

COLLEGE OF COMPUTER, MATHEMATICAL, AND NATURAL SCIENCES

UNDERGRADUATE MAJORS

CMNS MAJORS

Astronomy
Atmospheric and Oceanic Science
Biological Sciences
Chemistry & Biochemistry
Computer Science
Environmental Science and Policy
Geology
Immersive Media Design
Mathematics
Neuroscience
Physics

cmns.umd.edu

If you have questions about the admissions process or would like to set up a visit, please contact **Eden Garosi**, Coordinator of Undergraduate Admissions Counseling and Recruitment, at egarosi@umd.edu.

The College of Computer, Mathematical, and Natural Sciences offers rich and diverse undergraduate majors that prepare the next generation of problem solvers to tackle increasingly complex challenges across the full range of science. Our curricula provide rigorous course work and hands-on learning through laboratory experiences.

Our students have a wealth of opportunities in faculty research laboratories on campus, or with the wide range of federal laboratories, research institutes, and private companies in the Baltimore-Washington corridor. Our outstanding students graduate well-prepared to enter top graduate programs across the country, professional schools in the health sciences, or employment in federal agencies or the private sector.



UNIVERSITY OF
MARYLAND



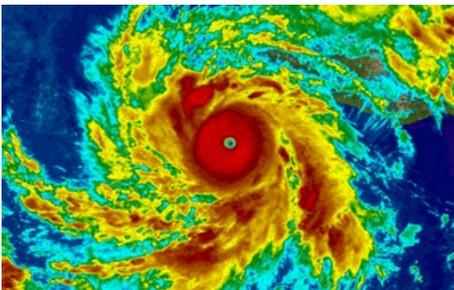
ASTR
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Astronomy (ASTR)

A degree in Astronomy from the University of Maryland can launch you on a successful pursuit of the answers to mysteries humans have pondered for ages.

The Department of Astronomy offers courses leading to a Bachelor of Science degree in Astronomy. Our majors complete a strong program by combining courses in mathematics and physics, in addition to astronomy. Our graduates are well prepared for positions in government or industry laboratories, observatories, firms that provide computational support, and other technical careers. Our top students pursue graduate studies at outstanding universities around the nation.

A variety of astronomical research is done by our faculty and our students have the opportunity to explore these forefront research areas, including the study of exoplanets, black holes, cosmology, stellar evolution, comets, planetary rings in the outer solar system, star formation, and galaxy structure. In addition, NASA's Goddard Space Flight Center is located 15 minutes from campus and many of our students are awarded internships there and at other national facilities. Students also have the opportunity to carry out research for course credit.



AOSC
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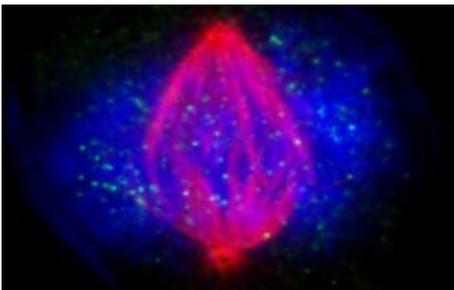
Atmospheric and Oceanic Science (AOSC)

By earning a degree in Atmospheric and Oceanic Science, you'll learn about some of the most complex environmental problems faced by modern society from one of the top programs in the country.

Our major emphasizes a solid background in the fundamentals of meteorology and oceanography. You will explore the science of global warming, severe storms, hurricanes, air pollution, the ozone hole, weather predictability, and many other phenomena. With a strong background in science and mathematics from our program, our graduates have gone on to such diverse jobs as government researchers at NASA and NOAA, forecasters for private companies and the government, as disaster risk consultants for an insurance company, and as forecasters on the evening news.

As a capstone to the major, you complete a senior thesis, performing original research on your chosen topic with some of the top researchers in the world. You can take advantage of the vibrant research community in the Washington, D.C. area to work with world class researchers at Maryland and in nearby laboratories and institutions to develop ties to potential future colleagues and employers.

The department also offers a master of professional studies degree, which builds on the undergraduate program, allowing you to earn a master's and a bachelor's degree in only five years.



BSCI
bsci.umd.edu

Biological Sciences (BSCI)

A bachelor's degree in the Biological Sciences will provide you with broad training in the discipline from which you can pursue a career, or advanced study in graduate or professional schools. The Biological Sciences major has a common framework of introductory and supporting course work and allows for specialization in one of five areas which provide a more focused set of advanced program courses. Courses, academic advising, and oversight of the Biological Sciences majors and curricula is provided by the faculty members of three academic departments: the Department of Biology, the Department of Cell Biology & Molecular Genetics, and the Department of Entomology.

All Biological Sciences majors complete a 3-course introductory sequence (Cell/Molecular Biology, Ecology/Evolutionary Biology, and Organismal Diversity) as well as Genetics. In the introductory courses, you will gain a strong foundation in biology in the context of modern topics and techniques. You will clone genes, characterize enzymes, and use computers to simulate the effects of environmental stress on the population growth of organisms.

In more advanced courses, you will explore cutting-edge topics and learn modern research approaches to current scientific questions. Opportunities to do independent scientific research under the mentorship of a faculty member will further increase your exposure to biological sciences.

Your comprehension of biology will be enhanced by supporting coursework, including a 1-credit freshman orientation seminar, 2 semesters of Calculus, 4 semesters of Chemistry, and 2 semesters of Physics.

A brief overview of the Specialization Areas of the Biological Sciences major:

Cell Biology and Genetics (CEBG)

Common molecular and cellular processes support all life. The Cell Biology and Genetics specialization allows you to explore these processes and gain a deeper understanding of both the unity and diversity of animals, plants, and microbes. By choosing this area of study, you will delve deeply into cellular structures and functions, and come to understand the detailed mechanisms of heredity and gene



CEBG
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expression. This specialization will prepare students for graduate study in a wide variety of modern fields, as well as for further study and careers in medicine, dentistry, forensic science, genetic counseling, or work in the biotechnology industry.

The CEBG specialization includes required course work in Cell Biology and Physiology, Molecular Genetics, and Biochemistry. Options include courses such as Microbial Pathogenesis, Immunology, Biology of Cancer, Virology, Microbial Physiology, and Biology of the Human Genome.



ECEV
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Ecology and Evolution (ECEV)

Biological organisms, including humans, are connected to each other and to their environment by complex interactions. They come to these interactions through their evolutionary history. The Ecology and Evolution specialization allows students to study complex biological systems, focusing on the evolutionary adaptations that allow organisms to fill specific environmental niches. This specialization will prepare you for graduate study, basic and applied research, and careers in areas such as conservation, environmental biology, veterinary medicine, employment in zoos, or work in science policy.

The ECEV specialization includes required coursework in Ecology, Evolution, and Statistics. Options include courses such as Mammalogy, Animal Behavior, Biology of Extinct Animals, Natural History of the Chesapeake Bay, Microbial Ecology, Molecular Evolution, and Marine Ecology.



GENB
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General Biology (GENB)

The General Biology specialization provides a strong but flexible curriculum for students with either broader or more specific interests than those covered by other areas of specialization. You will take courses across the biological levels of organization, but within those constraints you may choose to study one taxon or area in greater depth. This specialization will prepare you for graduate study in a broad range of biological fields, secondary school teaching, science writing, professional schools, biology/business-related careers, and basic or applied research.

The GENB specialization includes required coursework in Statistics/Mathematical Biology, and Biochemistry. You will select your advanced courses from three required categories: Genetics & Evolution; Cell Biology, Development, and Physiology; and Ecology, Behavior, and Organismal Biology.



MICB
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Microbiology (MICB)

Microorganisms such as viruses, bacteria, and single-celled eukaryotes are typically unseen but play crucial roles in all of Earth's ecosystems. The Microbiology specialization involves the study of microorganisms, including their distribution and role in the environment, relationship to other living organisms in health and disease, and use in biotechnology. Because of the importance of the study of bacteria and viruses in the biology of health and disease, food safety, host-pathogen interactions, genetic engineering, and the threat of bioterrorism, there are strong job opportunities for students with MICB degrees. This specialization will prepare you for graduate study, professional school, careers in public health, forensic science, biotechnology, and the pharmaceutical industry, and jobs in research labs and government agencies developing public policy or overseeing government regulations.

The MICB specialization includes required coursework in Microbiology and Biochemistry. Options include courses such as Molecular Genetics, Microbial Pathogenesis, Recombinant DNA, Immunology, Bioinformatics, and Epidemiology & Public Health.



PHNB
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Physiology and Neurobiology (PHNB)

The complex biology of animals is supported by physiological and neurobiological processes. The Physiology and Neurobiology specialization provides a foundation in the molecular and cellular processes of life that produce complex body systems, allowing students to study how these processes are organized into systems in whole organisms. This specialization will prepare you for graduate study, medicine, dentistry, allied health fields, and basic or applied research.

The PHNB specialization includes required coursework in Cell Biology, Mammalian Physiology, Principles of Neuroscience, and Biochemistry. Options include courses such as Biology of Vision, Biology of the Human Genome, Biology of Cancer, Endocrinology, and Diseases of the Nervous System.

Chemistry & Biochemistry (CHEM/BCHM)

All Chemistry and Biochemistry majors complete the four semester majors-only Introductory Chemistry sequence, an introductory Biology (BSCI) course, advanced versions of Calculus I and II (with Calculus III recommended), and calculus-based Physics I and II. Both majors also take Instrumental Methods of Analysis, Physical Chemistry I and lab, and a Professional Issues course.

The upper-level major requirements reflect the differences between the two subjects. Biochemistry has an emphasis on biological sciences, and less emphasis in some areas less relevant to



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ENSP
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living systems than does the Chemistry major. Specific course differences are the inclusion of two extra BSCI courses, and a four-course biochemistry sequence (three lecture courses, and Biochemistry Laboratory) into the Biochemistry curriculum. Biochemistry majors do not have to take Advanced Inorganic Chemistry and Physical Chemistry Laboratory II, both of which are required for Chemistry majors. Finally, Biochemistry majors have the suggested option of replacing Physical Chemistry II with Biophysical Chemistry.

Students completing their degrees in chemistry or biochemistry pursue advanced degrees in chemical or biochemical sciences, medicine, dentistry, business, and law. Others elect to pursue employment in government or private laboratories, and education.

Computer Science (CMSC)

A degree in Computer Science from the University of Maryland will help students acquire the knowledge, skills, and attitude to succeed in the exciting field of computing. The Department of Computer Science offers a Bachelor of Science degree. Computer Science also offers a program that allows undergraduate students to earn B.S. and M.S. degrees in five years. The department provides mentoring, assistance with the development of academic plans, and guidance about research and internship opportunities to help students succeed in the field of computer science.

Students receive a foundation in the computing discipline and can structure their curriculum to reflect individual interests and specializations. The department offers a wealth of courses that allows students to explore the field of computing. These courses include: Introduction to Computer Systems, Object-Oriented Programming, Computer and Network Security, Computer Graphics, Introduction to Artificial Intelligence, Introduction to Machine Learning, Introduction to Human Computer Interaction, and Software Engineering. Computer Science undergraduates are also actively involved in research. A research focus not only integrates content from many courses, it teaches practical problem solving and communication skills necessary to work as a computing professional, whether entering industry or academia following graduation. Additionally, students can pursue degree specializations in Cybersecurity, Data Science, or Machine Learning:

Cybersecurity (CMSC)

The Cybersecurity specialization allows students to have the necessary background to address a wide range of cybersecurity issues that are relevant to government, industry, and academic careers. Students who are interested in pursuing the Cybersecurity specialization will take foundational courses in Computer Science and also complete a set of upper-level courses in topics such as Computer and Network Security, Operating Systems Security, and Cryptography.

Data Science (CMSC)

The Data Science specialization enables students to acquire broad range of skills needed to be a successful data scientist. Data Science is an emerging field encapsulating interdisciplinary activities used to create data-centric products, applications or programs that address specific scientific, socio-political, or business questions. The Data Science specialization includes courses from a variety of fields in Computer Science, mainly Machine Learning, Statistics, Database Design, Systems, Algorithms, and Visualization.

Machine Learning (CMSC)

The Machine Learning specialization enables students to acquire a broad range of knowledge in the concepts of machine learning, deep learning, and artificial intelligence. Machine Learning is an aspect of artificial intelligence in which computers use algorithms to improve their learning. The Machine Learning specialization includes courses from a variety of fields in Computer Science, mainly Artificial Intelligence, Algorithms, Deep Learning, and Robotics.

Environmental Science and Policy (ENSP)

Environmental Science and Policy (ENSP) is a broad, multidisciplinary undergraduate major, drawing courses and faculty from 20 departments and three Colleges. A Bachelor of Science degree in Environmental Science and Policy offers you courses from an array of disciplines, and requires you to select an area of concentration. All ENSP majors take the same introductory courses including Environmental Science, Environmental Policy, Calculus I, Statistics, Ecology/Evolutionary Biology, General Chemistry I, Geography of Environmental Systems, and two additional courses in Geography, Economics, or Environmental Politics.

ENSP concentrations offered by CMNS:

Biodiversity & Conservation (BIOD)

Biodiversity is invaluable to the process of evolution since it represents the pool of resources from which evolution can select; it is the key to adaptation to changes, since the greater the biodiversity, the more resilient an ecosystem will be following natural disasters or human intrusions. This concentration provides a background in the biological principles that influence the diversity of life, especially those that create and those that reduce diversity.

Environmental Geosciences and Restoration (ENSP)

Environmental Geosciences and Restoration reflects the national trend toward the increasing prominence of environmental geosciences, including life sciences and biogeochemistry. It integrates Earth and life sciences to a much greater degree than any current ENSP concentration; and links the emerging discipline of environmental restoration with core sciences so that students are well-prepared for graduate programs and employment.



GEOL
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Geology (GEOL)

Geology majors at the University of Maryland study the physical, chemical, and historical aspects of planet Earth.

Geology offers a broad range of undergraduate courses to accommodate students with interests as diverse as Environmental Sciences, Geophysics, Geochemistry, Planetary Sciences, and Paleontology. There are three major tracks: The Professional Track prepares students for careers in the broad range of geological sciences; the Secondary Education Track prepares students for careers in secondary education; the Geophysics Track offers training in quantitative applications of the methods of physics to geologic questions, including seismology and remote sensing. Geology offers eight distinct minors, a departmental honors program, and a combined B.S./M.S. program where students can telescope their Geology B.S. and M.S. degrees.

Its undergraduate program focuses on mentoring relationships between undergraduates and faculty researchers, culminating in a two-semester Senior Research Thesis. With an undergraduate enrollment of approximately 60 students and 26 resident faculty members, the department offers excellent faculty-student interaction and small class sizes.

The Geology major features field work and outdoor activity. Many courses involve field-related projects or field trips to areas of interest. Geology students have performed field work in Brazil, Siberia, and the rift valley of East Africa. Geology Professional and Secondary-Ed track majors also complete a 5-6 week summer field camp.



IMDM
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Immersive Media Design (IMDM)

A new and nationally unique major, the interdisciplinary Immersive Media Design major (IMDM) prepares students to work and succeed in emerging areas of digital media. Immersive media surrounds the viewer with interactive sight, sound and other sensory modalities, creating an immediate and engaging experience. Technologies for immersive digital media include virtual and augmented reality, large scale projection, immersive domes, video and audio installations, AI-guided media creation, and others still being invented. Effective design of these experiences requires practitioners who can bridge the technology with the artistic. IMDM combines coursework in computer science and art, along with a special sequence of courses in immersive media, so students both master and apply the required skills.

Studio laboratory courses in each year of the major give students opportunities to design and create new works and add to their portfolios. These technologies are driving new opportunities in entertainment, film, games, education, scientific simulation, and other fields. As a joint major between the department of Computer Science and the department of Art, the program combines coursework in both departments. The program has two tracks, one offered as a Bachelor's of Science (B.S.) through the College of Computer, Mathematical and Natural Sciences, and one offered as Bachelor's of Arts (B.A.) through the College of Arts and Humanities. Those pursuing the B.S. through CMNS will take courses in the rigorous and nationally ranked Computer Science department with the intent of mastering the science and practice of this exciting field. They will also take courses in Art to learn the fundamentals of aesthetics and design, and the core sequence of IMDM courses where students from both tracks collaborate on significant works.

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MATH
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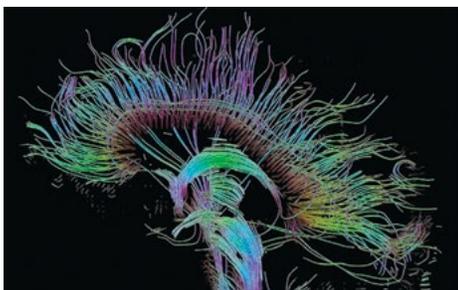
Mathematics (MATH)

The Department of Mathematics educates students in a broad range of modern theoretical and applied mathematics and statistics. Students that major in Math develop problem-solving skills that can be broadly applied within mathematics and to other disciplines.

The Department of Mathematics offers a variety of courses on classical and contemporary topics, including geometry and topology, number theory and cryptology, analysis and algebra, chaos theory, mathematical finance, probability and data sciences. The program prepares students for diverse career options in government, industry, education, and academia.

The Mathematics major includes tracks in applied mathematics, statistics, and secondary education. The department also offers a combined degree program, through which students can earn a Bachelor of Science in Mathematics and a Master of Arts in Mathematics or Statistics in five years. The department offers many student opportunities which include the Mathematics department honors program, the Math Club, Pi Mu Epsilon Honor Society, math competitions, Undergraduate Teaching Assistantship Program, and research opportunities for undergraduates.

Students obtaining a degree in mathematics at the University of Maryland have gone on to work for renowned companies and government agencies, including Microsoft, Boeing, Google, Northrop Grumman, Bloomberg, the National Security Agency, NASA, the Census Bureau, and the Federal Reserve. Students have also gone on to pursue graduate studies in mathematics at outstanding institutions around the world.



NEUR
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Neuroscience (NEUR)

As a Neuroscience major you will experience rigorous training in the interdisciplinary study of brain and behavior. This new major branches the Biology and Psychology departments and is rooted in the rich, active neuroscience community on campus. You will complete a required set of Neuroscience courses as well as a supporting sequence of coursework in mathematics, biology, chemistry, physics, and psychology. You then will then choose an upper-level specialization and coursework in (1) cellular, molecular, and physiological neuroscience or (2) behavioral and cognitive neuroscience.

In your courses, you will address how the cells and synapses of a nervous system provide perception of the world, plan and control movement, and create complex behaviors, memories, emotions, and thoughts. You will be exposed to current techniques and strategies in neuroscience research and learn skills to critically evaluate such research. Your upper-level course work pulls the best neuroscience-related courses from across campus, and allows you to take a deeper dive in the questions that most excite you. You have further opportunity enhance your experience by completing independent research under the mentorship of a faculty member.

The Neuroscience major will prepare you for a broad range of career paths including scientific research, medicine, clinical psychology, allied health professions, or science-related government, nonprofit, or private sector employment.



PHYS
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Physics (PHYS)

There are many advantages to studying physics at Maryland, such as small class-sizes, outstanding teachers, and very talented classmates. The Physics department provides a separate track of physics courses taught entirely by our faculty even at the introductory level! However, we believe that the most important physics education occurs outside the classroom, and we encourage all of our majors to participate in cutting-edge research with our internationally recognized faculty in areas such as Atomic, Molecular and Optical Physics, High Energy Physics, Quantum Computation, Condensed Matter Physics, Non-Linear Dynamics, Biophysics, Plasma Physics, and more. Through participation in research projects, you learn what it takes to conduct world-class scientific research and decide whether you have the passion to pursue this career path. Whether you decide to continue to study physics in graduate school or work in fields such as engineering, software development, law, business, or education, a bachelor's degree in physics from Maryland provides an excellent foundation. Our very talented undergraduates have a passion for physics that helps create a dynamic and collegial atmosphere in which to study, but they have a wide variety of interests and talents in many other areas, including music, sports, art, and theatre.

The Physics department is home to many research centers, labs, and institutes that will allow you to explore the breadth of the field of physics. Such institutes include the Maryland NanoCenter, Maryland Center for Fundamental Physics, Maryland Biophysics Program, East-West Space Science Center, Joint Quantum Institute, and the Institute for Advanced Computer Studies.