UNIVERSITY of GUELPH

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 **Doctor of Philosophy** of

LILIYA NASANOVSKY, on Friday, September 1, 2017 at 1:00 p.m. in SSC 2315
(Advisor: Dr. Ian Tetlow)

Thesis Title: **Bacterial branching enzymes as agents for modifying glucan structure in industrial processing.**

Examination Committee:

Dr. A. Bendall, Dept. of Molecular and Cellular Biology (Chair)
Dr. I. Tetlow, Dept. of Molecular and Cellular Biology
Dr. E. Allen-Vercoe, Dept. of Molecular and Cellular Biology
Dr. B. Micallef, Dept. of Plant Agriculture
Dr. H. Brumer, Michael Smith Laboratories, UBC

Abstract: Starch is used as a cheap, renewable, chemically reactive matrix in many industrial processes. During processing, access to chemically reactive groups on starch is essential and largely depends on their exposure, which is in part, a function of the branching frequency within starch. The ability to manipulate glucan branching in starch and other polyglucans offers many industrial end users with superior performance bio-products.

Branching enzymes (BEs) introduce α-1,6 branch points in starch and thus increase the number of reactive non-reducing chemical groups making post-harvest starch more chemically reactive, facilitating its solubility and reducing retrogradation (gelling property). Starch-derived polyglucans tend to gel rapidly, particularly in the presence of linear amylose chains (a component of starch), and thus hinder industrial processing and reduce polyglucan usability. BEs are promising industrial tools for increasing branch frequency and producing starches with improved physicochemical properties, as well as for reducing glucan chain length (by removing amylose) and alleviating retrogradation, and thus improving the solubility properties of post-harvest starch.

A detailed biochemical and functional characterization of recombinant glycogen branching enzymes from *Thermus thermophilus* and *Deinococcus radiodurans* (DrGBE) was performed. Additionally, a proof of concept was demonstrated through the novel application of DrGBE to modify a commercial starch-based polyglucan to reduce gelling, improve stability and solubility, and produce a visco-stable product.

Curriculum Vitae: After obtaining her B.Sc. (Hons) and M.Sc. degrees from the University of Guelph, Lily began her Ph.D. studies in the lab of Dr. Ian Tetlow in the fall of 2011.