Summer Opportunities in Mathematics
Summer 2020

Many students are interested in spending part of their summer learning new mathematics or exploring some career paths related to mathematics. After all, what could be better than getting paid for doing something you enjoy! Here are some links to help you research some of these opportunities. This is not a comprehensive list. Please let the department know if you know of other programs that might be of interest to Bowdoin students.

Summer Research Programs in Pure and Applied Mathematics

1. National Science Foundation Research Experience for Undergraduate Programs

Located throughout the US, REUs are eight-to-ten week programs which admit 10-12 students for an intensive experience working on mathematics research closely with a professor. The stipend for the summer is roughly $4000, and all travel and living expenses are covered.

The programs are highly competitive, targeting mainly students for the summer after their junior year who are exploring the possibility of attending graduate school. Required background usually consists of at least a course in linear algebra and mathematical proof. When researching individual programs, don’t be discouraged by intimidating project titles. The programs are designed for students just like you, and you will be taught the background necessary to participate. This is a great opportunity to learn something not ordinarily seen in any class at Bowdoin!

The application deadlines vary, but cluster around February and March. For more information, visit:

2. Park City Mathematics Institute

This is a 3 week residential program in Park City, Utah, which focuses on one topic per year. There are classes and problem sessions on this topic at a variety of levels, from undergraduate through research level mathematics. There are concurrent programs for teachers at all levels. The program offers a smaller stipend, and its short length allows students to do some mathematics and spend some of the summer at home or elsewhere. This year’s topic is Number Theory Informed by Computation. For this program, they require students to have completed at least one of Analysis or Group Theory or Ring Theory.

https://pcmi.ias.edu/program-index/2018

3. Research in Industrial Projects/ Sites in UCLA and Singapore

“The Research in Industrial Projects (RIPS) Program provides an opportunity for high-achieving undergraduate students to work in teams on a real-world research project proposed by a sponsor from industry or a national lab. “Projects are selected to have a major mathematical component and to be something that will pose an interesting challenge to talented undergraduates. Recent projects have included how to do a physics-based animation of a lava lamp, how to stitch together two images, how to analyze cancer data using microarrays, statistical data assimilation methods for weather data, modeling particle transport phenomena in reactors, and designing missions to the moons of Jupiter. This is just a sampling of the types of projects assigned to RIPS teams. New industrial sponsors join the RIPS Program each year and the same projects are never repeated.” Graduating seniors are eligible to apply!

http://www.ipam.ucla.edu/programs/student-research-programs/
4. **Summer@ICERM – A special institute at Brown University**

ICERM is designed for a select group of 14-16 undergraduate scholars. Students work in groups of two to four, supervised by faculty advisors and aided by teaching assistants. This year’s topic is Fast Learning Algorithms for Numerical Computation and Data Analysis.

https://icerm.brown.edu/summerug/2018/

5. **MSRI-UP – A summer program at the Mathematical Sciences Research Institute in Berkeley, CA**

The MSRI Undergraduate Program (MSRI--UP) is a comprehensive summer program designed for undergraduate students who have completed two years of university-level mathematics courses and would like to conduct research in the mathematical sciences. The main objective of the MSRI-UP is to identify talented students, especially those from underrepresented groups, who are interested in mathematics and make available to them meaningful research opportunities, the necessary skills and knowledge to participate in successful collaborations, and a community of academic peers and mentors who can advise, encourage and support them through a successful graduate program.

In 2020, MSRI-Up will focus on Branched Covers of Curves. The research program will be led by Dr.Edray Goins, Professor of Mathematics at Pomona College.

· https://www.msri.org/up

6. **SIAM and AMS Databases**

The Society for Industrial and Applied Mathematics and the American Mathematical Society also maintain long lists of summer research and other opportunities on their student webpages

· http://www.siam.org/students/resources/fellowship.php
· http://www.ams.org/employment/undergrad.html

**Statistics Programs**

1. The US Census Bureau summer internship program seeks students interested in statistics. For more information, see:

   http://www.census.gov/about/census-careers/opportunities/programs/student.html

2. **Summer Institute for Training in Biostatistics**

   “SIBS was designed to provide undergraduate and beginning graduate students with intensive training in applied biostatistical methods and to expose them to graduate school and career options in the fields of biostatistics, statistics, and public health. Students take a two-credit hour graduate-level course in introductory applied biostatistical methods, they attend seminars and panel discussions featuring faculty, staff and alumni, and participate in field trips to local public health institutions as well as in numerous social activities.”

   The host institutions for SIBS in 2019 were: Boston University Medical Campus, North Carolina State/Duke, Emory, University of Colorado, Denver, Univ. of Iowa, Univ. of Michigan, USC. Check website for 2020 dates and locations.

3. Mayo Clinic

https://www.mayoclinic.org/jobs/internships/biomedical-statistics-informatics/overview

“The Biomedical Statistics and Informatics Internship provides a learning experience for both undergraduate and graduate students interested in participating in the analysis of ongoing research projects conducted at Mayo Clinic. This annual summer program begins in late May or early June (depending on candidate availability) and lasts a minimum of 10 weeks. During the Biomedical Statistics and Informatics Internship, you have an opportunity to enhance your computer and statistical skills while working under the direction of a lead statistician or lead bioinformatician.”

4. Dort College Undergraduate Research in Biostatistics

http://www.dordt.edu/academics/programs/math/statgen

“Every summer 5-6 top undergraduate students join our nationally recognized research team for eight weeks to investigate current research problems in statistical genetics. This year the program will run from June 1 - July 24, 2020, and will take place on the campus of Dordt College, in Sioux Center, Iowa. A $4,000 stipend will be provided along with free on-campus housing. We will also cover travel costs to and from campus at the beginning and end of the program, as well as other travel costs incurred as part of the program (e.g. travel to conferences to present research results) For students participating in the research program, their experience goes well beyond the typical summer research program. Critical components of our program are to bring research results forward to publication in leading peer-reviewed journals and to present our work at national and international conferences of statistics and genetics. Most students participating in our program use it as a stepping stone to Ph.D. programs in statistics, biostatistics, statistical genetics, bioinformatics and other related disciplines.”
The topic this year will be statistical genetics.

5. Research Experience for Undergraduates in Statistics and Industrial Mathematics at WPI

“This nine week program offers outstanding undergraduate students the opportunity to work on mathematical and statistical problems in close collaboration with faculty and industrial sponsors.

The program is designed to provide a glimpse of the ways that advanced mathematics is used in the real world to solve complex problems. The students work on problems which begin with a real-life problem generated by our industrial sponsors. They work closely with a company representative to define the problem and develop solutions of immediate value to the company. They are guided by a faculty advisor to maintain a clear focus on the mathematical issues at the core of the project.

What is the role of a mathematician in business and industry?
What is it like to work with technical experts on a problem that requires significant mathematics but also must satisfy real-world constraints?
What kind of mathematical and statistical tools are used to solve problems in business and industry?
The REU program at WPI provides a unique experience that answers these questions, an experience that complements standard academic training.”
https://labs.wpi.edu/cims/initiatives/reu/
6. Summer research experience for undergraduates at UConn Health: Data and Models in the Biosciences

Technological advances in the measurement of molecular events in cells and tissues make it possible to obtain detailed information about the wide variety of dynamic processes that control the development and functioning of organisms. This has given rise to a systems approach in biology and biomedicine, which captures these processes at the systems level through the language of mathematical models. Accordingly, the scientific focus of this program is on the development, implementation, and application of mathematical algorithms to problems in biology and biomedicine.

https://health.uconn.edu/quantitative-medicine/biomath/

7. A database of statistics internships (lots and lots and lots of them) can be found at: https://stattrak.amstat.org/2019/12/01/2020-internship-listings/

Mathematical Biology Programs

1. Mathematical and Theoretical Biology Institute in Tempe Arizona (ASU)

"This intensive eight-week summer research experience for undergraduates in Tempe, Arizona prepares promising young scientists interested in working at the interface of mathematics, statistics and the natural and social sciences for the rigors of graduate studies."

https://mtbi.asu.edu/SummerProgram

2. National Institute for Mathematical and Biological Synthesis in Knoxville, TN

"Looking for a fun and challenging summer research experience? The Summer Research Experiences (SRE) at NIMBioS for Undergraduates and Teachers provides undergrads in math, biology and related fields, as well as high school teachers in mathematics and biology, the opportunity to conduct research in teams with UT professors, NIMBioS researchers, and collaborators on projects at the interface of math and biology. During this eight-week summer program, undergraduates live on the UT-Knoxville campus and work in collaborative teams on a variety of biological research projects using mathematical methods. The topics change each year and cover a range of life science areas including disease and health, evolution, ecology, molecular biology and more."

http://www.nimbios.org/sre/

3. Mathematical Biosciences institute at Ohio State University

This year’s data has not been updated yet, so here is last year’s information:
"The goal of this MBI NSF-funded program is to introduce students to exciting new areas of mathematical biology, to involve them in collaborative research with their peers and faculty mentors, and to increase their interest in mathematical biology. The program consists of three parts - each including a mix of educational and social experiences:

Mathematical Biosciences Bootcamp (mid-June) at MBI
Participants are introduced to various areas of the mathematical biosciences via lectures, computer labs, and visits to biological labs on campus.
Mentored Research Experience (mid-June to early-August) at the REU host sites
Participants complete a mentored research project individually or in pairs at one of MBI's partner institutions. Participants also attend a weekly online seminar series and virtual all-program meeting. Capstone Week (early August) at MBI
Participants return to MBI for a wrap-up week featuring student talks and posters, keynote talks by prominent mathematical and biological scientists, and Q&A panels.

http://mbi.osu.edu/education/summer-undergraduate-program/

Special Programs for Women Interested in Mathematics

1. Institute for Advanced Study (Princeton University)

http://www.math.ias.edu/wam


"The program brings together research mathematicians with undergraduate and graduate students for an intensive 11-day workshop on the campus of the Institute for Advanced Study which is designed to address issues of gender imbalance in mathematics. Founded in 1994, the program includes lectures and seminars on a focused mathematical topic, mentoring, discussions on peer relations, an introduction to career opportunities and a women in sciences seminar."

2. The Edge Program

http://www.edgeforwomen.org/

"This program is intended to enhance the diversity of women in mathematics graduate programs. It is intended for women planning to apply to graduate school in mathematics and provides a solid introduction to topics you will see during your first year in graduate school."

Dates: June 1-26 at Brown University

Assorted Other Opportunities

1. National Security Agency Programs

The NSA offers several programs for rising seniors (and exceptional younger students). Students applying to these programs should be able to, and taken either abstract algebra or number theory. These programs will accept small numbers of exceptionally strong students. Applications are always due around November 15 for the following summer, so this is something you might consider for next summer. The full list of programs offered for undergraduates at the NSA can be found through the following link:

2. NASA Internships

"NASA Internships are educational hands-on opportunities that provide unique NASA-related research and operational experiences for high school, undergraduate, and graduate students as well as educators. These internships integrate participants with career professionals emphasizing mentor-directed, degree-related, real-time world task completion. During the internship participants engage in scientific or engineering research, development, and operations activities. In addition, there are non-technical internship opportunities to engage in professional activities which support NASA business and administrative processes. Through these internships, participants leverage NASA’s unique mission activities and mentorship to enhance and increase their professional capabilities and clarify their long-term career goals."

https://intern.nasa.gov/

DEVELOP and LARSS are popular programs. The location that accepts the most applicants is Langley in Virginia, and some of the more coveted locations are Goddard, Ames, and JPL in D.C. and California. Coding experience is helpful, but not required, for instance experience with one of GIS, Matlab or Python.

Mathematics Teaching Opportunities

1. Working as a counselor in a summer math program

There are a number of summer math programs for high school and junior high school students who accept undergraduates as counselors or teaching assistants. You can find a comprehensive link at

http://www.ams.org/employment/mathcamps.html

Follow up to see whether there is an application for a counselor position. This can be a fun way to do a little teaching of mathematics and encourage younger students who are interested in math.

One particular such program is PROMYS, based in Boston which does use undergraduates from a variety of schools to help teach number theory to high school students. You should not apply to this program unless you have had some number theory. Prof. King works with this program – please see him if you are interested in applying.

http://www.promys.org/home

2. Teaching and Residential Assistants at Summer Academic Programs are available at many of the large New England boarding schools. Openings for these positions can be researched through CXD. Schools include Loomis Chaffee, Exeter Academy, and Northfield Mount Hermon.

3. Gifted and Talented Summer Programs hire college students as teaching and residential assistants. These positions are usually posted in December to January. These include:

- The Center for Talented Youth (Johns Hopkins University)
  https://cty.jhu.edu/jobs/summer/positions/residential/teaching_assistant.html

- Duke TIP
  https://tip.duke.edu/about/seasonal-employment-tip

- Summer Institute for the Gifted has programs at many different locations throughout the country.
Mathematics for Social Justice Programs

1. Voting Rights Data Institute, run by Moon Duchin, who spoke about her work at Bowdoin in 2017. The 2020 program has not yet been announced, so check the website for more details.

http://gerrydata.org/

2. Data Science For Social Good summer fellowship at Carnegie Mellon University

"The Data Science for Social Good Fellowship is a full-time summer program to train aspiring data scientists to work on machine learning, data science, and AI projects with social impact in a fair and equitable manner. Working closely with governments and nonprofits, fellows take on real-world problems in education, health, criminal justice, sustainability, public safety, workforce development, human services, transportation, economic development, international development, and more."

http://www.dssgfellowship.org/

3. Nebraska Summer Research Experience: Social Network Analysis for Solving Minority Health Disparities

https://www.unl.edu/summerprogram/health

They will run two projects:

Network Risk of HIV & HCV Infection in Rural Puerto Rico
"This project investigates the social network contexts of HIV and HCV infection drawing on data from four rural communities in Puerto Rico collected in 2014-5. The emphasis of this project will be on the use of block modeling and network statistical analysis to isolate indicators of high risk that result from dyadic relationships among injectors and the injection "roles" that result from these interactions"

Informal Networks in a Labrador Inuit Community
"This project investigates eight social network domains of the residents of the Northern community of Nain, Labrador. Socio-demographic and network data were collected between January and June, 2010 from interviews with 330 adult residents. The emphasis of this project will be on the use of network descriptive techniques and statistical analysis to study the relationships between these network domains."

Actuarial, Accounting, Insurance and Financial Analyst Internships

1. Travelers Insurance Internships

https://careers.travelers.com/job-search-results/?keyword=internship

“Our internships provide meaningful work assignments that allow interns to interact with experts and gain insight into the real working world. As an intern, you’ll have the opportunity to network with senior leaders, participate in a variety of training and development activities, and meet other interns from across the country.”
A wide variety of locations all over the country.

Many of these opportunities can be researched through CXD.

**Summer Research Opportunities at Bowdoin**

Students can sometimes do summer research with a professor at Bowdoin College. If you are interested in this you should contact your professors early in the spring semester, and check out the

https://www.bowdoin.edu/student-fellowships/summer-fellowships/index.html

page. The deadlines for application for summer research awards tend to be in late February and early March.

**Other Sources of Information on Mathematics Careers and Opportunities**

1. The American Mathematical Society
   http://www.ams.org/programs/students/students

   A site with resources for students exploring paths in mathematics, engineering, computer science, technology, health care and science.