I worked in Carleton Laboratory, under the Columbia Civil Engineering department, during the summer of 2015. Because this was my first internship in a STEM field, I wished to test different disciplines and environments in addition to gaining general engineering skills. Carleton Lab is unique in that the lab partakes in not only research, but also commercial testing, which is contracted work done at a client’s request. Therefore, working at Carleton exposes me to both traditional academia and industry-focused academia.

As a Carleton “labbie”, I joined a commercial testing team, which was composed of two juniors, Sarah and Wilton, and was led by a graduate student named Alex. Our team was tasked with finishing the analysis of a novel composite material and reporting our findings, the culmination of a three-year-long project for a client.

The team dynamic was relaxed, and we each did a bit of everything, but I worked with Sarah the most. The first thing I did was read literature to familiarize myself with the civil engineering jargon, and read the previous years’ reports. There was some lack of continuity between previous project managers, so we were kept quite busy with correcting in any oversights from work done by past lab assistants. We spent most of June machining different samples of the composite material, for which I gained valuable mechanical skills with the Baleigh horizontal bandsaw, vertical band saw, grinder, and lathe. During this time, we made hundreds of samples of the material, to be tested under various conditions. July and August was a constant cycle of testing our samples, analyzing the data, and writing reports based on our experiments.

Although the tests we ran were based on ASTM standards, we designed the testing specifications. For instance, one of the tests we ran, flexural creep, involved subjecting the material to a constant load to determine the material’s deformation behavior over time. The flexural creep test was not run during previous years, which meant we had the opportunity to
design the mechanisms ourselves. We identified parameters to test based on the ASTM standard, and then created a custom-built rig to hold and measure 18 samples and their loads, which varied from 15 lbs to 98 lbs, for 500 hours. We also devised a schedule for measuring the material deformation and whipped up an Excel spreadsheet for calculating the creep modulus, the ratio of initial stress to creep strain.

I am quite proud that we managed so many tests in just two months (July and August). Alex, at this time, had begun working part-time with a civil engineering firm because he too wanted to try out different working environments this summer, and had also taken a two-week vacation. This meant that we, the three lab assistants, were largely autonomous and responsible for the project’s timely continuation, an experience that not many other undergraduate lab assistants receive. We ran UV corrosion tensile tests, which measured the material’s tensile strength after varying days of ultraviolet radiation (ranging from 7 to 50 days). We ran freeze thaw tensile tests, which measured the material’s tensile strength after various cycles of extreme cold and hot temperatures (ranging from 150 to 300 cycles of temperature fluctuations). We also ran thermal aging tensile tests, which measured tensile strength after exposure to different temperatures (ranging from 140°C to 210°C) for varying amounts of days (from 7 to 50 days). In addition to the flexural creep test, we ran fracture toughness tests, which measured the material’s ability to resist fracture given that the material contains a crack. That’s a lot of testing!

During the testing phase of the summer, I learned how to use the two different kinds of Instron machines, and polished my documentation skills by recording all data on the cloud and photographing each test. All data processing was kept redundant, to ensure that no data was lost. Even with our precautions, we lost data for one batch of samples, but the lost data was not vital thanks to the sheer volume of data we had already gathered.
Then, we analyzed the data that came from each tensile test, calculating stress and strain values throughout the test and calculating the ultimate load, the serviceability failure, the chord modulus, and the strain at failure. Any observations on data anomalies or testing anomalies were also included in our analysis. We presented this analysis in an agreed-upon custom format, and met with the client to check on the status of the project.

Simultaneously, we compiled the final report for this three-year-long project, which by the end of my internship, had stretched to over 1,500 pages. We standardized the presentation of the data (e.g. graph styles, font styles, editing styles), and asked the other lab assistants to copyedit in their free time — compiling the final report involved all of the lab summer hires.

It’s important to note that throughout this entire essay, I have used the word “I” sparingly, because “we” is much more accurate. My internship was very much a team effort because engineering is foremost a team sport, and the interpersonal skills I’ve gained through this internship will reappear throughout my entire STEM career, no matter the engineering discipline I choose to work in.

Furthermore, having applied to the lab as a freshman with no prior experience, I am thankful that the lab saw enough potential to hire me. Working at Carleton was a great way for me to understand the relaxed environment of academia, as well as get a sense of the industry counterpart through the stories from upperclassmen in the lab.

Finally, although this internship did not point me to a definite career path for me, I am glad to have finally used classroom concepts in real life, and to have met the amazing people at the lab who have given me support and advice throughout the summer. Carleton was a great experience, and I’d encourage any civil or mechanical engineer to apply!