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MEMO

RE: Nord Proposal

I have reviewed the proposal entitled "**POGIL WORKSHEETS FOR BIOCHEMISTRY CLASSROOM**" being submitted by Rekha Srinivasan for consideration of funding by the Nord grant program and wish to offer my support for it. The proposed activities, budget, and timeline seem reasonable and practical. In response to requirements for this memo, I will state that no funding is available from the Chemistry department for this project.

POGIL WORKSHEETS FOR BIOCHEMISTRY CLASSROOM

Project Description: The purpose of this project is to guide biochemistry students towards critically applying their academic knowledge to real-world scenarios by integrating POGIL-style active learning worksheets into the biochemistry curriculum.

POGIL, or Process Oriented Guided Inquiry Learning, focuses on actively engaging students in skill-development and guided inquiry. POGIL-style learning has been implemented with success in organic chemistry college classrooms, and the shift towards its implementation in biochemistry college classrooms is intuitive.

In biochemistry, this will take the shape of research article-style passages provided to students throughout the course of the semester. Students will be expected to apply their knowledge from biochemistry to understanding and answering guided questions about these passages. This style of testing mirrors that present on the Medical Colleges Admissions Test (MCAT), a test for which a course in biochemistry is a prerequisite. POGIL-style learning will guide pre-medical students towards a better grasp of MCAT-style questioning.

Specific goals:

a. Generate POGIL-style exercises for each unit of the biochemistry material.
b. Implement the POGIL-style exercises in CHEM 328 in Spring 2019.
c. Evaluate the effectiveness of the approach by surveying students at the end of the course to understand the impact of the POGIL-style exercises on their learning.

Student Impact: POGIL-style learning will allow students to develop a deep understanding of biochemistry material, as success on POGIL worksheets is not founded on recall, but rather, critical thinking. This will allow students to become not only proficient in the biochemistry material but also in applying it to scenarios they will likely encounter for the rest of their careers in the health sciences. A sample POGIL-style exercise can be seen in the Appendix. This exercise never directly asks questions related to the classroom material, but instead asks students to critically apply their learning to understanding the unknown passage at hand.

Metrics and Data Collection: The effectiveness of the worksheets will be measured by doing attitude surveys where student attitudes will be mapped for traditional class work and POGIL worksheets.

Professional Impact: Our previous work of Bridging Chemistry and Hierarchical approaches to active learning were funded by Nord and well received at National meetings of American Chemical Society (ACS) and American Society of Biochemistry and Molecular Biology (ASBMB). We will continue to create innovative teaching practices through this grant and will present the work in the Nationa. Meeting of ASBMB.

II. Project timeline

Fall 2019: Dr. Srinivasan will be spending the Fall semester in India on a Fulbright award. However, she will be working with her students remotely on this project during that time.

Goals for Fall 2019:

a) Identify atleast 50 articles of current research in Biochemistry pertaining to concepts being taught in Chem 328.

b) Summarize each of these articles in a single passage format. I expect this work to take atleast 75 hours per student for the semester.

Goals for Spring 2019:

a) Create atleast 50 POGIL worksheets from the research passages.
b) Implement in Chem 328 classroom in spring 2019
c) Do student attitude surveys at the beginning, midterm and end of semester to see effectiveness of the POGIL worksheets for long-term learning of Biochemistry.

III. References

[1] Moog, Richard S., and James N. Spencer. "POGIL: An overview." *Process Oriented Guided Inquiry Learning (POGIL)*994 (2008): 1-13.

[2] Hein, Sara M. "Positive impacts using POGIL in organic chemistry." *Journal of Chemical Education*
89, no. 7 (2012): 860-864.

IV. Department of contact

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V. Appendix

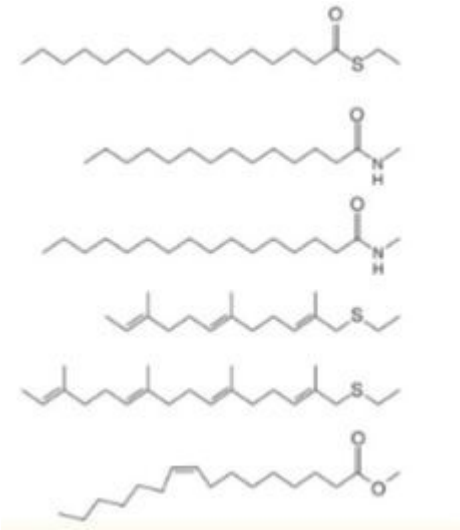
Protein *S*-acylation, the only fully reversible posttranslational lipid modification of proteins, is emerging as a ubiquitous mechanism to control the properties and function of a diverse array of proteins and consequently physiological processes. *S*-acylation results from the enzymatic addition of long-chain lipids, most typically palmitate, onto intracellular **cysteine residues** of soluble and transmembrane proteins via **a labile thioester linkage**. Addition of lipid results in **increases in protein hydrophobicity that can impact on protein structure, assembly, maturation, trafficking, and function**. The recent explosion in global *S*-acylation (palmitoyl) proteomic profiling as a result of improved biochemical tools to assay *S*-acylation, in conjunction with the recent identification of enzymes that control protein

IV. acylation and de-acylation, has opened a new vista into the physiological function of *S*-acylation.

Chamberlain, Luke H and Michael J Shipston. "The physiology of protein S-acylation" *Physiological reviews* vol. 95,2 (2015): 341-76.

1. Why is cysteine the residue involved in acetylation? Would replacing cysteine with another amino acid affect the enzyme's ability to carry out S-acylation?

2. Say you have to switch out the cysteine residue with another amino acid. (You can change the enzyme used as well.) Choose a lipid below and explain which amino acid you would use to form a linkage between the protein and the lipid.



3. What resides are likely to be on the outside of the soluble protein? The transmembrane protein?

VI. Budget

Expenses	
Two undergraduate student employees at $15/hour for 150 hours each	$4500
Dr. Srinivasan conference attendance to ASBMB to present work	$2500
Total	$7000

Previous Nord Grants received:
2016 Hierarchical approached to Flipped Classroom $2400
2014 Active Learning in Organic Chemistry $900

Rekha R. Srinivasan

James S. Swinehart Professorial Teaching Fellow and Senior Instructor, Department of Chemistry

Email: rxs111@case.edu January 2019

EDUCATION

Case Western Reserve University, Cleveland, OH
Ph.D. in Chemistry, May 2003
Dissertation: "*Biophysical studies of ABri peptide associated with Familial British Dementia"*

TEACHING

Case Western Reserve University, Cleveland, OH 06/17-Current
James Swinehart Professorial Teaching Fellow in Chemistry

Case Western Reserve University, Cleveland, OH 06/15-Current
Senior Instructor: Department of chemistry

AWARDS

James S. Swinehart Professorial Teaching Fellow in Chemistry, 2017

American Junior Academy of Science recognition of Excellence in the support and Development of Superior Pre-College Scientific Talent, 2017

J. Bruce Jackson Award for Excellence in Undergraduate Mentoring, 2016

WISER Faculty advisor of the year award, Case Western Reserve University, 2014, 2015 and 2016,2017

Greek Life Outstanding faculty advisor award, Case Western Reserve University, 2012-2013

Roc for Doc Outstanding faculty award, Case Western Reserve University, 2013

John C. Wood Outstanding faculty award, Case Western Reserve University, 2013

Carl F. Wittke award for excellence in undergraduate education, Case Western Reserve University, 2010

ABSTRACTS and CONFERENCE PRESENTATIONS

Srinivasan, R., and Su, J., The impact of active learning videos on Student understanding in Organic Chemistry, *255th American Chemical Society National Meeting, Aug 2018*

Srinivasan, R., Nicholas, T., Reddy, N., Blended Instruction in Introduction to Biochemistry Class, *American Society of Biochemistry and Molecular Biology National Meeting, April 2018*

Srinivasan, R., Juarez, R., Meyer, D. and et al., Bridging Chemistry, *253rd American Chemical Society National Meeting, April 2017*

Meyer, M**.** and **Srinivasan, R.,** Active learning impact on Student attitudes toward Chemistry in General Chemistry, *Ohio Project Kaleidoscope Inaugural Conference, 2015.*

Srinivasan, R., and Meyer, D., Student derived experimental procedures in a flipped lab experience, *248th American Chemical Society National Meeting, August 2014.*

Srinivasan, R., Spicy journey into the world of chemistry for SAGES, *248th American Chemical Society National Meeting, August 2014.*