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 Cover: Citizen Science, Photo: Chris Kayden
 Inside: Citizen Science, Back cover: Biology class
 Photos: Pete Manney, '93 MFA, '00

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Bard

DIVISION OF SCIENCE, MATHEMATICS, AND COMPUTING

Students in Bard College's programs in science, mathematics, and computing learn the concepts, methods, and practices of biology, chemistry and biochemistry, computer science, mathematics, physics, and psychology. Much science work at Bard is collaborative, involving faculty and students in cutting-edge experimentation that has resulted in students being coauthors on published papers. Courses in complementary areas, such as mind, brain, and behavior; environmental and urban studies; global public health; and science, technology, and society are offered through Interdivisional Programs and Concentrations.

Lab work takes place in the 70,000-square-foot Gabrielle H. Reem and Herbert J. Kayden Center for Science and Computation as well as the Bard College Field Station, whose location on the Hudson River and the mouth of the Saw Kill allows for on-site research and teaching access to freshwater tidal marshes, swamps and shallows, deciduous and coniferous forests, and other habitats.

The College's commitment to scientific literacy is reflected in the innovative Citizen Science program, a two-week intensive that gives all First Year students a core understanding of both the conduct and the content of science, allowing them to grapple with the ever-increasing number of national and global issues influenced by science.

Academically outstanding high school seniors who are committed to majoring in biology, chemistry, physics, computer science, or mathematics can apply for the Distinguished Scientist Scholarship, which covers up to full tuition.

NOTABLE ALUMNI/AE

László Z. Bitó '60 (chemistry), professor emeritus of ocular physiology at Columbia University, conducted research that led to development of a breakthrough drug for the treatment of glaucoma; he received an honorary doctorate of science from Bard in 2007. **Babacar Cisse '03** (chemistry), an award-winning neurosurgeon at Weill Cornell Brain and Spine Center, conducts research on how brain tumors develop and become malignant. **Megan Kerins '06** (physics) founded Solar Stewards, a solar-energy consulting company that concentrates on emerging economies. **Brianna Norton '00** (chemistry) is a physician focused on treatment for hepatitis C and opioid dependence. She earned an NIH grant and the 2021 John and Samuel Bard Award in Medicine and Science. **Tatiana Prowell '94** (languages and literature) is breast cancer scientific liaison in the Office of Hematology and Oncology Products at the U.S. Food and Drug Administration (FDA) and professor of oncology at Johns Hopkins. She received the 2019 John and Samuel Bard Award in Medicine and Science. **Mariana Raykova '06** (mathematics and computer science) is a research scientist at Google; she received the 2017 John and Samuel Bard Award in Medicine and Science. **Eduardo Rozo '00** (physics) is a professor of experimental cosmology at the University of Arizona, utilizing probes to better understand the physics behind the accelerated expansion of the universe. **Karen Saxe '82** (mathematics), who received both an honorary doctor of science degree from Bard and the John and Samuel Bard Award in Medicine and Science, is director of the Government Relations Office of the American Mathematical Society. **Ilyas Washington '96** (chemistry) is cofounder of Alkeus Pharma, a clinical-stage biopharmaceutical company, and cofounder of biOrg3.14, a pharmaceutical company that invents technologies to fight diseases ranging from age-related macular degeneration to diabetes.

NOTABLE FACULTY

Craig Anderson (chemistry and biochemistry), research focuses on synthesis, characterization, and reactivity of heteromultinuclear anticancer metal complexes; winner of Chemical Institute of Canada's Award of Excellence and Society of Chemical Industry Award. **Hal Haggard** (physics), interests include quantum gravity, semiclassical analysis, symmetry and integrable systems; recipient of National Science Foundation research fellowship and visiting fellow at Perimeter Institute for Theoretical Physics in Waterloo, Canada. **Swapan Jain** (chemistry and biochemistry), research centers on structure of nucleic acids, interaction of drugs with DNA and RNA, and RNA regulation. **Felicia Keesing** (biology), investigation of how loss of biological diversity influences tick-borne disease transmission; grants from National Geographic Society, National Science Foundation, National Institutes of Health, EPA; fellow, Ecological Society of America. **Antonios Kontos** (physics), research centers on terrestrial experiments that aid understanding of astrophysical processes; his recent work on precision optomechanical measurements was crucial to the first experimental detection of gravitational waves. **Emily McLaughlin** (chemistry and biochemistry), research interests include synthesis of complex molecules and development of new synthetic methods; recipient of U.S. Department of Education GAANN Fellowship. **Gabriel G. Perron** (biology), focuses on antimicrobials, antibiotic resistance, and genomic DNA; recipient of postdoctoral honors and fellowships. **Bruce Robertson** (biology/environmental and urban studies), research includes understanding the impacts of human activities on biodiversity, animal behavior, and species interactions; research grants from California Energy Commission and U.S. Geological Survey.

BIOLOGY

The Bard College Biology Program offers courses and research opportunities in the most exciting areas of biology research today—biodiversity, neuroscience, infectious diseases, conservation, evolution, and more. Our program prepares all students to be critical thinkers in the world of science, and gives them hands-on experience in designing and conducting biological research. About 80 percent of graduates are involved in science or math as graduate students, health professionals, teachers, writers, or researchers. Bard students have had a 78 percent acceptance rate to graduate programs in medicine (the national average is 50 percent). Their scores on the MCAT are in the 96th percentile or above.

Resources in the Reem-Kayden Center for Science and Computation include a confocal microscope, DNA and protein electrophoresis instruments, a digital gel-imaging system, standard PCR machines and two Real-Time PCR machines, two fluorescence microscopes, and ecology field equipment.

RECENT SENIOR PROJECTS

- “**The effect of E-cadherin knockdown is essential to mantle cell survival**” Saleem Alhumaidi '20, Hudson, New York (concentration: Middle Eastern Studies)
- “**Diversity and human influence in the nest microbiome**” Zayd Yusuf Normand '20, Bangkok, Thailand (Biology; Historical Studies)
- “**The effects of cannabidiol on the microbiome of larval zebrafish**” Maracela Talamantes '20, El Cajon, California (concentration: Global Public Health)

CHEMISTRY AND BIOCHEMISTRY

The Chemistry and Biochemistry Program at Bard provides an experience that is designed primarily, but not exclusively, for students planning to pursue graduate work in chemistry, biochemistry, engineering, and related fields. Within our state-of-the-art facilities, students gain extensive hands-on experience with contemporary instrumentation and experimental techniques. Laboratory courses are small (typically no more than 15 students per section), which allows for individual use of research-grade instrumentation. The instruments include a 400-MHz NMR; GC/MS; LC/MS; HPLC; UV/Vis, Raman, and FTIR spectrophotometers; an inert atmosphere glovebox; and an ultrafast Ti:sapphire laser incorporated into two-photon microscope and direct-laser-writing setups.

In addition to the program's core coursework, students have the opportunity to become involved in faculty-led research at early stages of their undergraduate careers. In the last five years, faculty in the Chemistry and Biochemistry Program have published 15 papers, which include more than 50 Bard undergraduate coauthorships. Recent alumni/ae have pursued graduate studies and/or obtained employment in academia, science editing, industry, and medicine.

RECENT SENIOR PROJECTS

- “**Ir catalyzed [2 + 2] cycloaddition of vinylogous amide through energy transfer**” Lovanee Modely Cunden '20, Curepipe, Mauritius
- “**Development of a CRISPR-SpyCas9 in-vitro cleavage assay**” Adam Ahmed Fallah '20, Covington, Georgia (concentration: Mind, Brain, and Behavior)
- “**Developing a high-throughput LacZ reporter gene assay to evaluate activation of the xpt-pbuX guanine riboswitch by analogue ligands**” Silvie Hannah Lundgren '20, Kingston, New York (Chemistry and Biochemistry; Russian and Eurasian Studies)

COMPUTER SCIENCE

The Computer Science Program at Bard offers courses on the fundamentals and applications of computers and algorithms. Thinking computationally—formally representing information and the procedures to manipulate that information (i.e., algorithms)—results in a unique and powerful lens through which to view the world. The program focuses on the foundations of computer science and introduces students to multiple programming languages and paradigms. It offers broad coverage of theoretical, applied, and systems-oriented topics, including the effects of computing on society. The computer science space includes a cognitive systems lab and a robotics lab.

At Bard's Laboratory for Algebraic and Symbolic Computation, Bard faculty, students, and staff work together to produce new theorems and algorithms, solve intricate problems with metadata design, and develop websites that integrate several complex software systems. The goal is to extend the capabilities of existing theorem provers, model searchers, and computer algebra systems through improved connectivity and knowledge management. Current domains of interest include universal algebra and the constraint satisfaction problem.

RECENT SENIOR PROJECTS

- “**Rhythm Quest: Creating a Music Video Game**” Tanner Daniel Cohan '20, Columbia, Maryland (Computer Science; Music)
- “**Predicting Imports in Java Code with Graph Neural Networks**” Aleksandr Fedchin '20, St. Petersburg, Russia (Computer Science; Classical Studies)
- “**A Computational Method for the Image Segmentation of Pigmented Skin Lesions**” Kaila Mollie Piscitelli '20, West Hartford, Connecticut (Computer Science; Cello Performance BMus, Bard College Conservatory of Music)

MATHEMATICS

The Bard Mathematics Program has three main functions: to offer students the opportunity to study the primary areas of contemporary mathematics; to provide physical and social science majors with the necessary mathematical tools for work in their disciplines; and to introduce all students to serious and interesting mathematical ideas and their applications. For mathematics majors, the program combines high academic standards and individual attention, both in the availability of faculty members for discussion and options for tutorials, independent study, and individualized Senior Projects.

The Bard Math Circle is a mathematical enrichment program for middle and elementary school children, organized by Bard students and faculty in the Mathematics Program. The Math Circle holds mathematical enrichment programs at local libraries, organizes math competitions for middle school students, and runs a math day camp in August.

RECENT SENIOR PROJECTS

- “**Chase-Escape on Sparse Networks**” Emma Sylvie Bernstein '20, Yardley, Pennsylvania (concentration: Mind, Brain, and Behavior)
- “**A Multi Centerpoint Theorem via Fourier Analysis on the Torus**” Yan Chen '20, Shanghai, China
- “**Migration and Neoliberalism: Do Diasporas Facilitate Pro-Market Policies at Home?**” Veronika Elizebeth Gillis '20, Red Hook, New York (Mathematics; Economics)

PHYSICS

The Physics Program presents courses and research experiences in theoretical and experimental physics that provide a firm foundation for work in a variety of scientific areas. A majority of recent graduates have pursued advanced degrees in physics or engineering; others are working in fields such as technical support, computers, finance, and secondary education. Most students take a core sequence of physics courses, but electives and tutorials help tailor a curriculum to reflect each student's interests and level of preparation. Physics equipment includes a scanning electron microscope, scanning probe microscopes and an optical inspection microscope in Bard's Nanofabrication Lab, a clean room incorporated into the Gravitational Wave Optics Lab, machine shop, and computer design/fabrication shop.

Faculty research currently focuses on extrasolar planets, loop quantum gravity, microhydroelectric power, precision optics for gravitational wave detection, and graphene-based nanofabrication, with students participating in these research programs as early as their first year.

RECENT SENIOR PROJECTS

- “**Practice-Room Acoustics: What Matters to Musicians about the Practice Space**” Yu-Tien Chou '20, Yangmei, Taiwan (Physics; Bass Trombone Performance BMus, Bard College Conservatory of Music)
- “**Production of Entangled Photons via Spontaneous Parametric Down-Conversion**” Logan P. Kaelbling '20, Norfolk, Massachusetts
- “**Electrochemical Modulation of Bacterial Biofilm Formation**” Ethan James Richman '20, Saugerties, New York (Physics; Chemistry and Biochemistry)

PSYCHOLOGY

Bard's Psychology Program aims to engage undergraduate students with the enormously broad and rich science of human behavior. Topics in the field range from neuronal and genetic mechanisms all the way up to the social systems that govern group behavior. Program faculty introduce students to psychology's subfields (social, cognitive, developmental, abnormal, and neuroscience); engage students in integrative, critical thinking about the mechanisms underlying human thought and behavior; educate students in the process of empirical science as it applies to behavior; and provide hands-on opportunities for data collection and analysis. Survey courses, laboratory courses, intensive seminars, and individually mentored research prepare students to excel in an interdisciplinary society.

RECENT SENIOR PROJECTS

- “**The Way You Hear It, the Way You Judge It: Moral Decision-Making and Moral Reasoning in Accented Speech**” Yifan Gu '20, Suzhou, China
- “**Existing but Not Living: A Discussion and Proposal for the Acute Social Withdrawal Syndrome Hikikomori in Japan**” Andrea Michelle Otey '20, Riverdale, Georgia (Psychology; Asian Studies)
- “**The Cost of Avoidance: Predicting Avoidant Behavior versus Confrontational Behavior in Response to Interpersonal Conflict**” Charles Heath Wood '20, Sherman Oaks, California

BARD-ROCKEFELLER SEMESTER IN SCIENCE

The Bard-Rockefeller Semester in Science is a New York City-based program designed for advanced science students, particularly those interested in neuroscience, biochemistry, molecular biology, developmental biology, biophysics, or genetics. Students spend a semester working with faculty from Rockefeller University (RU) and taking specially designed classes at RU and at the Manhattan headquarters of Bard's Globalization and International Affairs Program.

INTERESTED IN ENVIRONMENTAL AND URBAN STUDIES?

The interdependence of human societies and the physical environment is the focus of this wide-reaching major with regional, national, and international scope. Among the focus areas that offer empirical experience are: agriculture and food systems; environmental science; and global perspectives on environment, society, and culture, including analysis of biocultural diversity and climate change. Majors pursue an internship in their field of interest.

INTERESTED IN MEDICINE?

A dedicated health professions advising team provides advice and support for students interested in medicine or careers in other health-related fields. Guidance includes course selection to fulfill professional school requirements, and emphasis on relevant research and practical experience related to student interest. Outreach events, small-group workshops, and planning with academic advisers provide opportunities for study and career-path evaluation.

3+2 AND 4+1 DEGREE OPTIONS

ENGINEERING

Students spend three years at Bard, then two years at Columbia University's Fu Foundation School of Engineering and Applied Science or Dartmouth's Thayer School of Engineering. Students receive a BA from Bard and a BS from the other institution.

ENVIRONMENTAL POLICY/CLIMATE SCIENCE AND POLICY Students complete their undergraduate studies, then proceed to the MS degree program at the Bard Center for Environmental Policy, receiving two degrees in five years.

FORESTRY/ENVIRONMENTAL MANAGEMENT

Bard offers 3+2 options with the master's degree programs in either of these fields at Duke University.

TEACHING

A 4+1 option with Bard's Master of Arts in Teaching Program offers undergraduates a path to a BA, MAT, and New York State Teacher Certification for grades 7-12 (in biology, history, literature, mathematics, or Spanish) within five years of entering college.

SUMMER RESEARCH

BARD SUMMER RESEARCH INSTITUTE

Students receive stipends to work on campus over the summer, in Bard laboratories, on projects related to faculty research. Areas of research in the sciences include: biology, chemistry and biochemistry, computer science, mathematics, physics, and psychology.

CARY INSTITUTE OF ECOSYSTEM STUDIES

The Cary Institute, in nearby Millbrook, New York, offers summer internship positions to Bard students for research on Lyme disease, water quality, the Hudson River, and other topics.

DISTINGUISHED SCIENTIST SCHOLARS SUMMER RESEARCH

Moderated scholarship recipients may apply for a stipend for off-campus summer research projects following the sophomore and junior years.

RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU)

Highly competitive, federally funded REU programs offer students the opportunity to participate in research at various institutions across the country. Bard students have spent summers in REU programs at Harvard University, Stanford University, Los Alamos National Laboratory, and elsewhere.