This summary includes answers from all respondents who took the survey in the 43-day period from Thursday, August 13, 2015 to Thursday, September 24, 2015. 53 completed responses were received to the survey during this time and represents 76.8% of the total number of students who held a Work Learn International Undergraduate Research Award position during the summer (May to August). This sample of respondents does not fully represent students by faculty or academic year level.
International Undergraduate Research Award Program

The International Undergraduate Research Award Program, now in its third year of running, supports undergraduate international students in gaining valuable workplace experience. Last summer, the program funded 41 students to conduct research across campus. This year, a total of 69 students were awarded a $4,500 grant and were paid a total minimum of $5,969.60 for a 16-week period to participate in undergraduate research that will help them achieve the following workplace learning goals (which are also the learning outcomes of the Work Learn Program):

- Mentorship opportunities
- Professional skill development
- Application of knowledge
- Developing a network
- Ownership and responsibility of work
- Self-awareness and reflection
- Contributing to personal learning goals and the University as a whole

Award Allocations by Faculty

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>18</td>
</tr>
<tr>
<td>Arts</td>
<td>12</td>
</tr>
<tr>
<td>Applied Science</td>
<td>12</td>
</tr>
<tr>
<td>Sauder</td>
<td>13</td>
</tr>
<tr>
<td>Land &amp; Food Systems</td>
<td>5</td>
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<tr>
<td>Forestry</td>
<td>7</td>
</tr>
<tr>
<td>Kinesiology</td>
<td>2</td>
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</tbody>
</table>

Student Profile

The majority (55.1%) of the international undergraduate research award winners was female (Female: 38, Male: 31). Most of the recipients were in their 3rd year of studies (40.6%), 33.3% were in 4th year, 23.3% were in 2nd year, and two students (2.8%) were in their 1st year of studies.
45.3% of students heard about the undergraduate research award program through their department or faculty. Nine students (17.0%) were asked directly by their professor to apply, while five students (9.4%) heard about the program through the students.ubc.ca/careers website. About half of the students (50.7%) reported having no prior research experience and 34.5% of students held one or more jobs during the summer in addition to their research position. During the summer, 20% of students reported working between 41-50 hours per week, 56.4% worked between 31-40 hours, and 12.7% worked 25-30 hour per week. 79.7% of students spent 60 minutes or less commuting to and from campus, while 2.9% spent between 1-2 hours commuting both ways, and 17.4% live on campus.

### Why Students Seek A Research Placement

The top three reasons students choose a research position is to gain experience and professional skills in a research lab (68.1%), to test out a possible future career in research (56.5%), and to apply their academic knowledge (50.7%). Other reasons were:

- To earn money (46.4%)
- To work closely with a faculty member (44.9%)
- To expand their network (42.0%)
- To give back to the campus community (10.1%)
- To feel more connected to campus (8.7%)

### Student Learning Experience

The majority of students (81.4%) agreed or strongly agreed that their undergraduate research position has provided them with valuable workplace experiences and professional skills development. 90.6% of students feel that their research experience has to some or great extent developed or improved their analysis and problem solving skills; 94.3% of students feel they have greatly developed or improved their initiative and motivation skills. An overwhelming majority felt that their research experience helped develop their adaptability skills to a great extent (51.0%) or to some extent (41.5%).
My Undergraduate Research position...

- Made me feel more connected to UBC: 35.8% Strongly Agree, 32.1% Agree, 24.5% Neutral
- Gave me opportunities for mentorship: 45.3% Strongly Agree, 39.6% Agree, 35.8% Neutral
- Made me feel prepared for acquiring work in the future: 47.2% Strongly Agree, 35.8% Agree, 17.0% Neutral
- Helped me see the connection between my university studies and future work opportunities: 49.0% Strongly Agree, 26.4% Agree, 17.0% Neutral
- Helped me develop transferrable skills (e.g., communication skills, public speaking, teamwork, etc.): 49.1% Strongly Agree, 32.1% Agree, 15.0% Neutral
- Was related to or helped me refine my career goals: 56.6% Strongly Agree, 30.2% Agree, 15.0% Neutral
- Helped me build a network of connections with faculty, staff, and/or students: 62.3% Strongly Agree, 24.5% Agree, 15.0% Neutral
- Was related to my academic field of study: 64.2% Strongly Agree, 20.7% Agree, 15.0% Neutral

My Undergraduate Research experience helped develop or improve my...

- Adaptability: 51.0% Great extent, 49.0% Some extent, 24.5% A little
- Initiative and motivation: 45.3% Great extent, 34.0% Some extent, 22.6% A little
- Analysis and problem solving: 58.5% Great extent, 34.0% Some extent, 22.6% A little
- Teamwork: 34.0% Great extent, 45.3% Some extent, 41.5% A little
- Organization: 41.5% Great extent, 45.3% Some extent, 39.6% A little
- Communication: 32.1% Great extent, 34.0% Some extent, 41.5% A little
98.1% of students agree that their research experience has met their expectations and 98.0% reported being somewhat or very satisfied with their overall experience. 70.6% of students think that there is good access to research opportunities for international undergraduate students at UBC and 21.6% of students are unsure if and where these opportunities exist.

Engaged Supervision
All students rated the relationship with their manager as either very positive (78.4%) or positive (21.6%). In respect to supporting student learning on the job, the majority of students felt that their supervisors provided them with effective or very effective:

- Discussion of their work expectations at the beginning of the position (88.6%),
- Orientation to the workplace (introduced to key people, tools/resources) (77.4%)
- Workplace training directly related to their work and role (71.7%)

However, 39.6% of students did not receive an exit evaluation.

Student’s Well-Being
Work Learn Undergraduate Research Award recipients must be engaged in research and development activities on a full-time basis (35 hours per week) during the tenure of the award for a minimum of 16 consecutive weeks. The majority of students (83.4%) felt their research position had either a positive or very positive effect on their time management skills; mental health and well-being (71.7%); ability to contact people from different economic, social, and ethnic backgrounds (58.5%); and participation in extra-curricular activities like student clubs/politics, volunteer activities (37.7%). 50.9% said the experience either had a neutral or no effect on their rest or sleep.

“What I Liked BEST About My Research EXPERIENCE”

<table>
<thead>
<tr>
<th>What students liked BEST about their research experience...</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
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</thead>
<tbody>
<tr>
<td>Conduct projects and timelines</td>
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<tr>
<td>Applying skills and problem solving</td>
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<tr>
<td>Exposure to new programs or equipment</td>
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<tr>
<td>Future goals/studies</td>
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<td>3</td>
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<tr>
<td>Flexibility</td>
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<td>3</td>
<td></td>
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<tr>
<td>Independence and Responsibility</td>
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<td>5</td>
<td></td>
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</tr>
<tr>
<td>People/Supervisor - networking, diversity, connections, students, faculty, mentorship</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research and gaining experience</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19</td>
<td></td>
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</tbody>
</table>

5
Student Comments:

“I liked the flexibility of the work and being able to interact with other students working on their own research projects in the math department.”

“Getting to know graduate students and post-docs from a variety of backgrounds and working together with them”

“The most valuable part of this experience for me was having the guidance and mentorship from my supervisor. Her taking the time out of her busy schedule and patiently explaining the significance and process of things to me step-by-step when I was unsure was beyond expectations, to which I am eternally grateful for. The patience and understanding from my supervisor definitely enhanced this experience for me and enabled me to learn more than I would have without her”

“Ability to engage in “real-life” research, better understand underlying complexities in doing research, greatly improved Excel skills. I enjoyed tasks that allowed me to problem solve; eg. manipulating large data sets through Excel by discovering and learning about various Excel functions and commands.”

“Maintaining and recording the research data from experiments was particularly helpful for me to gain better organization skills. There were plenty of graduate students and mentor figures there to correct my lab technique and offer good experience in experimental procedure.”

“I enjoyed being exposed to the research side of working in my field. I liked the fact that we were answering a question that could be useful in future experiments and possibly shed some light on the effects of urban and agricultural run-off on fresh water systems that may currently be overlooked; it gave me a sense of purpose in my work.”

“This experience enhanced my self-motivation and project management abilities, and also improved my technical skills on modeling and control system design.”

“The experience allowed me to get further understanding of the research experience here at UBC in a field that I really enjoy. I have made some great contributions to the lab and have met some fantastic people. What’s really great is that this experience has allowed me to become a better researcher as a whole.”

“The opportunity to focus on research without having to worry about my financial situation. The high level of flexibility of the award: can select my mentor myself, decide with that person on the type of project and work that I would do. Looking back, I got personal and academic growth from the experience.”

“I love how I am being engaged not as an undergraduate in my work but as a colleague. My opinion matters. I also loved how I am left to be independent in my work.”

“I like how this experience confirmed my goal to pursue further education. Also, my supervisor allows the students to design their own experiment and assists with the project by providing great advice.”
What I Liked LEAST About My Research EXPERIENCE:

<table>
<thead>
<tr>
<th>Suggestion</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>More awareness and promotion for the program</td>
<td>14</td>
<td>28.6%</td>
</tr>
<tr>
<td>More funding, more awards, and create more opportunities for international students</td>
<td>9</td>
<td>18.4%</td>
</tr>
<tr>
<td>No change/ No suggestions</td>
<td>6</td>
<td>12.2%</td>
</tr>
<tr>
<td>Organize Events for students to attend; more student involvement</td>
<td>5</td>
<td>10.2%</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>10.2%</td>
</tr>
<tr>
<td>Give students a better idea about what to expect during a work learn position; standardized system</td>
<td>4</td>
<td>8.2%</td>
</tr>
<tr>
<td>Raising Salary</td>
<td>2</td>
<td>4.1%</td>
</tr>
<tr>
<td>More/Less time</td>
<td>2</td>
<td>4.1%</td>
</tr>
<tr>
<td>Ensure that the supervisor takes an active interest in the student’s learning</td>
<td>1</td>
<td>2.0%</td>
</tr>
<tr>
<td>Encourage participating professors to publish material including the students involved.</td>
<td>1</td>
<td>2.0%</td>
</tr>
</tbody>
</table>

Total Responses 49

Student Suggestion:
### APPENDIX 1 - RESEARCH PROJECT ABSTRACTS

For this project, I conducted policy-related research on topics relating to conservation. More specifically, the central objective of this research project was to produce a detailed, empirical account of the current state of implementation of, and engagement with the Aichi Biodiversity Targets within Canada. This objective has been achieved through content analysis of policy documents that reflect the activities, initiatives, and decisions of state and non-state actors engaged with the Aichi Targets in various capacities within Canada. The following research questions have guided empirical inquiry: What specific policy responses to implementing the Aichi Targets are underway? Which agencies/actors are involved? What are their roles? What is the focal scale of various initiatives? What is the status of the response (aspirational or implemented)? The work performed has included (1) conducting systematic content analysis of 142 documents using a Qualitative Data Analysis software and (2) synthesizing this information in the form of a written report with a potential for publication. These activities have provided an excellent opportunity to engage with qualitative research methods.

I was in charge with a project that I was working on for my directed studies. The topic is surrounded by the theory of meaning maintenance model, which proposes that individuals strive to understand their environments in a sensible way. When they don’t experience events in this way, they are likely to adapt what is known as belief affirmation. It is essentially adhering to commonly held beliefs when a situation is ambiguous and can’t be interpreted in a sensible way. My role was an experimenter. Other than running experiments, I also trained a few individuals to be our research assistants. I also helped with promoting the study outside of campus to get non students to participate. Other than this, I helped with another project on implementing questions for an experimental and control condition. So far, our sample size has increased and doubled from when we started but it is still not large enough for us to analyze the data.

One of the projects I worked on is fear of falling and sway perception. It involves measuring the subject’s EMG and rate of sweating while having them stand normally and paying attention to their own posture sway. I was involved in participant recruitment, set up and data collection, making sure that data collected is reflective and honest. Another project is a novel study on balance in patients with Parkinson’s disease. I helped to recruit elderly participants, arranged the testing schedule and collected the data to perform some simple statistical analysis. We were able to finish data collection for this study and piloted for future study that can be built upon the results of the data. The third project is related to the relationship between balance performance and social anxiety. I helped with participant recruitment, experiment setup, data collection and sent the data to the principal investigator who is currently overseas.

The project is the development of graphical user interface (GUI) for da Vinci surgeon console, which integrates the user’s eye-gaze and voice commands for ultrasound machine control. In this project, I did a research on which ultrasound machine parameters are commonly changed during the surgery, and on the intuitive design of the GUI. Then, I designed and developed the GUI using multiple programming languages, and performed system integration which involved the configuration of different kinds of hardware. Finally, I performed an initial usability testing on the GUI by actually running the GUI on the da Vinci surgeon console.

My research project is 'biomass gasification'. It is from chemical and biological engineering. I am very grateful that my supervisor, Naoko Ellis and Xiaoto Bi, provided this opportunity for me. During this period, I have done lots of work and experienced a lot from it. This is a very promising project which consists of two main fluidized beds (bubbling fluidized bed, circulation fluidized bed). Bubbling fluidized bed (BFB) acts as a main reactor in the system, inputting biomass (usually is tree chips) and air for combustion, while CFB (circulation fluidized bed) emphasizes on combustion. Because the gasification will reach its perfect condition at 800-850 (Temperature), the CFB needs to combust natural gas for heating up sand in the system. When the system operates, sand will be moved as fluid, so the temperature request in the BFB will be accomplished. Consequently, this system produces synthetic natural gas (CO+H2). As the material of it is only biomass, it is renewable and do not contaminate local environment. As being an intern in this team, I would like to thank Dr. Li and Dr. Chen. They are senior engineers and are in charge of this project. When I have questions, they are enthusiastically answers me, and provide me a series of work experience in this summer. As a worker, my main effort emphases on repairing. Helping them to repair and reinstall the equipment. Besides, I also did the
| Effect of precipitates on foamability in flotation systems | 1) Prepare a sodium oleate solution at high pH and perform a titration test; gradually add small amounts of acid and do the turbidity measurements as a function of pH to see the turbidity changes as a function of pH to detect the formation of precipitates. Use water turbidity as the reference point. This needs to be done as a function of concentration of sodium oleate and immediately after solution preparation to prevent solution ageing. 2) Test different methods for preparation of sodium oleate solutions, and come up with a procedure for each. 80% pure sodium oleate powder and 99% pure oily oleic acid are available for this purpose. Another method to be tested is Klassen method. Measure turbidity of solution in each method. It would be also good to determine particle size distribution if possible. 3) Perform the foamability and gas dispersion measurements in sodium oleate solutions as a function of concentration at pH 6.5 (and lower), at which precipitates are the dominant species, and determine the conditions at which bubble coalescence occurs; Concentration: 5, 10, 20, 30, 50, 70 mg/L pH: 6.5, maybe 4.5 Results: Bubble size measurements and observations 4) Perform foamability and gas dispersion measurements at a pH as high as 8.5 (where the gas is dispersed and foamability is good) and increase the amount of precipitates by increasing concentration; pH: 8.5 Concentration: 70, 100, 200 ppm Results: Bubble size measurements and observations 5) Allow suspension containing precipitates to settle for two days and then decant them, first measure turbidity and then measure the frothing ability of decanted solution and compare to original case; This could be done following the tests in item 1 for high solution concentrations of solutions. 6) Compare the effect of fatty acid preparation method on the precipitates' behavior. Prepare oleic acid following the procedures introduced by Klassen and check how this affects foamability; Measure turbidity of solution prepared in this method. Klassen method: Oleic acid gradually added to small volume of hot alkali liquor (in some cases containing small amount of frother), it is then added to cold water, followed by intense agitation. Then repeat tests in item 1. 7) Investigate Livshits and Dudenkov's claim that increased concentration of flotation frother can restore foamability of the flotation system depressed by the precipitating hydrophobic species; Perform tests in item 4 at increasing concentrations of frother 8) Investigate the effect of hydrophobic particles (e.g. talc) and hydrophilic particles (quartz) on foamability of the fatty acid foams (in comparison to the foams formed in the absence of such particles); The size of these particle is also important! 9) Perform gas dispersion and foamability tests in a frother (MIBC) solution with artificial seawater (0.6 M NaCl solution + 1300 ppm Mg2+ and 400 ppm Ca2+) versus pH in the pH range from 8 to 12 to verify how precipitating magnesium hydroxide affects foamability under such conditions. This precipitate is hydrophilic and so it is entirely different from the precipitating fatty acids.

The project I worked on for the summer is CHIME (Canadian Hydrogen Intensity mapping Experiment), a radio telescope that is currently being built nearby Penticton. My work involved measuring the mesh surface of the cylinders and analyzing those data for deviations from the ideal shape. I also conducted temperature chamber measurements of low-noise amplifiers, filter amplifiers, and cables to consider the effect of the weather conditions on the electrical components in the telescope. Other tasks involved analyzing data collected by the "pathfinder" (a smaller test version of the full telescope).

My role this summer was to produce a computer simulation to model gated diffusion of calcium ions within heart cells. Working off geometric domain designs and reaction parameters published in two key journal articles, my goal was to replicate the results of biological experiments through these simulations to hopefully gain a better understanding of the mechanisms behind this natural phenomenon. I have built up a series of increasingly complex models over the course of the term, and I am now working to understand the implications of the particular parameter values that produce an accurate simulation.

My project is to calculate Coulomb sum rules of electron scattering off 4He and 16O using coupled-cluster theory. We examined Coulomb sum rules of electron scattering off 4He and compared our results with exact calculations (hyper-spherical harmonics calculations) and also with experimental results. Our results shows difference with the exact calculations due to center-of-mass contaminations while shows fairly good agreement with experimental data.

Sex-hormone binding globulin is a protein that transports steroids and regulates the bioavailability of sex steroids in the body. Previous studies have shown that estrogen from oral contraceptives has an effect on...
The aim of my research is to identify the mechanisms of estrogen-mediated regulation of SHBG, to further understand the effects of oral contraceptives on the body. This project involves working with a reporter assay system using HepG2 and Hep89 cell lines in tissue culture. It also involves looking at natural SHBG production within these two cell lines when dosed with estrogen. Further analysis involved identifying relevant transcription factors and their relative changes in concentration. Based on the current data, the project has found that estrogen affects SHBG regulation indirectly and does not interact in close proximity to the protein’s start site. Rather, it is likely to regulate the transcription factors that bind to the SHBG gene, ones that are currently still being looked at.

Most of my work was concerned with expanding the code base for a solver of boolean satisfiability problems. In particular, the program in question is specialized in synthesizing novel stochastic local search solvers by combining pieces of existing algorithms in novel ways. The result is an effective example of programming by optimization. I expanded this program by adding to it - two modules that came from a pair of solvers that had been published more recently. I then re-ran a series of experiments to find new optimal configurations of the upgraded program, and incorporated it into a larger Java codebase.

My project studies a new type of contribution to the energy of a Maxwell system defined on a small compact manifold with non-trivial topology. This contribution cannot be described in terms of the physical propagating photons; rather it emerges as a result of tunneling events between topologically different but physically identical topological sectors. My work, in specific, examines the properties of the system in response to an external electric field and possible experimental confirmations of this contribution. I computed the various experimentally measurable quantities of the system.

During the Summer Research term, I produced MATLAB codes and scripts that allowed to extract seismic datasets from SEGY formatted files, convert data from time domain to frequency domain (applying signal analysis and processing concepts), change geometry of data matrices to reflect real seismic marine acquisition geometries, produce quality control plots by comparing amplitude residual, phase residuals and shot gathers between observed data and modeled data. These codes were used alongside with 2D frequency domain acoustic modeling and imaging codes produced by SLIM, which allowed to perform Reverse Time Migration on real datasets and produce images of the earth’s subsurface.

Replication of the RNA viral genome of influenza A virus occurs in the nucleus of the infected cells. Thus, the viral genome must enter the nucleus of their host cells in order to establish a productive infection. The influenza nucleoprotein (NP) is involved in the import of the viral RNA into the nucleus and has been proved to contain at least two nuclear localization signals (NLSs), NLS1 and NLS2. To test the contribution of these NLSs to the nuclear import of the influenza genome, previous studies have performed site-directed mutagenesis on the basic amino acids of NLS1 or NLS2. Then, using a reverse genetics system has obtained viruses with mutations on the NLSs of NP. Plaque assay results indicated that viruses with NLS1 or NLS2 mutations are non-infectious. However, the mechanism of how these mutations inhibit viral infection has not been elucidated. This study was carried out to determine which critical stage in the influenza A infectious cycle is interrupted in these mutant viruses. To do this, tissue culture cells will be infected with the mutant viruses and following the infection using immunofluorescence microscopy after immunostaining viral NPs at different time post-infection. These experiments will enable us to examine the intracellular distribution patterns of the NLS1/NLS2 mutant and wild-type NP in each stage of the viral life cycle in infected cell lines. Hence, the specific role of NLS1 and NLS2 will be determined. Collectively, our data indicate that the mutant viruses were still able to establish the infection at a slow rate in comparison to wild-type viruses. NP was able to be transported into the nucleus of the mutant viruses-infected cells at early time post infection, but the assembly or export of vRNP was impeded at 18h and 24h post infection. The understanding of NLSs function during influenza infection will lay a foundation in establishing viral genome nuclear entry inhibitors that could be developed as next generation of anti-influenza A virus drug.

In this project, Fourier transform infrared (FT-IR) spectroscopy and Raman spectroscopy were used for the determination of antioxidant activity and antioxidant content in different varieties of blueberry. The antioxidant activity of these blueberries were also determined using traditional chemical assays, including
DPPH, TEAC, F-C, and ORAC assays to provide correlation. I performed this project individually with the training by a graduate student who has conducted the counterpart experiment with chocolate. Up to now all the chemical assays are finished, while the data obtained from FTIR and Raman spectroscopy were not consistent. Further exploration about other pretreatment method for spectroscopy detection is needed.

I was asked to help Dr. Crawford conduct research on how best to improve the student experience for his course on multinational corporations as political actors. I conducted research into different experiential learning techniques, methods of increasing class participation, and potentially relevant topics and areas of interest not covered in the course in question. I carried out an extensive literature review and worked with a focus group to gauge student expectations of innovations in the classroom and what they saw as potential areas for improvement. My work allowed Dr. Crawford to make more informed decisions on how best to reformat his course to appeal to changing student expectations.

The project is to model an integrated thermal hydronic system using Simulink and design control system to optimize the performance of the system. As the research assistant, my tasks include system components (solar thermal collector, heat pump, heat exchanger, etc.) modeling by using Simulink, control system design and system optimization. By conducting advanced research, consulting heat transfer and control experts, and analyzing test data, I have made the project an important step forward towards the final goal, an optimized integrated solar thermal system, which supplies desired DHW with minimized components cost and electrical energy consumption. In turn, this job experience has been improving my understanding of heat transfer, fluid flow, and mechanical design continuously and dramatically.

I have been working on several projects as part of my work. All of the projects that I work on are centered on student learning in introductory Physics labs in UBC. One such project is to investigate critical thinking in a particular experiment performed by students in a course over 3 years. Together with my supervisor and a colleague in Stanford University, I am writing a paper on this particular study indicating that a new pedagogical framework that is in place in the labs are effective at getting students to think more critically of their data and measurements.

I worked under supervision of Dr. Drelichman with regards to obtaining information relating to the effects of the Inquisition on different areas in Spain as part of Dr. Drelichman’s research into Spanish economic history. Tasks included quantitative tasks such as simple extraction and formatting of data and the use of macros and VBA to manipulate and sort data, as well as qualitative tasks requiring interpretation of survey questions for further research.

Saanich Inlet is a seasonally anoxic fjord. My supervisor is studying the microbes inhabiting it, in particular methanotrophs. She has previously performed the incubations on the water samples with different treatments (12CH4/13CH4/+NO2 added) and I analyzed the change in the methanotrophs abundance using the qPCR technique. I made plots in RStudio to compare how the number of methanotrophs, total bacteria and the ratio of the two change depending on each treatment. qPCR was performed on pmoA gene (specific for methanotrophs), and 16S gene to determine the total number of bacteria in each sample. In addition, I have worked with a post-doctoral researcher on Hakai environmental samples and performed DNA/RNA extractions, cDNA synthesis and PCR; I have also prepared the samples for sequencing by doing pyrotag PCR, gel electrophoresis and DNA quantification.

I worked on the design and preparation of a long term experiment meant to measure fluctuations of mind-wandering throughout the day. This includes a large review of literature, a search for technological devices and solution that would allow for such measurements, along with questionnaires and tests.

I worked on two main projects. The first was a study decomposing logs and their nutrient contents. It’s the last part of a 30 year study on how decomposing wood’s mass, nitrogen, phosphorous, and carbon change over time. I prepared the logs for analysis by removing non-woody material, ground them up into homogenous material, and worked with several people on UBC and elsewhere to complete the nutrient analysis. This involved performing digestions, which required the use of a fume hood, acids, and reactants, none of which I’ve worked with in the past. The data I collected will be used by the professor to write a research paper this fall. The second project I worked concerned decomposition of part of the forest floor
and how bacteria contribute to the nitrogen cycle. I collected samples, prepared solutions in the lab, and helped with various parts of sample preparation which included oven drying, weighing, filtering, and securing the samples in small tins. Additional analysis for this project will be done in Austria and Germany and be used for a research paper.

I worked with hydrogen peroxide enhanced microwave advanced oxidation process (MW/H2O2-AOP) to treat waste water. My work consisted of performing chemical analyses to characterize sewage sludge before and after MW/H2O2-AOP treatment. The treatment was done at two different temperatures (90°C and 110°C) and with various hydrogen peroxide dosages. I also helped analyze the data from these experiments so the relationship between hydrogen peroxide dosage and various sludge characteristics could be determined.

I assisted in the trial of a new archaeological technique/method which involved taking many core samples in order to understand a site rather than a large scale excavation. My work included recording the contents of each core, taking carbon samples for dating, and creating a graphic representation of the cores for publications and further research. This method is proving to be successful.

The challenge in implementing a full duplex at a node is to isolate the transmitter’s strong self-interference signal from its local receiver in order for the receiver to be able to listen to the weak signal coming from a remote node. All of the prior attempts in realizing the hardware have been made using components that are very large, bulky and consume significant power. To reduce the power consumption, implementing it on IC is necessary. However, the IC implementation is costly and challenging. Therefore, a preliminary step is taken. My goal of my research is to make 5G communication module on PCB. The processes are as follows: designing, prototyping, testing and reporting. With this summer research, I had a deeper understanding in communication circuit. In addition to this, I found a genuine interest in this topic.

I have worked on long-term invertebrate sample projects relating to harvest and growth rate. The projects included team work in the field and independent work within the lab. The overall research has resulted in furthering long-term data on stream ecology and ecosystem productivity.

Pulmonary mechanics and the hypoxic ventilatory response of various species of high-altitude waterfowl in the Americas.

The objective of the research project was to explore the effects of different dosages of hydrogen peroxide at two different temperatures on the microwave enhanced advanced oxidation treatment of sewage sludge using a 915 Hz continuous and closed system. My work involved preparing and running the microwave experiments, conducting chemical analysis to characterize the sludge before and after treatment, compiling and analyzing the measured data and begin writing a research paper together with my colleagues (another undergraduate work learn student and a graduate student). The results from this research project will help in optimizing the current system and in creating a full scale system in the future.

I have been assisting the professor in doing airline and air transport economics, management strategy, and policy analysis and related research such as finding and collecting data, some preliminary analysis, generating power point presentation slides, and other administrative assistant work. Main research project, SSHRC, which is to investigate the effect of Open Skies Agreement in Canada on its service trade, was so long term project to finish during the summer that professor suggested me to keep working as a part-time RA during this winter term. I am pleased to renew the RA contract and keep working for the professor.

My research project is about antimicrobial effect of carvacrol and metal oxide nanoparticles against Campylobacter jejuni. I determined the Minimum Inhibitory Concentration of carvacrol and found that 15 - 30 ppm was effective to reduce the cell counts of Campylobacter jejuni. I did antimicrobial testing to determine the survival rate of C. jejuni after treatment with carvacrol within 10 hours. On top of that, I had to troubleshoot some problems while working with metal oxide nanoparticles. I had to do antimicrobial testing for metal oxide nanoparticles (Aluminum oxide) by itself and combine it together with carvacrol.

I have been working on a research project called Passive Membrane Filtration System for Rural Communities at the Filtration Technology Group, Civil Engineering Department, UBC. I worked at the lab and the workshop to build the system that is designed to purify water for drinking by rural households in India. It is a research prototype and we are still figuring out the workings of it. The work is based on a past and a current Master’s
Impact investing applied research. Produced written reports for potential impact investors. Topics included rural electrification in Sub-Saharan Africa, employment opportunities for individuals with ASD, micropensions in West Africa.

Research topic: Mixed effect model for complex data
- In practice, especially in longitudinal study, data are often complex and incomplete in a sense that there may be missing data, censoring data, dropout data, outliers and measuring errors. A mixed effect model can be viewed as an extension of the corresponding classical regression model for cross sectional data by introducing random effects in the model and facilitates individual-specific inference.
- The work I do include: Data Pipeline: Clean-up and manipulate massive and unstructured data to prepare for modeling; Exploratory Data Analysis: Know the data by data visualization and conducting both parametric and nonparametric tests; Modeling: Feature engineer and cross-validation.

I was working with some early data of Mars to plot probability density distribution of marsquakes. It’s a model of what the Insight lander would measure when it is launched to Mars next year. Along the way, I learnt to use UNIX, the Generic Mapping tool and got better at MATLAB. The final outcome of the project was to analyze quake distribution on mars and associate them with specific features on the martian terrain.

Working with Dr. David Gillen on two efficiency improvement projects for the Port of Prince Rupert, I analyzed previous research projects on similar subjects, which allowed me to identify the most applicable modeling parameters for the port efficiency measurement. I was working remotely with a team of 6 highly qualified professionals, all in different locations. Various aspects of the project include: data gathering, model selection, and efficiency analysis in order to identify inefficiencies and potential investment opportunities at the port.

Programming Languages have typically been classified as either dynamically or statically typed. Gradual Typing is a technique that blends the two type disciplines; the programmer can define which portions of the program are typed in a static style, and which are typed in a dynamic style, at a very fine granular level by selectively placing type annotations. Based on the theoretical foundations for gradual type inference laid down by Garcia and Cimini (2014), we implemented an end-to-end system for a self-contained language in Racket. Having an implementation of a gradually typed language, gave us a handle on the different features and aspects of gradual typing, allowing us to further investigate current research problems in the area.

My superiors had built 32 'ponds' in South Campus that we added equal amounts of sediment, water, and predators to. We added treatments to all but four of the ponds with sediment, nutrients (P and N), and/or insecticide; some were only one treatment, and others had multiple treatments. These treatments are the three most common inputs from urban and agricultural run-off. Our goal was to compare how the benthic invertebrate populations differed between treatments and controls to see if there were any outstanding results that might be helpful in the field if one wasn't aware of what inputs from run-off were being put into the system that might affect field work experiments or results. We measured pH, oxygen levels, and temperature of the ponds, as well as chlorophyll content, plankton densities, ending sediment levels, and degradation of leaf litter in each pond. It was a five week experiment, but the results are still being processed. When we were not out at the ponds taking measurements, I was in the lab processing one of my supervisor’s previous experiments, extracting benthic invertebrates from stream sediment samples (very similar to the ones that we took at the end of the pond experiment.) After the experiment ended, I extracted benthic invertebrates from pond sediment samples and water column samples. I learned more in-depth what the research and experimental design process is, as well as how to identify invertebrates and thinking about what I had found in those samples would mean based on the treatments they were exposed to.

It is commonly assumed that the iron deficiency is the most significant contributor of anemia. However, recent evidence has suggested that genetic hemoglobin disorders rather than iron deficiency is the major predictor of hemoglobin concentration among women of reproductive age in rural Cambodia. This is concerning as the WHO currently recommends iron supplementation to women of reproductive age where
the prevalence of anemia is high, such as that in Cambodia. Iron supplementation, if given without cause, would be a waste of valuable resources and may even cause harm. A double blind randomized controlled trial was conducted to determine if iron deficiency is the cause of anemia among Cambodian women of reproductive age. Women were randomized to one of four supplementation groups - multiple micronutrient supplementation with iron, multiple micronutrients without iron, iron only or placebo. My roles included assisting in the development and modification of training materials for local enumerators. I also supervised teams of enumerators during the screening, baseline, midline and monitoring phases of the project. My efforts in these areas were beneficial in ensuring that the training and implementation of the project progressed smoothly. I was also tasked with conducting literature research on the various causes of anemia and factors that may influence the diagnosis of anemia in this population. These findings were able to support and further strengthen various aspects of the research. I was also responsible for the collection of ground water samples. 

With guidance from my mentor, I developed the protocol and conducted the pH and temperature readings of water samples myself before transporting it to the lab for analysis. These ground water samples were determined as the primary drinking source of water among a sub-sample of the sample and will be analyzed for iron content. High levels of iron in drinking water may add to body iron stores which would contribute to iron nutrition for that individual. These findings will be invaluable for the final analysis of the research in determining if iron deficiency is the cause of anemia within this population. Overall, I believe that I was indeed a valuable asset to this research team. I was able to assist and make important contributions to numerous aspects in this research project as mentioned above. Moreover, I was able to enhance my own education through this experience. I was able to apply the knowledge I had gained from classrooms at UBC and transfer it to real world situations. With the support and guidance from the most amazing mentor, I was also able to gain a thorough understanding of research and identify where my passion lies.

My research project looks at individual behavioural differences in rats when they encounter forced exposure to threats (Carbon dioxide, bleach and fox scent (predator scent)). I helped to set up the experimental settings, including transporting rats from their cages to the experiment room and recording behaviours exhibited by rats under presence of threats. We looked at the latency of escape behaviour, as hypothesized to see if there are any differences in individual rat behaviours. Some rats have the tendency to ‘freeze’ when threat is presented, but immediately moved away from the threat. These differences in behaviours will push for researchers, especially in comparative medicine to provide better treatment to these animals as not all rats behaved the same way under threatening conditions.

I worked on developing a model of probability density map of Mars quakes based on data that we have about faults. My work included coding using MATLAB, UNIX and the Generic Mapping Tool (GMT). We now have a map of simulated quakes on Mars that is dependent on the distance of the predicted quake to the Insight lander's seismometer that will be deployed on Mars next year. Once this is complete, we intend to associate different features on Mars to these quakes based on their probability density distribution.