



COLLEGE of  
BIOLOGICAL SCIENCE

DEPARTMENT OF MOLECULAR  
AND CELLULAR BIOLOGY

**Announcement:**

All interested members of the university community are invited to attend  
the Final Oral Examination for the degree of **Master of Science** of

**CAROLINE REISIGER**

**On Thursday, October 27, 2022 at 2:00 p.m.** (SSC 2315)

**Thesis Title:** Diurnal regulation of enzymes of starch synthesis in the leaves of *Zea mays* L.

**Examination Committee:**

Dr. Robert Mullen, Dept. of Molecular and Cellular Biology (Exam Chair)  
Dr. Ian Tetlow, Dept. of Molecular and Cellular Biology  
Dr. Jaideep Mathur, Dept. of Molecular and Cellular Biology  
Dr. Joseph Colasanti, Dept. of Molecular and Cellular Biology

**Advisory Committee:**

Dr. Ian Tetlow (Advisor)  
Dr. Jaideep Mathur

**Abstract:** Plants produce energy and fix atmospheric carbon from photosynthesis during the day which they use for growth and respiration. Plants also store several forms of carbon in their leaves, including the polyglucan starch, to use in nocturnal metabolism. Plants must carefully control this process to prevent starch synthesis or degradation at the wrong time in the diurnal cycle. Therefore, the regulation of the enzymes responsible for this turnover is crucial. This becomes increasingly difficult during periods when the plant experiences external abiotic stress, which can disproportionately affect the chloroplasts if reactive oxygen species created during the photosynthetic reactions build up. Most starch synthetic enzymes are catalytically active under reduced conditions and their activity is restricted under oxidizing ones, making production of starch in leaves difficult under stress conditions. Evidence will be provided in this presentation showing plastidial starch phosphorylase (Pho1) acts to regulate starch turnover under oxidative stress by providing an alternative pathway for starch synthesis and degradation. Results show that oxidative activation of glucan phosphorylases is a general phenomenon and may also regulate glycogen metabolism in different mammalian cell types.

**Curriculum Vitae:** Caroline completed her B.Sc. (Hons.) in Plant Science with a minor in Nutrition and Nutraceutical Sciences at the University of Guelph in April 2020. She then began her M.Sc. in Molecular and Cellular Biology in Fall 2020 under the supervision of Dr. Ian Tetlow.

**Awards:** Caroline received a Highly Qualified Personnel Scholarship funded by OMAFRA and the Food from Thought research program during her studies.