

# STEM

*a guide for science, technology, engineering  
and mathematics students*



a publication by the

**DUJS**

| Dartmouth Undergraduate  
Journal of Science



Dear Reader,

Your first year at Dartmouth can be a difficult adjustment for a variety of reasons. As underclassmen, we found it difficult to traverse the maze of science, engineering, and mathematics courses here at Dartmouth. Resources were scattered across department websites, and the ORC was unwieldy at times. Additionally, we sometimes found it hard to talk to upperclassmen to learn from their successes or mistakes. Because we realized the utility of a centralized resource for academic inquiries, this publication serves as the official *STEM Guide* by the *Dartmouth Undergraduate Journal of Science* to help all science students here succeed academically.

The guide features compiled information about each STEM department along with statistics and related extracurricular activities. It also contains quotes and interviews from professors and students in order to provide personal advice and anecdotes. To help you prepare for life after Dartmouth, which is admittedly a somewhat distant prospect, we have included career advice as well.

We hope this guide serves as your companion when choosing your next term of classes or when you start D-planning for the next three years. We wish you the best of luck going forward!

Sincerely,

The *DUJS* Editorial Board

*The Dartmouth Undergraduate Journal of Science aims to increase scientific awareness within the Dartmouth community by providing an interdisciplinary forum for sharing undergraduate research and enriching scientific knowledge.*

EDITORIAL BOARD

Steven Chen '15  
 Scott Gladstone '15  
 Andrew Foley '15  
 Stephanie Alden '16  
 Annie Sun '16  
 James Howe '17

STAFF WRITERS

Alexandra Dalton '16  
 Melvin King '16  
 Kevin Ma '17  
 Kartikeya Menon '16  
 Jingya Qiu '16  
 Esther Wu '16  
 Nancy Wu '16

# BIOLOGY

The Biology major is a flexible major with numerous areas of concentration. Ranging from ecosystems to biochemistry and science education, biology at Dartmouth has a lot to offer.

*Biology students with a double major and students minoring in biology often major in: Anthropology, Environmental Studies (both pair well with ecologically-focused concentrations), Psychology, Neuroscience (both pair well with Behavior and Neurobiology as well as cell-focused concentrations), Chemistry (pairs well with Biochemistry and cell-focused concentration), and Economics (almost no overlap, but a popular track for those planning on going into biotech). Completing pre-health requirements leaves only two classes away from qualifying for the minor.*

**75** students graduate with a biology major each year, on average

**60-70** students in foundation courses

## Foundation courses:

- 12: Cell Structure and Function
- 13: Gene Expression and Inheritance
- 14: Physiology
- 15: Genetic Variation and Evolution
- 16: Ecology

**10-25** students in advanced-level classes (BIOL50 and above)

## Related Extracurriculars:

- Dartmouth EMS
- Nathan Smith Society
- Women In Science Program
- Pre-Vet Society
- Active Minds
- Women In Science Program
- EE Just Society

## Careers

Many biology majors further their passion for life sciences by pursuing terminal degrees, usually an M.D. or a Ph.D. Those that do generally go into health-related fields, veterinary medicine, research and development, or academia. Every year, a large number of biology majors pursue post-graduation work completely unrelated to their major(s).



The Class of 1978 Life Sciences Center

“Change the way you think about biology. Learn concepts not facts, try to understand why and how processes work and don’t just accept information. Be curious and challenge yourself to ask why at every opportunity.”

**Amy Gladfelter, Associate Professor**

## Interview with Diane Qi '16

*What is your favorite thing about the department?*

My favorite thing about the biology department is that the faculty really encourage students to get involved with research during their Dartmouth career. In a way, you feel as if you are making your own small contribution to the knowledge passed on to you in class, and that is really cool.

*What do you recommend to first-year students considering a Biology major?*

I would recommend that they take advantage of the research opportunities at Dartmouth. A lot of professors enjoy mentoring undergrads, so never be afraid to reach out!

## Interview with Amir Taree '17

*Why did you choose to major in Biology?*

I chose a major in biology because it has been my passion since taking AP Biology as a sophomore in high school. As a pre-health student, biology also offers the closest investigation of the human body.

*What are some things that the most successful STEM students you know have in common?*

The most successful STEM students engage with the material in as many ways as possible. This includes attending office hours to thinking at an application level beyond the normal class material.

*How do you balance your activities and studies?*

Balancing activities and studies is best achieved by prioritization. Each student must have specific priorities and goals in mind with their activities and studies and that will help to guide that student to success.

# CHEMISTRY

Chemistry at Dartmouth provides students with a wide range of opportunities both inside and outside the classroom, with four possible options within the major.

*Most popular secondary majors and minors: Economics and Biology are the most popular, but there are also many humanities and social sciences, including, but not limited to: Art History, English, Classics, Music, and Psychology. Occasionally people combine chemistry with math or physics in some capacity. Some combination of ENVS and Chemistry is common as well. Pre-health requirements leave you only one class away from qualifying for the chemistry minor, with inorganic chemistry (Chem 64) as the only additional course.*

## Introductory courses:

**5:** General Chemistry I

**6:** General Chemistry II

**10:** Honors General Chemistry

**25-120** students in introductory courses

**5-40** students in upper-level classes

**23** chemistry majors graduated in the 2013-2014 academic year

**3** in biophysical chemistry

**7** in biological chemistry

**13** in other areas of chemistry

## Prerequisites for the Major:

**Mathematics 3 and 8 (and 13 for plan A major); and Physics 13-14 (strongly recommended) or 3-4 or 15-16**

## Interview with Stephanie Alden '16

*Did you come to Dartmouth knowing you wanted to major in biological chemistry?*

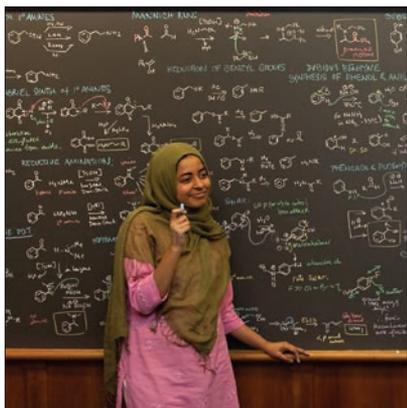
In high school I had a great chemistry teacher, so I came to Dartmouth leaning towards chemistry. My freshman and sophomore years I wasn't sure what my major would be, so I took a lot of biology and chemistry classes out of interest. I found that I enjoyed both and decided that the biological chemistry major was a nice compromise. It allows me to focus more on chemistry while incorporating its biological applications.

*What do you find to be most helpful or necessary to succeed in chemistry classes?*

After taking many chemistry courses, I've found that attention to detail and good planning are the keys to success. It can be really hard to catch up in a class once you fall behind. The classes move pretty quickly, and the material tends to build on itself, so falling behind in one section can mean several confusing classes in the future and a lot of work before exams.

*What is your favorite thing about chemistry at Dartmouth?*

The professors are by far my favorite thing about chemistry. I have taken classes that range from nine to almost 120 students in a section, and in both cases the professors make an effort to get to know and help every student succeed. You can tell that they're passionate about both their research and their teaching, and they are always open to discuss both with their students.



A student in CHEM 58, Honors Organic Chemistry II, writes reactions on a blackboard.

“Chemistry has a lot of different flavors. A student will find attractions towards either biochemical, traditional, materials science, or physics, normally. As a student develops an affinity to one of the sub-disciplines, then additional courses beyond what is required for the major can be added. These additional courses should be guided by specific interests of the student.”

**John Winn, Professor**

## Careers

Chemistry majors take a variety of paths after their time at Dartmouth. A few students spend a fifth year in Dartmouth's 4+1 Master's Program, concentrating on advanced work in biophysical chemistry. About half pursue an M.D. and become practicing physicians, while a quarter of chemistry majors go directly to graduate school and end up in academia, the pharmaceutical industry, and/or teaching. The rest are split between finance, law school, Teach for America, and a variety of other occupations.

# COMPUTER SCIENCE

Computer Science at Dartmouth provides students with a rigorous curriculum that teaches essential problem-solving and critical thinking skills applicable in a variety of jobs after graduation.

*While there are no specific concentrations within the major, minors have the options of focusing on Computer Science, Digital Arts, Computational Methods, and Operations Research, among other fields.*

**51** computer science majors  
graduated in the 2013-2014  
academic year

**60-180**  
students in  
introductory courses

**20-70**  
students in upper-  
level classes

## Requirements:

COSC 1 & 10 (Prerequisites)

Two theory or algorithms courses (30-49)

Two systems or hardware courses (50-69)

Two applied computer science courses (70-89)

Three elective courses (drawn from 30-89)\*

A culminating experience (either a senior thesis or COSC 98)

\*with approval from the Undergraduate Advisor, one mathematics course, reading course, or graduate course may substitute for one course from 30-89

## Related Extracurriculars:

Dartmouth Hacker Club  
Women in Computer Science  
Dartmouth Digital Arts Exhibition

## Careers

After majoring in computer science, most Dartmouth students take jobs in industry, including employment in startups, research/university work, social media, and research powerhouses. Other graduates go on to graduate school to pursue a Ph.D., while others go into digital arts or corporate work.



Students from Andrew Campbell's COSC 50, Software Design and Implementation, test out nanocopters they designed to respond to hand gestures.

"Can you major in Computer Science at Dartmouth even if you've never written a line of code? Absolutely! Many of our best majors came in with zero programming experience. Computer Science 1, taught in the fall, winter, and spring terms, is designed for people with negligible programming background. Even if you don't intend to major in Computer Science, if you can't compute, you can't compete - so take Computer Science 1 at some point during your Dartmouth career."

**Thomas Cormen, Professor and Chair**

"The learning experiences that will prepare you best for the future - for success in future classes, interviews, and jobs - are the ones in which you are given the most opportunity to create of your own volition. If computer science is for you, then such experiences are also the most fun. Seek out project-based classes, where your only guidance is the end product and some design suggestions. Seek out internships that are like these classes, where success lies not in following directions to the point, but instead in constant innovation and problem solving. Let these experiences consume you, and the challenges they present take over your challenge-hungry mind. Think about them in the gym, in the shower, in your sleep. Give yourself the time and the freedom to dive in, and you will never look back."

**Jake Leichtling '14, Salutatorian**

# EARTH SCIENCES

With two possible concentrations within the major, the earth sciences department provides a variety of learning experiences for those interested in finding out more about the natural world, more formally called “environmental geosciences,” by combining field studies with theoretical studies of developments and natural occurrences that affect the Earth.

**15** earth sciences majors graduate in each academic year, on average

**40-150** students in introductory courses

**5-20** students in upper-level classes

## Introductory courses:

- 1: How the Earth Works
- 2: Evolution of Earth and Life
- 3: Elementary Oceanography
- 5: Natural Disasters and Catastrophes
- 6: Environmental Change
- ...among others

## The Stretch

Offered since the 1960s, the “Stretch” is an off-campus program that exposes students to the geology of Western North America. Destinations range from Death Valley to the Canadian Rockies, with topics of study including the history of the ice age and economic geology.

## Careers

Earth sciences majors can have several careers after graduation. Of the Dartmouth EARS graduates between 1997 and 2013, 25% went into academia, 20% went into the oil and gas industry, about 10% pursued work relating to the environment, 15% went into government, 5% turned to work in minerals, and the last 25% pursued an alternative career path. Training at the Master's level or above is becoming increasingly necessary to be successful in the field.

“Earth Sciences is really at the nexus of many ways of looking at the natural world. Thus, any time a chemical, biological, or physical problem is considered not in isolation (say in the lab) but in the real world, earth scientists can offer context and knowledge of the complex interactions of the problem under investigation with the rest of the natural world.”



Dartmouth student Samuel Streeter '13 at Denali National Park to document climate change.

**Leslie Sonder, Associate Professor**

---

## Interview with Ed Meyer, Research Scientist

*What are the professors involved in outside of classes? What are they like in classes?*

Our faculty are involved in projects that deal with topics including the effect of dams on streams across New England, how large ice sheets in Greenland and Antarctica are responding to changing climate, and how glaciers at high elevation in equatorial latitudes respond to climate change. We have a young and enthusiastic faculty, and they all bring an energy to the classroom that has made many Earth Sciences classes some of the most popular on campus.

*What is your favorite thing about the department?*

Professors and graduate students work closely with undergrads in field work, lab work, data analysis and publication. For example, undergraduates are frequently traveling to Greenland and Antarctica, then returning to campus to and fostering a highly collaborative environment. Faculty and graduate students are really eager to get undergraduate students excited in the science. It's remarkable to watch an undergraduate come into one of our intro courses as a first-year student and get hooked. You get to see them as they progress through the major and how their thinking about the science has become more advanced. Watching this progression is only possible because our majors are so closely integrated into what we do.

# ENGINEERING

With a five-year Bachelor of Engineering and a four-year Engineering Sciences major, Dartmouth's engineering program offers a dynamic curriculum with an emphasis on project- and team-based work. Thayer prepares students for almost any job, whether a student is interested in pursuing engineering or applying a technical background to the business world.

**In the 2013-2014 academic year...**

**91** engineering sciences majors graduated

**80%** or more typically graduate with the B.E.

**40-70** students  
in introductory and  
prerequisite courses

**Prerequisites for  
the major:**

Math: 3, 8, and 13, or 11

Physics: 13-14 or 15-16

ENGS 20 or COSC 1 and 10

**10-90**  
students in upper-  
level classes

## **Related Extracurriculars:**

Dartmouth Formula Racing  
Dartmouth Humanitarian Engineering  
National Society of Black Engineers  
Society of Petroleum Engineers  
Society of Women Engineers

“People enjoy the project-based learning at Thayer and the ability to actually see their ideas get built. Students find it satisfying to have an end product and something to show for their hard studying, calculations, and other work done at the Thayer School. Team-work related skills are more valuable than any one additional course.”

**Holly Wilkinson, Assistant Dean,  
Academic and Student Affairs**



Students walk through the MacLean Engineering Sciences Center.

## Interview with Sarah Hammer '15

*Sarah is the head of the Society of Women Engineers and is a chemical engineering major at Thayer. During her time at Dartmouth, she has taken advantage of off terms to do research at two different universities, the University of Pennsylvania and the University of Michigan.*

*What is your advice for students struggling to figure out whether they're a good fit for STEM in general?*

I have a lot of friends that gave up on STEM or pre-health because people were better than they were in classes. But if you're interested, don't give up—if you're really interested in it, it'll ultimately take you further than it will other people. If you think chemistry or biology is cool, don't let your lack of excelling in one science class tell you that you shouldn't do something.

*Sarah applied for the WISP program at the end of her freshman year and joined a lab in the earth sciences department. While the project itself didn't engage her in the way that she'd hoped, she points to both her female PI and female graduate students as critical mentors that strongly encouraged her to go forward with science and follow her dreams.*

## Interview with Kevin Ozoria '17

*Kevin is an Engineering Sciences major modified with Studio Art and Architecture, who hopes to use his degree to apply human-centered design principles to structures and devices that everyone can use. Kevin emphasizes the benefits of pursuing his own course of study and creating a program that fits with all of his interests.*

*How did you make the Dartmouth Engineering Sciences major your own?*

The ability to design a major or course of study that is your own—something that I was able to do at the Thayer School—has allowed me to be the most creative version of myself. I want to give back to the community and create things that people will enjoy, and I would encourage any prospective engineering student to study hard, pursue your interests, and take advantage of every opportunity to learn about what you're interested in. That's how you'll have the greatest impact.

# ENVIRONMENTAL STUDIES

The Environmental Studies Program offers an interdisciplinary major with a curriculum that emphasizes the interplay between environmental science, such as ecology and ecosystem science, and environmental policy and governance. Interests lie in integrating these approaches into addressing and understanding environmental issues.

*In addition to the ENVS major and minor, the ENVS program offers a sustainability minor, which allows students to take courses relating to sustainability outside of ENVS.*

**48** environmental studies majors

and **21** minors graduated in the  
2013-2014 academic year

## Introductory courses:

2: Introduction to Environmental Science

3: Environment and Society

11: Humans & Nature in America

**20-60** students  
in introductory  
courses

**5-40** students in  
upper-level classes

## Related Extracurriculars:

Dartmouth Organic Farm

Ecovores

Ecoreps

Environmental Studies Division

## Prerequisites for the major:

Math: 3 or 10

Chemistry 5, Physics 3,  
Biology 1, or EARS 1

Economics: 1 or 2

## Careers

Environmental Studies students often pursue careers in law or business, with environmental management—an area with corporate placements and MBA program opportunities—being a particularly popular career path. Another direction for ENVS majors is environmental policy analysis and environmental consulting, which works for students who have taken courses in statistics, modeling, and economics. Many graduates work and attend graduate school in public policy, applied economics, and environmental policy. Some go to environmental consulting firms, while others pursue M.S. or Ph.D. programs.



Students in ENVS 25, Ecological Agriculture, learn about corn pollination at the Dartmouth Organic Farm.

“Since we integrate content from the biophysical sciences, the social sciences, and the humanities, all kinds of skills can be useful in ENVS, and different students have different comparative strengths. ENVS is arguably the ultimate liberal arts major; we not only teach courses that focus on different fields but also on how to integrate that knowledge in addressing environmental issues.”

**Richard Howarth, Professor and Chair**

---

## Interview with Shea Flanagan '14

*What prompted you to choose the ENVS major?*

I decided to major in ENVS after declaring a biology major, so I am actually a double major. I am very interested in environmental policy and conservation as well as pure ecological research, and I felt that to explore those topics (e.g. policy and conservation) in-depth, I should also major in ENVS, since the biology major tends to be more theory focused.

*What type of job opportunities are available to ENVS majors, and how have your studies affected your current and future career plans?*

I'm currently in Kenya doing giraffe monitoring at Soysambu conservancy. I was able to connect with this opportunity through my thesis research in the ENVS department, after investigating giraffe movement patterns post-translocation. There's a bunch of opportunities open to ENVS majors, since the major covers such a broad variety of disciplines.

# MATHEMATICS

Mathematics straddles the line between art and science. More generally, those who study math seek out new patterns and use them to formulate theories and conjectures. Mathematics is an essential tool in a wide range of fields, applicable to finance, medicine, and all types of engineering and natural science.

**2013-2014 academic year:**

**57** mathematics majors

**12** mathematics minors

**20-60** students in introductory courses

**5-30** students in upper-level classes

## Paths through the major:

pure, applied, and mathematics for education\*

\*The mathematics education track provides preparation for certification as a public school teacher of mathematics.

## Prerequisites for the major:

- 3: Calculus
- 8: Calculus of Functions of One and Several Variables
- 13: Calculus of Vector-Valued Functions
- 22 or 24: Linear Algebra with Applications or Honors Linear Algebra

## Related Extracurriculars:

Association of Women in Mathematics

Dartmouth Mathematical Society

A wealth of extracurricular lectures, symposia and conferences sponsored by the mathematics department

## Careers

Majors in both pure and applied mathematics have an excellent range of options for internships and jobs after graduation. Employers and graduate schools realize that formal training in mathematics gives you analytical acuity and exceptional problem-solving skills, whether they relate to improving algorithm efficiencies or financial models. Recent graduates have gone into stack development at software development firms, finance, the private sector, graduate school, medical school, law school, and Teach for America, among other paths.



President Phil Hanlon teaches Math 11, Multivariable Calculus, to first-year students.

“Mathematics is the key to unlocking many of the mysteries of the world around us. It is fundamental to all of the sciences. We try to offer a broad selection of both pure and applied courses that should be of interest to everyone who wants to do real science, as well as those who want to go further in mathematics with a minor, modified major or straight mathematics major.”

**Dana Williams, Professor of Mathematics**

---

## Interview with Jacob Savos '16

*How has Dartmouth's Mathematics department prepared you for life after graduation?*

The Mathematics department at Dartmouth does a fantastic job helping students build a strong foundation to explore and understand the world of mathematics. The professors and coursework succeed in giving you the tools necessary to understand what math is, why it works, and how you can apply specific concepts to different situations. Through its lectures, research, campus events, and extracurricular activities, the department builds a holistic and diverse look at mathematics.

*What is the most important piece of advice you wish you had received as a first-year student interested in mathematics?*

Explore both what the department *and* the school have to offer! Besides mathematics, I've explored other areas of study that have clarified my interest in math and academia in general. Following my interests has created opportunities to learn to things that I've thoroughly enjoyed and wouldn't have been exposed to otherwise, such as programming, data visualization, and “the philosophy of reality.”

# NEUROSCIENCE

Neuroscience is an interdisciplinary major that pulls from a variety of fields such as biology and psychology, as well as chemistry, computer science, and engineering. As a result, the major lends itself to a variety of interests, including pre-health. Particularly reflective of student interests are the electives, which can include classes taught in a range of departments.

*While students cannot modify Neuroscience with another major, they can modify another major with Neuroscience (Biology or Computer Science, for example). The ability to take electives in different departments enables a great deal of flexibility.*

**62** neuroscience majors  
graduated in the 2013-2014  
academic year

**80-110** students  
in introductory courses

## **Introductory courses:**

PSYC6: Introduction to  
Neuroscience or BIOL34:  
Neurobiology

**20-60** students in  
upper-level classes

## **Prerequisites:**

Four quantitative courses  
including, but not limited to:

Math: 3, 4, 8

CS: 1, 10, 31

Engs: 20

Chem: 5, 6

Physics: 3, 4

## **Related Extracurriculars:**

Active Minds

Aspire

Dartmouth Bioethics Group

## Careers

Neuroscience majors often pursue an M.D. after graduation. Another popular route for majors is graduate school, which can lead to a variety of fields including, but not limited to, health policy, industry, optometry/endocrinology, or a career in academia, teaching, health policy, or industry.



Professor Ming Meng, who teaches courses including Developmental Perception and Mind and Brain, indicates an area of the brain used in visual perception.

“Neuroscience lies somewhere on the empirical spectrum among biology, psychology, and philosophy, and the field must rigorously interface with each of these disciplines in order to make sound advancements. A lot of great interdisciplinary work is being done in the field. What I will say is that neuroscience, as it is currently taught, helped me learn to think in “systems,” which is a fantastic skill that can be applied in a number of problem-solving scenarios.”

Adam Mehring, '14

---

## Interview with Nikita Raman '16

*What are your favorite parts of the neuroscience major?*

I've really enjoyed my time as a neuroscience major. The number and breadth of courses offered as electives within the neuroscience major gives you an opportunity to find the areas that you like to study most and focus on them. The faculty teaching the major courses are fantastic lecturers. Many of them also take on undergraduates in their labs, which I'd highly recommend pursuing. Getting involved in neuroscience research gives you the chance to understand the methodology behind the research studies you read about, and makes your coursework much more meaningful.

*What do you wish you had known as a first-year, prospective neuroscience major?*

I wish I had known that you don't need to have a strong science background going into the major. If you think the brain is awesome and want to learn more about how it works, just take the classes—you'll learn the hard science by doing it along the way!

# PHYSICS & ASTRONOMY

With separate majors in astronomy, physics, and engineering physics, Dartmouth's Physics and Astronomy Department provides students with a wide range of courses, all of which provide students with excellent critical thinking and problem solving skills that can be used in careers in science, technology, and elsewhere after graduation.

**17** Physics & Astronomy  
majors graduated in the 2013-  
2014 academic year

**50-100**

students in  
introductory courses

**10-25** students in  
upper-level classes

## Introductory courses:

13 or 15: Introductory Physics I

14 or 16: Introductory Physics II

*Without Calculus:*

**3: General Physics I**

**4: General Physics II**

## Related Extracurriculars:

Dartmouth Physics Society

Dartmouth Mathematics Society

EE Just Scholars

## Careers

Physics & Astronomy students from Dartmouth are equipped to succeed in many careers after graduation. Ranging from masters and Ph.D. work in cosmology and quantum mechanics, to working alongside engineers and programmers in technical companies, to heavily-quantitative financial modeling and analytics, the varied outcomes for Physics & Astronomy majors rely on critical thinking skills developed throughout the major that allow students to excel at Dartmouth and beyond.



Professor Robyn Milan teaches the accelerated version of Introductory Physics I (PHYS 15) to first year students.

### Student in the Spotlight: Nina Maksimova '15

*Any student that has ever taken a course in the physics department has probably seen Nina Maksimova '15 and wondered who she was. With office space on the first floor of Wilder and as the head of the Dartmouth Physics Society, Nina has embraced physics at Dartmouth and is currently working on her second research paper with a professor that she has worked with since her freshman year at Dartmouth.*

*When she arrived at Dartmouth, Nina wanted to be a history major. While she came from a family of physicists and wanted to go into astrophysics during middle school, her history classes enticed her the most. But at a college orientation program, an upperclassman told her, "take a class that you hated during high school," and she did just that.*

*Nina took Physics 13 with Professor Robert Caldwell her freshman year and found it interesting. During office hours, she asked Professor Caldwell for material to read in her free time, and later asked to join his research team studying theoretical cosmology. She also did research with Professor Kristina Lynch, whose team worked with NASA to study the northern lights using rockets. After working in both theoretical and experimental physics her freshman year with Professor Caldwell and Professor Lynch, Nina realized that theoretical physics interested her most, and she has been working with Professor Caldwell since.*

*While she's become a staple of Dartmouth Physics, she also wants to emphasize that she didn't find her niche at Dartmouth on day one—"that sort of thing takes time."*

# MULTIPLE MAJORS AND MINORS

While the majority of students only choose to pursue one major during their time at Dartmouth, many students decide to add a minor or a second major. Although difficult at times, students can definitely accomplish this feat with the right planning.

## **Most common STEM double majors:**

Biological Sciences and Economics  
Physics and Mathematics  
Philosophy and Mathematics

**201** double majors graduated in the 2013-2014 academic year

**3** triple majors graduated in the 2013-2014 academic year

**326** students with one minor graduated in the 2013-2014 academic year

“Students double majoring while pursuing the sciences need careful, proactive planning (D-plan, course sequencing, and prerequisites). To do so requires meeting with faculty and pre-health advisors, clear goals, and time management.”

**Teoby Gomez, Assistant Undergraduate Dean**

“I think that double majoring makes a lot of sense for students who have a few different interests and are willing to spend the majority of their classes focusing on just a couple of topics. Additionally, it’s important to weigh the ways in which the majors overlap, and how that may help prepare you for life after Dartmouth. I felt that pursuing my two majors would be extremely engaging, but that it would also prepare me for careers I find to be fascinating.”

**Kevin Francfort '15, Engineering and Economics**

# RESEARCH AT DARTMOUTH

Although the term “research” often conjures up images of lab benches and test tubes, academic research is actually much broader in scope. It can be in any academic discipline, from theater to government to chemistry. The goal of research at Dartmouth, as described by the Office of Undergraduate Advising and Research (UGAR), is to contribute meaningfully to your intellectual and academic development by forming a mentor relationship with a Dartmouth faculty member.

*There are a variety of ways to get involved in research at Dartmouth, from emailing a professor and being paid from one of their grants to applying for funding and being connected through a scholarship sponsored by the UGAR. Any student can get involved in research at any point of their Dartmouth career, and these are just a few of the many ways to receive funding for your work.*

## Freshman Year:

*WISP (Women in Science Project)  
First Year Research in Engineering*

## Sophomore Year:

*Sophomore Science Scholars  
Neukom Scholars  
Paganucci Fellows*

## Junior Year:

*Presidential Scholars  
Junior Research Scholarships  
Mellon Mays Fellowships*

## Senior Year:

*Senior Fellowships  
UGAR Research Grants*

---

## Interview with Brendan Wang '15, Chemistry major

*What would you recommend students do to find research or be considered for research by a professor?*

My suggestion for being considered for research is to do some digging around online to see what kinds of research being conducted at Dartmouth. If anything seems particularly interesting, email a professor to see if you can chat with them for 10-15 minutes about what type of things they are investigating. A lot of the time you can just stop by their office too, though emailing beforehand is always nice! If their research still seems interesting after talking with the professor, ask if they need help with any projects or have any free space in the lab. You would be surprised to see how many professors say yes!

*Visit the UGAR website at <http://www.dartmouth.edu/~ugar/> for more information about contacting professors, receiving financial support for research, and research opportunities available at Dartmouth.*

# PH.D. AND GRADUATE STUDIES

Thinking of getting a Ph.D.?

Graduate school will push you far beyond your undergraduate education, to the edge of human knowledge. It takes 4-7 years to complete a Ph.D., of which the first two years are usually occupied by coursework, and the final 2-5 years are an apprenticeship in research. The culmination is a Ph.D. thesis, in which you formally present your original research work to the scientific community.

Most graduate schools pay for your tuition and provide a stipend to cover the costs of living in exchange for teaching and grading duties. In many ways, it is similar to a job, with duties and responsibilities. There are many places online to search for graduate schools, and it is reasonable to apply to between six to 10 schools. Requirements include the GRE general test, three letters of recommendations from professors, a statement of interests, career goals, and an application fee. Some programs also require GRE subject exams. The GRE general test has three parts—verbal, analytical, and quantitative—and is very similar to the SAT for undergraduate admissions. While not explicitly required, many schools like to see prior research experience as indications of interest, commitment, and academic potential.

What should I do now as a freshman to get started?

Search for potential graduate schools you are interested in and look at the requirements for admission. Keep these in mind when you establishing your D-Plan.

Establish relationships with professors. Go into office hours or invite them to lunch.

Likewise, establish relationships with upperclassmen, as they are seasoned students who have successfully navigated Dartmouth's academic environment.

Contact professors you'd like to work with and see if they have any positions open in their labs.

Take a variety of courses early in your undergraduate career to determine which area you are interested in. This is especially important because you will end up dedicating the next four to seven years in that field.

# INTERVIEW WITH ITTAI ERES '14

Double major in Biological Sciences and English

Ph.D. Candidate in Human Genetics at the University of Chicago

*How and why did you decide to pursue graduate school?*

I loved the work I did in biology in undergrad—both in the classroom and in the lab—and I think my ultimate goal is to one day become a professor. Biology is such a fun subject, and I love being able to both learn so much about life and apply it in a creative fashion in the lab. I decided to pursue graduate school both so that I could one day become a professor, and to acquire a Ph.D. in pursuit of expanding our knowledge about biology.

*What steps did you take (between freshman and senior year) to get into graduate study (i.e. research, taking the GRE, recommendations)? What is the timeline like?*

I actually did everything fairly late. I got involved with research as an undergraduate only entering my junior year, through the Presidential Scholars program. I would definitely recommend to others who may be interested in this path to get involved with research earlier, either through programs (WISP, HHMI, etc.) or simply by blitzing a professor whose work they're interested in! I also didn't take the GRE until midway through my senior fall, and if graduate school is something you know you want to pursue, I would look into doing it earlier - perhaps near the end of junior year.

*What tips would you give incoming freshman who think they want to go into academia?*

Get involved with research as soon as possible, and don't get discouraged if you don't like it at first! My first research experience was actually extremely disappointing, and I'm glad I was just determined to try another one because I ended up loving it (and doing my thesis there). Research can be frustrating, but it can also be incredibly satisfying. Try out different opportunities if you're not content with one!

*What classes would you recommend incoming freshman take (any field/major)?*

My favorite class by far was Game Theory (GOVT 19) with Professor Herron. I would also recommend taking CS 1, Psych 1 and some higher level Philosophy seminars.

*What are your future goals?*

To acquire a Ph.D. from graduate school and to hopefully one day become a professor of human genetics!

*Any other advice?*

Don't forget to challenge yourself in other ways and explore other academic interests! I was very glad I also got involved with other activities at school, and even more glad that I also majored in English (it's nice to take a break from hard science textbooks every once in awhile).



# PRE-HEALTH

The pre-health curriculum consists of rigorous coursework in the physical and life sciences, as well as clinical exposure outside of the classroom. While pre-health can be intimidating, Dartmouth has many resources, including the Health Professions Program (HPP) and the Nathan Smith Society (NSS), to help guide students through the process.

## Course Requirements

Two terms of english: Writing 5 and First-Year Seminar fulfill this requirement

Two terms of math (20% of schools required, recommended by most): strong recommendation for one calculus course and one statistics course

Two terms of biology (with lab); students can take two of:

Biology 12 (Cell Biology)

Biology 13 (Genetics)

Biology 15 (Microevolution)

Biology 16 (Ecology)

Two terms general chemistry:

Chemistry 5 + Chemistry 6

- OR -

Chemistry 10

Two terms of organic chemistry:  
Chemistry 51 + Chemistry 52

- OR -

Chemistry 57 + Chemistry 58

Two physics courses (with lab):

Physics 3 + Physics 4

- OR -

Physics 13 + Physics 14

One term biochemistry:

Biology 40 (no lab)

- OR -

Chemistry 41 (lab)

Highly recommended:

Biology 14 (Physiology)

or Biology 2 (Human Biology)

Psychology 1

Sociology 1 or 2

---

“If you have even a little bit of interest in a health career, take steps right from the beginning of freshman fall. It is far better to start on the pre-health path and realize it is not something you want to do than to realize midway through college that you want to go to medical school.”

Nivedita Nagaraj '16

# EXTRACURRICULARS AND NATHAN SMITH SOCIETY PROGRAMS

- Dinner with a Doc/Vet/Dentist Program
- Take a Med Student to Lunch Mentoring Program
- DHMC /VA Shadowing Program
- Dartmouth Ears (a patient visiting program at DHMC/VA)
- Dartmouth-Geisel Ethics Discussion Group
- Dartmouth Cancer and Patient Services
- Dartmouth Cancer Scholars

## On Campus Resources

Minority Association of Premedical Students  
Pre-Health Mentor Corps  
Teaching Science Fellows  
Nathan Smith Society ([www.dartmouth.edu/~nss](http://www.dartmouth.edu/~nss))  
Pathways to Medicine

A successful medical school or health program application shows a strong foundation and success in coursework in the sciences, a good test (MCAT/DAT/GRE) score, letters of evaluation, and extracurricular activities including clinical exposure, volunteer work, and research.

---

## Pre-Health Advising and Health Professions Program:

Sarah Berger, Student Academic Support Center, Carson 132  
Dr. Lee Witters, LSC 122

*Walk-in Office hours announced at the beginning of each term*

Students who are considering medical/dental/vet or other health professional schools should connect with the Health Professions Advisors early and throughout their Dartmouth experience. Though a healthcare career path may begin later, decisions made early affect long-term career options.



# FINANCE & CONSULTING

Finance is a field that deals with the allocation of resources and liabilities over time under conditions of uncertainty. Finance applies economic theory, quantitative analysis, and mathematical models in order to price assets, calculate risk, and predict returns on a variety of investments. Investment banking, wealth management, risk analytics, sales and trading, private equity, and loan structuring are all areas of finance that seek STEM students who can apply their critical thinking and problem solving skills to complex financial problems.

Consultants are professionals who provide expert advice in a particular area, such as security, management, law, finance, medicine, engineering, or science. Consultants use quantitative metrics to propose solutions to problems of feasibility and profitability for their clients. Creative, knowledgeable, and systematic thinkers—such as STEM students—are often attractive hires for expertise-driven consulting firms.

*STEM students interested in corporate recruiting should reach out to the Center for Professional Development to receive advice on resume building, internships, and post-graduation job opportunities. Internships and job opportunities in finance and consulting can be found all around the world, including in New York, Boston, San Francisco, London, Tokyo, Hong Kong, and many other cities.*

---

## Interview with Scott Gladstone '15, Computer Science major

*What skills did you learn as a computer science major that applied to your career goals?*

My junior year summer internship was with a financial modeling group at an investment manager in New York. The group's goal was to deliver software-driven solutions to clients seeking risk and return analytics on their investments. During the entire interview process, the driving theme was to apply my mathematics and engineering experience to develop creative, efficient solutions to complex financial problems. I heavily leveraged the programming experience that I gained in my computer science coursework, and even though the learning curve was pretty steep, I was able to quickly and successfully integrate myself into the team.

*Do you have any advice for first-year students about how they could determine whether or not finance is something they might enjoy?*

Take an economics class or consider an out-of-major internship! I only took one economics course before applying for my first internship in finance, and I discovered a passion for it. Working at a private equity firm that looked exclusively at technology sector companies, I found it fascinating to be able to break down and analyze companies that produced products that I used on a daily basis. Without that internship experience, I probably would never have known how captivating I find the financial sector.

# RESUME BUILDING

## From the Classroom and Lab Bench to the Office: Essentials for STEM Students

*Opportunities abound for students who study Computer Science, Engineering and the Sciences at Dartmouth. STEM students are frequently in high demand for internships and job opportunities, as there are often more positions available than people to fill roles! If you major in a STEM related field, you may find that you have:*

- More material for your resume. When your coursework aligns with your goals, you can include class and team projects in the Experience section of your resume.
- Access to funded research, internships, job and graduate school opportunities.
- A host of faculty, researchers, professionals and peers willing to help and mentor you. Visit [MentorNet.org](http://MentorNet.org) and the Dartmouth Career Network.
- A need for a CV (an academic version of your resume, often longer in length and including citations of publications).

## Tips to Ensure Success

*As STEM coursework often depends on cumulative understanding, it is critical for you to take full advantage of resources and services across campus. Therefore, we encourage you to:*

- Meet with a dean in the Undergraduate Deans Office during your first term.
- Check in with a Pre-Health advisor as soon as possible if your future goals include Medical, Dental or Vet School—or any other careers in the Health Professions.
- Seek out any help you need to support you in your success—including the Academic Skills Center.
- Get to know Chandlee Bryan ([chandlee@dartmouth.edu](mailto:chandlee@dartmouth.edu)), the CPD's liaison to the sciences. You can contact her via email or set up an appointment to meet with her.
- Start internship and leave term searches at least one term before you are seeking an opportunity.

“Something that STEM students might consider is a career working in industry. From working on oilfield technologies for a big petroleum company to helping design new types of solar cells at a startup, there are an enormous number of opportunities for undergraduates with STEM degrees.”

Annie Sun '16



# DUJS

Dartmouth Undergraduate  
Journal of Science

ESTABLISHED 1998

## ABOUT US

Founded in 1998, the *DUJS* aims to **increase scientific awareness** within the Dartmouth community by providing an **interdisciplinary forum for sharing undergraduate research** and enriching **scientific knowledge**.

- International distribution to universities and high schools
- Fully integrated with Directory of Open Access Journals (DOAJ) and Summon Index



SPRING 2014

Dartmouth Undergraduate Journal of Science  
Hinman Box 6225, Dartmouth College, Hanover, NH 03755  
Email: [dujs@dartmouth.edu](mailto:dujs@dartmouth.edu) | Tel: 603-646-8714



# DARTMOUTH

## HUMANITARIAN ENGINEERING



RWANDA 2013

## ABOUT US

DHE was founded in response to a simultaneous demand for **service and engineering opportunities** abroad and the growing need for **global poverty reduction** through small-scale localized and sustainable solutions.

Dartmouth Humanitarian Engineering  
Thayer School of Engineering, 8000 Cummings Hall, Hanover, NH 03755  
Email: [humanitarian.engineering@dartmouth.edu](mailto:humanitarian.engineering@dartmouth.edu)

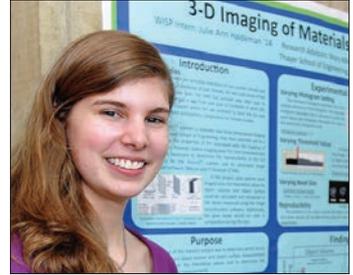


# WOMEN IN SCIENCE PROJECT

## ABOUT US

The Women in Science Project (WISP) is a co-curricular initiative to **encourage women to pursue their interest** in the sciences, engineering and mathematics by providing mentoring, **hands-on research experiences**, role models, and a sense of community. Opportunities include Research Internships for first and second year women, a **Peer Mentor Program** to connect first year women with upper class women, and informal opportunities to meet with visiting women scientists.

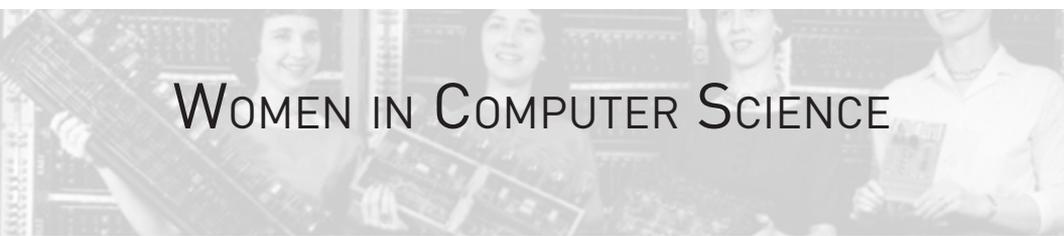
WISP is part of the Office of Undergraduate Advising & Research (UGAR) which promotes advising and research opportunities across campus to foster students' academic exploration and intellectual growth.



WETTERHAHN SYMPOSIUM 2011

---

Women in Science Project  
6243 Parker House, 2nd Floor, Hanover, NH 03755  
Email: [WISP@dartmouth.edu](mailto:WISP@dartmouth.edu) | Tel: 603-646-3690



# WOMEN IN COMPUTER SCIENCE

## ABOUT US

Founded in early 2012, the Women in Computer Science club (WiCS) **aims to bring together the women of CS** in the Dartmouth College community. We organize CS-related events for undergraduate and graduate students as well as faculty.



SUDIKOFF

---

Women in Computer Science (WiCS)  
Sudikoff 213, Hanover, NH 03755  
Email: [women.in.computer.science@dartmouth.edu](mailto:women.in.computer.science@dartmouth.edu)

# SOCIETY OF WOMEN ENGINEERS

## ABOUT US

The Dartmouth chapter of the Society of Women Engineers sponsors events ranging from workshops to luncheons with prominent women in a variety of fields of engineering and discussions with female Thayer alumni. The group organizes social activities and study parties to foster a supportive community. Several members of the chapter are involved in an online mentoring network for high school students interested in pursuing STEM. As a chapter of a national organization, students can attend national and regional conferences and network with women from academia, government and industry.



ENGS 21 STUDENTS

---

Society of Women Engineers  
Email: [swe.dartmouth@gmail.com](mailto:swe.dartmouth@gmail.com)

# DARTMOUTH MATHEMATICAL SOCIETY

## ABOUT US

- Math seminars by Dartmouth faculty about their research
- Social events where you can meet peers outside the classroom
- Internship panels where students share their experience and give advice on career opportunities for math majors

The Dartmouth College Mathematical Society creates community where students interested in mathematics can interact and discuss mathematics outside of the classroom. Students can discuss news, share experiences, and explore interesting topics in mathematics. We promote the pursuit of mathematics at all levels and provide events that cater to students with all degrees of mathematical experience.

---

Dartmouth Mathematical Society  
Email: [dartmouthmathsociety@gmail.com](mailto:dartmouthmathsociety@gmail.com)



# DARTMOUTH CHEMISTRY SOCIETY

## ABOUT US

The Dartmouth Chemistry Society aims to connect students interested in the subject with each other, as well as introduce them to chemistry professors and the opportunities chemistry at Dartmouth offers.

- Mentoring program for freshmen and sophmores interested in chemistry
- Chem for Kids, an outreach program to get younger students interested in chemistry



CHEM 5 STUDENTS

---

Dartmouth Chemistry Society  
Email: [dartmouthacs@gmail.com](mailto:dartmouthacs@gmail.com)



# DARTMOUTH PHYSICS SOCIETY

## ABOUT US

The Dartmouth Physics Society, or DPS, is a student group open to majors, minors, and all those interested in physics and astronomy. We bring physics fun to those who are interested as well as to increase awareness and presence of our Physics & Astronomy department on campus.



Dartmouth Space Physicist Explores  
Earth's Radiation Belts

---

Dartmouth Physics Society  
Email: [Dartmouth.Physics.Society@dartmouth.edu](mailto:Dartmouth.Physics.Society@dartmouth.edu)

# DARTMOUTH ENTREPRENEURIAL NETWORK

## ABOUT US

The Dartmouth Entrepreneurial Network offers a commitment to promote entrepreneurship and innovation. The Innovation Center and New venture Incubator provides a physical space for students to formulate their business idea and get advice. Students can also partake in an entrepreneurship boot camp that includes sessions on brainstorming, pitching, marketing, and other related concepts.



Students at the DEN Innovation Center

---

**DEN**

Dartmouth Entrepreneurial Network  
4 Currier Place, Hanover, NH 03755  
Email: [Dartmouth.Entrepreneurial.Network-Undergraduates@dartmouth.edu](mailto:Dartmouth.Entrepreneurial.Network-Undergraduates@dartmouth.edu)

# DARTMOUTH CONSULTING GROUP



## ABOUT US

The Dartmouth Consulting Group's mission is to provide undergraduates with practical skills to prepare them for a career in consulting. We serve local businesses and non-profits in a variety of pro-bono consulting projects as well as provide our members networking opportunities with alumni from several consulting firms in the US.

---

The Dartmouth Consulting Group  
Email: [Dartmouth.Student.Consulting.Group@dartmouth.edu](mailto:Dartmouth.Student.Consulting.Group@dartmouth.edu)





Dartmouth

SPECIAL THANKS

Dean of Faculty  
Associate Dean of Sciences  
Thayer School of Engineering  
Office of the Provost  
Office of the President  
Undergraduate Admissions  
R.C. Brayshaw & Company

Cover Photo by Eli Burakian '00

Dartmouth Undergraduate Journal of Science  
Sudikoff 155  
Dartmouth College  
Hanover, NH 03755  
(603) 646-8714  
<http://dujs.dartmouth.edu>  
[dujs@dartmouth.edu](mailto:dujs@dartmouth.edu)

Copyright © 2015  
The Trustees of Dartmouth College