistry and molecular biology careers.

The ASBMB hosts an extensive job board [20] and research internship database. [21] In addition, the ASBMB Careers Blog [22] profiles different biochemistry and molecular biology careers.

The ASBMB funds numerous awards and scholarships for undergraduate students. There are also special awards available to fund undergraduates' travel to ASBMB meetings. While many of these awards

For additional information about careers in biochemistry and molecular biology, visit the ASBMB website (. .). You also

ABOUT THE AMERICAN SOCIETY FOR BIOCHEMISTRY AND MOLECULAR BIOLOGY

The American Society for Biochemistry and Molecular Biology (ASBMB) is a nonprofit scientific and educational organization with nearly 12,000 members.

Founded in 1906, the society is based in Rockville, Md. The society's purpose is to advance the science of biochemistry and molecular biology through publication of scientific journals; organization of scientific meetings; advocacy for funding of basic research and education; support of science education at all levels; and promotion of the diversity of individuals entering the scientific workforce.