## 8. CHEMISTRY

**Location: St. George Campus**
**Mentor: Professor Mark Taylor**

**Area of Research and Nature of Project:** Organic chemistry. The goal of this project is to develop more efficient methods to prepare oligosaccharides (sugars) of biological relevance. Working closely with an experienced graduate student, students involved in the project will gain exposure to several important techniques in organic chemistry, including carrying out chemical reactions, purifying the products, and determining their structures by spectroscopy.

**Estimated Number of Hours:** Times are flexible but at least one afternoon per week.

**Number of Students:** One to two students will be accepted.

## 9. COMPUTER SCIENCE

**Location: St. George Campus**
**Mentor: Dr. Jonathan Dursi**

**Area of Research and Nature of Project:** Scientific, Technical, and Data-Intensive computing, to give timely results and to be on the cutting edge, have to make use of parallel computing: using many CPUs at the same time. But writing such software - breaking a problem into individual parts which can be solved separately and then recombined - is very challenging. What tools and languages there are for writing such software is usually either quite old, or is designed for problems very different than scientific programming. In this project, students will take existing serial programs for simplified but relevant scientific computations, and use emerging tools to re-write them for parallel computing on clusters of PCs, or on graphics cards. The pros and cons of the different tools will be compared. The results will likely be written up as a case study and published. The problems, and the tools used, will be chosen based on the interests and knowledge of the students.

**Recommended Background:** Strong programming skills in a language like C++ or Java; strong math skills.

**Estimated Number of Hours:** One to two hours per week working with mentor, with additional reading and computer homework.

**Number of Students:** One to three students will be accepted.

## 10. COMPUTER SCIENCE

**Location: St. George Campus**
**Mentor: Dr. Chris Loken**

**Area of Research and Nature of Project:** Big computing - whether for supercomputing simulations of black holes, or business analytics for Walmart sales data, or Facebook's data centres. This is done on clusters, large computers assembled from smaller ones. The challenge is in getting the smaller computers to work together on single tasks.

In this project, a team of students working with a number of experts from SciNet, will assemble a working cluster from scratch from existing PCs, and will examine the effects of different hardware and software choices on the performance of various pieces of parallel software.

**Recommended Background:** Strong computer skills.

**Estimated Number of Hours:** One to two hours per week working with mentor, with additional reading and computer homework.

**Number of Students:** One to three students will be accepted.