STEM

a guide

Dartmouth College
Dear Reader,

Your first year at Dartmouth can be a difficult adjustment for a variety of reasons. Just three years ago, 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 often 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 inaugural STEM guide by the Dartmouth Undergraduate Journal of Science to help all science students here succeed academically.

The guide features compiled information about each of the STEM departments, including 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.
**Biology**

With 17 areas of concentration ranging from whole ecosystems to biochemistry and a path focused on science education, biology at Dartmouth has a lot to offer.

*Most popular secondary majors and minors: 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). Pre-health requirements leave you only two classes away from qualifying for the minor.*

83 biology majors graduated in the 2013-2014 academic year

60-70 students in foundation courses

10-25 students in upper-level classes

**Foundation courses:**
12: Cell Structure and Function
13: Gene Expression and Inheritance
15: Genetic Variation and Evolution
16: Ecology

**Related Extracurriculars**
- Society of Biological Sciences
- 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 medicine, research and development, or academia. Those who do not may still enter those fields, but usually in a support role, such as a nurse practitioner or a lab technician. Every year, a large number of biology majors pursue post-graduation work completely unrelated to their majors.

“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 Paul Frazel ’15

Why did you choose to major in biology?
I was originally a neuroscience major, but I switched because I found neuro to be too psych-heavy. I wanted more of a basic science focus, especially around the pathways and goals of a cell and the incredible complexity and beauty of life at the cellular level.

What was a misconception that you had about the sciences when you came to Dartmouth?
I thought I was good at science because AP Biology was easy for me, but that was wrong; I didn’t realize how difficult and demanding - and rewarding - college science would be.

What are your plans after graduation?
I hope to complete a Master’s in Philosophy in the United Kingdom and then an MD/Ph.D, likely heading towards pediatric psychiatry as a research physician.

What are some things that the most successful STEM students you know have in common?
I have seen that the most successful students tend to study early and often, and get together to talk over lectures, homework, etc. I would say that explaining things to other people ensures you know it and strengthens your knowledge.

How do you balance your activities and studies?
You could say poorly, in one sense, because I think academics are important but not everything. A liberal arts college education should not be the narrow-focused grade/goal-grub that career-oriented individuals often choose or at least espouse. There are many places to learn outside the classroom/grading setting, for example, by working in a lab and actively engaging in that work, not just doing it for resume-pumping. The same goes for community service and other activities.
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

80–120 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 general chemistry

Prerequisites for the Major:
Mathematics 3, 8, and 13 (or equivalents); and Physics 13–14 (strongly recommended) or 3–4 or 15–16
Interview with Brendan Wang ’15

Did you come to Dartmouth knowing you wanted to major in chemistry?
I took two chemistry classes in high school and really enjoyed them. I decided to keep taking chemistry courses and other prerequisites (physics, math, etc.), all of which I found intellectually fulfilling. I continued with them, and now I’m a major!

What did you find most helpful or necessary to succeed in chemistry classes?
What I’ve found in chemistry courses more so than many other courses is that the coursework is relentlessly cumulative. It’s an incredible uphill struggle to study more than a week’s worth of material at once. I have only taken one chemistry course where the weekly problem sets were graded, so sometimes its quite easy to prioritize other coursework over chemistry coursework. The most helpful bit of advice that I have for success in chemistry courses is to start studying early and in small but frequent chunks. Studying with a friend in the same class is also incredibly helpful and motivating.

How do you think Dartmouth’s chemistry department has helped prepare you for life after graduation?
Chemistry courses are an interesting mix of quantitative and qualitative reasoning, and its this balance that I think has prepared me well for working after graduation. The introductory chemistry courses (5/6/10) and the physical chemistry courses (75/76) are particularly math-intensive, and my attention to detail has definitely increased greatly from these courses. The organic chemistry sequence (51/52 or 57/58) and inorganic chemistry (64) are more qualitative courses, and involve serious problem solving skills. The major is divided pretty evenly into courses that are quantitative and qualitative, and the skills acquired through these classes definitely lead to a well-rounded skill set.

“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 enter Dartmouth’s 4+1 Master’s program to study 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 gives students essential problem-solving and critical thinking skills that can be used 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

10-50 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
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 graduated in the 2013-2014 academic year

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.
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.”

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, and 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. Its 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
13 biomedical engineering majors graduated

40-70 students in introductory and prerequisite courses

10-90 students in upper-level classes

Prerequisites for the major:
Math: 3, 8, and 13, or 11
Physics: 13-14 or 15-16
ENGS 20 or COSC 1 and 10

Average 2013 BE starting salary: $64,539
“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. Teamwork related skills are more valuable than any one additional course.”

Holly Wilkinson, Assistant Dean, Academic and Student Affairs

Interview with Sarah Hammer ’15

Hammer is the head of the Society of Women in Engineering 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, University of Pennsylvania and 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 them 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. Sarah emphasizes that: It’s important for people to not stop looking for labs. Some people go into their first internship and feel stuck there or don’t like it and give up. Even now, there are 32-year olds that were doing one field of science their entire life and recently changed to a completely different one.

Sarah did research at the University of Pennsylvania in a chemical engineering lab her freshman summer but says about her experience that she didn’t realize that she didn’t like her project that much until the next summer, where she started working in a lab where it “clicked.” Sophomore summer, she did Presidential Scholars research with Professor Lee Lynd in the engineering department, researching chemical and biological engineering on biofuels. Professor Lynd had been her professor in Engineering 22, and she got to know him at small group lunches that he held for students. She did a Hanover FSP during her sophomore spring working in his lab full-time. She was struck by the “stark difference between how excited she could be about different projects.”

Students walk through the MacLean Engineering Sciences Center.
Environmental Studies

The Environmental Studies program at Dartmouth is 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 issues into addressing and understanding environmental dilemmas.

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

48 environmental studies majors
and 21 minors graduated in the 2013-2014 academic year

20-60 students in introductory courses
5-40 students in upper-level classes

Introductory courses:
2: Introduction to Environmental Science
3: Environment and Society
11: Humans & Nature in America

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
Some students pursue careers in law or business, with environmental management – an area where there are corporate placements and opportunities in MBA programs -- 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 then attend graduate school in public policy, applied economics, and environmental science and policy. Some go to environmental consulting firms, while others pursue MS or Ph.D. programs.

“Since we integrate context 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. In a way, ENVS is 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

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 was more pure science focused.

What are you doing now? What kinds of jobs are open 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.

52 mathematics majors graduated in the 2013-2014 academic year

20–60 students in introductory courses

5–50 students in upper-level classes

Paths through the major:
pure, applied, and mathematics for education*

*The mathematics education track provides preparation for a 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
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 Michael Kwa ’15

How do you think Dartmouth’s Mathematics department has prepared you for life after graduation?

My coursework within the department has greatly enhanced my ability to think critically and analytically about mathematics and information in general. The department has done a fantastic job of showing students the many applications of math outside of the classroom through lectures, competitions, and campus events hosted by the department.

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

Explore different areas of mathematics outside of the core curriculum! Mathematics is a very rich field with a variety of interesting applications and the mathematics department does a great job of touching many different fields. This is how I found some of my most enjoyable classes at Dartmouth, and what inspired me to become a math major.
Neuroscience

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

While students cannot modify Neuroscience with another major, they are free to 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

20-60 students in upper-level classes

Introductory courses:
6: Introduction to Neuroscience
or Biology 34: Neurobiology

Prerequisites:
Four quantitative courses
including, but not limited to:
Math: 3, 8, 10
CS: 1, 10, 31
Physics: 3, 4, among others

Related Extracurriculars:
Active Minds
Aspire
Dartmouth Bioethics Group
Careers
Neuroscience majors often pursue an M.D. after graduation, with a specialty in Neurobiology upon practicing. Another popular route for majors is graduate school, which can lead to neurobiological research in a variety of fields including, but not limited to, optometry/endocrinology, or a career in academia and teaching.

“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 Christian Chai ’15

What initially drew you to Neuroscience?
I was initially drawn to the neuroscience major because it provided an opportunity to engage with the hard sciences and psychology simultaneously. The multidisciplinary nature particularly impelled me--many different subjects appealed to me when declaring a major, and neuroscience was best able to synthesize my interests into a cohesive course of study.

What do you find to be the most interesting thing about the field?
I find it very satisfying to be able to relate to the field on an experiential level. With only a bit of abstraction, neuroscience becomes a very philosophical study, and it is something that really is very relevant to everyday life.

What do you hope to do with your major?
Post-graduation, I plan on attending medical school. However, health policy has always appealed to me, so I’d ultimately like to involve myself in something of the sort as well.
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 and 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: Introductory Physics I
14: 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 a wide variety of careers after graduation. Ranging from masters and Ph.D. work in cosmology and quantum mechanics to heavily-quantitative financial modeling and analytics, outcomes for physics & astronomy majors rely on the critical thinking skills developed throughout the major that allow students to excel at Dartmouth and beyond.

Professor Robyn Milan teaches Honors Introductory Physics I 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 been working 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 turned out to be what 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. Being involved with both theoretical and experimental physics her freshman year with Professor Caldwell and Professor Lynch, Nina was able to realize that theoretical physics was what 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, with the right planning, students can definitely accomplish this feat.

**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 early planning (D-plan, course sequencing, and prerequisites), meeting with faculty and prehealth 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 developing 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 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

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Interview with Brendan Wang ’15, Chemistry major

*What would you recommend students do to find research/be considered for research by a professor? (I.e. Should they have prior experience, what classes should they take in the first year, etc.)*

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/](http://www.dartmouth.edu/~ugar/) for more information about contacting professors, receiving financial support for research, and research opportunities available at Dartmouth.*
Thinking of getting a Ph.D.?

Graduate school will push you far beyond your undergraduate education, to the edge of human knowledge. It takes between 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 test 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 planning out 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 (Gov 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 or anything else you can add?
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 (for medical school)

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 30 (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-med 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)
Pathways to Medicine

A successful medical school or health programs 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 can be found all around the world, including in New York, Boston, San Francisco, London, Tokyo, Hong Kong, and many other cities.*

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Interview with Scott Gladstone ’15, Computer Science major

What Computer Science skills were you using at your financial modeling internship this summer?

My summer internship was with a financial modeling group at an investment management firm. 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 make use of my mathematical and engineering experience to develop creative, efficient solutions to complex financial problems. I heavily leveraged the coding experience that I gained in my computer science coursework, and even though the learning curve was pretty steep, I was able to successfully integrate myself into the financial environment within a couple weeks.

Do you have any advice for freshmen 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 realized that I loved it. I worked at a private equity firm that looked exclusively at technology sector companies. It was 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 exciting I find the financial sector.
RESUME BUILDING

From the Classroom & 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 write up class and team projects in the Experience section of your resume. (Do acknowledge that the work was for a course and work with others to explain your science in language that anyone can understand.
- Access to funded research, internships, job and graduate school opportunities. A host of faculty, researchers, professionals and peers willing to help and mentor you – check out MentorNet.Net 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 the cumulative accumulation of knowledge, it is also critical for you to take full advantage of resources and services across campus. Therefore, we encourage you to:

- Meet with an academic 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. CPD staff and your faculty advisors are also available to discuss graduate school options and preparation tips.
- 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), 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.
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

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

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
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.

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. Weekly meetings are on Tuesdays at 7 p.m. in Collis 221.

Women in Computer Science (WiSC)
Sudikoff 213, Hanover, NH 03755
Email: 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.

Society of Women Engineers
Email: swe.dartmouth@gmail.com

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**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

Dartmouth Mathematical Society
Email: 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 sophomores interested in chemistry
• Chem for Kids, an outreach program to get younger students interested in chemistry

Dartmouth Chemistry Society
Email: 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 Physics Society
Email: Dartmouth.Physics.Society@dartmouth.edu
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.