ELLEN LEHET

100 Malloy Hall, Notre Dame, IN 46556
elehet@nd.edu ◇ ellenlehet.com

EDUCATION

University of Notre Dame *August 2015 - Present*
Philosophy Department – Ph.D.
SUNY College at Potsdam *August 2013 - May 2015*
Mathematics – M.A.
SUNY College at Potsdam *August 2011 - May 2015*
Mathematics, Philosophy – B.A.
Computer Science – Minor

SELECTED PUBLICATIONS

Lehet, E. (Forthcoming). "Induction and Explanatory Definitions in Mathematics". *Synthese*.

SELECTED TALKS

The Possibility of Pure Proof in Contemporary Mathematics
To be presented at Mathematics in Philosophy: Purity and Idealization, March 2019.
Rigor and Intuition in Topology: The Development of the Poincaré Conjecture
presented at Masterclass in the Philosophy of Mathematical Practice, hosted by Vrije Universiteit Brussel, May 2018.

TEACHING EXPERIENCE

at University of Notre Dame

PHIL 20635: Theory of Knowledge	Spring 2019
TA for Jeff Speaks' PHIL 10100: Introduction to Philosophy	Fall 2017
TA for Curtis Franks' PHIL 31300: Formal Logic	Spring 2017
TA for Jeff Speaks' PHIL 10100: Introduction to Philosophy	Fall 2016

Outstanding Graduate Student Teacher Award Spring 2018

MATHEMATICS RESEARCH EXPERIENCE

Presidential Scholars Program, SUNY College at Potsdam Fall 2013 - Spring 2015
Virtual Knot Theory: Defining the Virtual Rational Tangle
advised by Laura Person
REU at Central Michigan University Summer 2014
Hölder estimates for Cauchy-Type Integrals
advised by Debraj Chakrabarti
REU at St. Mary's College of Maryland Summer 2013
Virtual Knot Theory: The Forbidden Number in Four Crossing Knots
advised by Sandy Ganzell

ACT 2019 APPLICATION

Name: Ellen Lehet

Affliation: University of Notre Dame, philosophy department

Email: elehet@nd.edu

Website: ellenlehet.com

1. Category Theory Background

I first encountered category theory in graduate level courses in algebraic topology and abstract algebra. After this introduction I became intrigued by the power and usefulness of category theory, and as a result participated in a reading group on category theory that covered the basic notions and material up through the Yoneda lemma. When I decided that my dissertation would be focused on the philosophical significance of category theory, I worked through parts of a couple books on my own: Riehl - *Category Theory in Context*, ch 1-4, and Awodey - *Category Theory*, ch 1-9. I've also read and worked through all of Eilenberg & Mac Lane's "General Theory of Natural Equivalences", as well as several philosophical papers about category theory.

Despite being a graduate student in philosophy, I have taken several graduate level courses in mathematics while at Notre Dame: Basic Topology and Geometry I, Basic Topology II, Basic Algebra I, Basic Algebra II (audit), Basic Logic I (model theory), Basic Logic II (computability theory), Descriptive Set Theory, Intermediate Topology and Geometry, and 2 semesters of topics in topology courses.

2. Dissertation Information

I expect to complete my Ph.D. in Spring 2020. In my dissertation, I argue that the methods and definitions found in category theory provide mathematical explanation, while also providing an account of what mathematical explanation.

3. Project Preference (ordered most interested to least interested)

1. Spivak — Toward a mathematical foundation for autopoiesis

   Reason for Interest**:** I'm particularly interested in this topic because mereology and the metaphysics of groups are popular topics in philosophy and doing work on the mathematical foundations of autopoiesis would help to better answer these questions philosophically. I believe that category theory can provide an interesting and new perspective on groups, both because it is able to capture a notion of structure that does not appeal to specific elements and also because of its ability to capture a notion of universals through universal properties. For these reasons I think that category theory will be able to provide insight on groups and the part-whole relationship that set theory is unable to provide.

2. Hofstra — Complexity classes, computation, and Turing categories

   Reason for Interest**:** Computability is one of the areas of mathematics that gets attention from philosophers of mathematics and I have taken a graduate level class in computability (with Julia Knight), so I feel like I would be well-equipped to contribute to this project and that it would relate to some discussions of computability within philosophy of mathematics.

3. Sadrzadeh — Formal and experimental methods to reason about dialogue and discourse using categorical models of vector spaces.

   Reason for Interest**:** The structure of language is another popular philosophical topic, and participating in this project would help me to further my knowledge and understanding both mathematically and philosophically.

4. Fritz — Partial evaluations, the bar construction, and second-order stochastic dominance
5. Backens — Simplifying quantum circuits using the ZX-calculus
6. Milewski — Traversal optics and profunctors

4. Commitment to Oxford

I should be able to get some funding from my own department for Oxford, so there's a 99% chance that I would be able to attend even if program funding was not available (though program funding would be helpful).

5. Statement of Interest

My dissertation argues that category theory has explanatory power within mathematics. My work is focused within the context of mathematics, but I believe that it only begins to get at the explanatory power of category theory. Two of the epistemically valuable features of category theory that I discuss in my work is its ability to formally and reliably generalize and generate mathematical analogies. In broader contexts, generality and analogy prove to be epistemic advantages in the sense that they contribute to explanation and promote understanding. For this reason, I think that category theory has the ability to provide illuminating explanations even outside the context of pure mathematics and this belief founds my interest in applied category theory. In particular, I think that applied category theory will help to shed on light on philosophical questions outside of philosophy of mathematics. Several of the projects listed this year seem like excellent ways to do this, given their relation to social groups, computability, and language, which are the basis of some contemporary philosophical discussions.

I'm also interested in participating in the school for the purpose of reviving my participation in mathematical research. Before becoming a graduate student in philosophy, I completed an M.A. in mathematics and participated in a couple REU programs. Not only have I enjoyed partaking in mathematical research projects, but I also think that reviving my participation in research programs will improve my ability to be a philosopher of mathematics. In my philosophical work, I take care to consider and incorporate examples from contemporary mathematics, but many philosophers of mathematics have neglected contemporary mathematics. As a result, there is a good deal of recent mathematical work that deserves philosophical attention. By taking part in the ACT school I will be in a better position to do informed philosophy of mathematics.

Gmail **Applied Category Theory <act2019school@gmail.com>**

recommendation for Ellen Lehet

1 message

Curtis Franks <Curtis.D.Franks.7@nd.edu> Wed, Jan 30, 2019 at 5:31 PM
To: act2019school@gmail.com

Dear organizers of the Applied Category Theory program,

I am on the Philosophy Faculty of the University of Notre Dame. Ellen Lehet, who has applied to attend the ACT program is writing a PhD. dissertation under my supervision.

Ellen is an excellent student. She has recently published an essay on mathematical explanation in a prestigious philosophy of science journal. She has other writing already prepared at the professional level and under review at similar journals. Her work is driven by philosophical vision but incorporates high level mathematical knowledge and insight. She has studied topology, algebra, logic, and geometry at the advanced graduate student level for years alongside her philosophical research.

Ellen's dissertation work, and a fair amount of the work that she sees as immediately extending her dissertation project, deals with the various levels of abstraction, explanation, generalization, and analogy in modern mathematics. This work is important because it counters the popular account of the nature of mathematics one finds in mainstream philosophical work (which tends to conceptualize mathematics according to what one might suppose a priori that it must be like without any direct familiarity with it). It is also, obviously, work that draws heavily from the sort of presentation of connections between domains that category theory is designed to articulate.

I think that Ellen is very suited to contribute to the ACT program. She knows a fair amount of category theory already, certainly more than almost anyone who is not a mathematical specialist in the field. More, she explicitly wants to use the framework of category theory, and already is doing so, to present concepts from outside of mathematics (about, for example, the nature of abstraction and generalization), and is eager to find new ways of doing so. It seems that many of the courses in the ACT program are suited to just this sort of temperament and research orientation.

Ellen is, moreover, very collegial and a welcome member of discussion groups and research teams. She enjoys collaboration, has no ego-investment in her own ideas, is ready to rework ideas and assist others. She will be appreciated in whichever group she joins.

If any further information could be helpful, please feel free to contact me.

Curtis Franks