Oral Defense Announcement
University of Missouri – St. Louis Graduate School

An oral examination in defense of the dissertation for the degree
Doctor of Philosophy in Chemistry with an emphasis in Organic Chemistry

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M.S. in Chemistry, May 2017, University of Missouri-St. Louis
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Towards Completely Automated Glycan Synthesis

Date: November 22, 2019
Time: 4:00 to 6:00 p.m.
Place: B428

Abstract
Carbohydrates are ubiquitous both in nature as biologically active compounds and in medicine as pharmaceuticals. Although there has been continued interest in the synthesis of carbohydrates, chemical methods require specialized knowledge and hence remain cumbersome. The need for development of rapid, efficient and operationally simple procedures has come to the fore. This dissertation focuses on the development of a fully automated platform that will enable both experts and non-specialists to perform the synthesis of glycans. Existing automated methods for the synthesis of oligosaccharides are highly sophisticated, operationally complex, and require specialized knowledge and skills. By contrast, high performance liquid chromatography equipment-based automation (HPLC-A) introduced by our lab represents a highly accessible method of synthesis. This approach offers operational simplicity by delivering all reagents using standard liquid handling components and convenient real-time reaction monitoring of every step using detectors and standard computer software. Since many operations still required the operator intervention, and the entire technology remained semi-manual, this dissertation aimed to generate a universal platform for the fully automated synthesis of glycans. To achieve the complete automation this dissertation focused on the following aspects: 1) the development of new concepts for chemical glycosylation applicable to stereoselective formation of challenging 1,2-cis glycosidic bonds; 2) implementation of autosamplers and switch valves as new components to achieve complete automation; and 3) the discovery of new chemically stable resins for solid phase synthesis of glycans. With these key developments, we have acquired a reliable and simple platform for the fully-automated oligosaccharide synthesis. The proof of concept was assessed by the synthesis of a number of target glycans. Synthesis of carbohydrates and other classes of biomolecules using this user-friendly and fully-automated platform will accelerate discovery in many scientific disciplines, most prominently chemistry, automation, and therapeutic agent development.

Defense of Dissertation Committee
Alexei V. Demchenko, Ph.D. (Chair)
Eike Bauer, Ph.D.
Keith J. Stine, Ph.D.
Chung F. Wong, Ph.D.