RESEARCH OPPORTUNITY PROGRAM
299Y/399Y PROJECT DESCRIPTIONS 2019-2020
FALL/WINTER

Name and Title: Miriam Diamond & Liisa Jantunen
Department: Earth Sciences

TITLE OF RESEARCH PROJECT: Microfibers from Clothing – Where Do They Come from and Where Do They Go?

Number of 299Y Spots: 2  Number of 399Y Spots: 2

OBJECTIVES AND METHODOLOGY:

Background: Microplastics, fragments of plastic less than 5 millimetres diameter, can be found in virtually all surface waters and, unfortunately, most fish and other aquatic organisms. Microfibers are the most abundant type of microplastic found in surface waters from urban areas like Toronto to the Arctic. We know that microfibers are released during laundering, but we know less about the washing conditions that influence their release. Work in our lab has shown that a filter on a washing machine can significantly decrease microfiber release. In addition to washing, there are likely other sources of microfibers to the environment such as those released during drying, during textile manufacturing, and perhaps during the regular wearing of clothes.

Goal: This project will advance our understanding of the mechanisms and factors related to microfiber release into, and distribution in the environment. Knowledge of the mechanisms and factors will help to inform strategies to mitigate microfiber pollution. The research is a joint project with Environment and Climate Change Canada and Health Canada. Environment and Climate Change Canada has identified microplastics as a pollutant of emerging concern.

Methods: The students will assist with two projects that will help to identify sources and factors related to microfiber release. The third project will help to characterize microfibers and microplastics in the Arctic. Specifically, one project will investigate clothes laundering (washing and drying) as a source of microfibers to the environment. The second project will investigate the change in abundance and composition of microplastics and microfibers in newly built and occupied homes. The third project will enumerate microplastic and microfiber pollution in Arctic waters. The work will entail preparing and then enumerating microplastics and microfibers in samples, e.g., wash water, indoor air, Arctic Ocean water. The analysis involves sieving, collection on filters, followed by counting and finally analysis to determine polymer type. Great care is taken to avoid contamination during sample analysis and to ensure that all counts are highly repeatable.

DESCRIPTION OF STUDENT PARTICIPATION:

Students will be trained to prepare samples for enumeration and analysis, and to enumerate microplastics and microfibers in concentrated samples. The enumeration requires visual inspection under a microscope and particle classification and counting (warning – this is laborious work!). The students will be encouraged to learn about the
methods used to identify plastic and fiber polymers using Raman spectroscopy and to organize data from this analysis.

The students will obtain experience in lab field work, an understanding of the subject matter, and they will have the opportunity to network with government colleagues.

**MARKING SCHEME** (assignments with weight and due date):

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Description</th>
<th>Weight</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to lab practices</td>
<td>Safety training and familiarization with lab practices</td>
<td>No grade</td>
<td>1st week, Sept</td>
</tr>
<tr>
<td>Literature review</td>
<td>Compilation of literature references relevant to this study</td>
<td>20%</td>
<td>3rd week, end of Sept</td>
</tr>
<tr>
<td>Pilot samples</td>
<td>Summary of methods and results from pilot samples to test methods and lab quality control/quality assurance of analysis.</td>
<td>25%</td>
<td>Early Nov</td>
</tr>
<tr>
<td>Sample enumeration</td>
<td>Interim report of results obtained from sample enumeration.</td>
<td>25%</td>
<td>End of Jan</td>
</tr>
<tr>
<td>Final report</td>
<td>Summary of methods used and results obtained from counting samples.</td>
<td>30%</td>
<td>End of March</td>
</tr>
</tbody>
</table>

**Contact with Student**

The methods to be followed by the student require specialized training and close oversight. As such, the students will receive initial training from the co-supervisors and PhD student Samantha Athey who is working on the “laundry” project. This will be followed by the co-supervisors meeting with the student every two weeks and the student will receive direct and more frequent supervision from S. Athey.