

January 30, 2019

Dear Daniel Cicala and Jules Hedges,

I strongly recommend that Sophie Libkind be admitted to the Applied Category Theory Adjoint School 2019.

At the University of Cambridge in 2015, Sophie Libkind wrote a Master's-level survey paper (there called a *Part III Essay*) on fibred categories under my supervision, as part of the Master's degree program in mathematics (called *Part III of the Mathematical Tripos*). This survey paper was a treatment of fibrations, indexed categories, and their use in the logical foundations of category theory itself, following Lawvere and Bénabou. This excellent survey paper was very well written and comprehensive in its scope, providing an insightful treatment of the subject of fibred categories and a thorough explanation of their role in the foundations of category theory, as well as a discussion of further directions including Hermida's work on the fibred 2-category of fibred categories.

Also at the University of Cambridge, Sophie Libkind completed the course in category theory that I taught within the Master's program, Part III of the Mathematical Tripos. This course was a thorough treatment of the fundamentals of category theory, including limits, representability, adjoint functors, and monads. In keeping with both the very high standards of scholarship within the Part III program and the exceptionally strong tradition of category theory education at Cambridge, this was a challenging and sophisticated introduction to the subject, with a level of depth that went beyond most introductory courses. Sophie Libkind's work in this course was excellent and is part of a strong foundation in category theory.

As Sophie Libkind is currently a graduate student in mathematics at Stanford University and has studied category theory at Cambridge, the ACT Adjoint School 2019 will be relevant to Sophie Libkind's career and will provide a great opportunity for research in the applications of category theory.

In view of Sophie Libkind's excellent work in category theory at the University of Cambridge, I strongly recommend that Sophie Libkind be admitted to the ACT Adjoint School 2019.

Sincerely,

Rory Lucyshyn-Wright

Assistant Professor
Department of Mathematics and Computer Science
Brandon University
John R. Brodie Science Centre
270 18th Street
Brandon, Manitoba, Canada R7A 6A9
(204) 727-7446
lucyshyn-wright@brandonu.ca

My name is Sophie Libkind, and I am delighted to be applying to ACT2019 school. I am currently a first year PhD student in Mathematics at Stanford University and expect to graduate in 2023.

Relevant Background

As an undergraduate at Swarthmore College, I majored in math and computer science. I chose courses and projects that focused on the rich connections between different fields and spoke to my curiosity for defining and analyzing structure. To highlight a few, I took syntax, semantics, natural language processing, theory of computation, and directed readings in communication complexity and homotopy type theory. After graduating from Swarthmore, I completed a Masters in Mathematics from the University of Cambridge where I focused on algebraic topology and geometry.

At Cambridge, I also took my first formal course in category theory and another in homological and homotopical algebra. I enjoyed it so much that I chose to write an essay on fibered categories and stacks under the direction of Dr. Lucyshyn-Wright. The goal of the paper was to generalize the notion of a category to a fibered category over an arbitrary base so that it realizes stuff, structure, and properties in a way that is compatible with these features in an ordinary category (a fibered category over **Set**). After graduating from Cambridge, I taught math and computer science at the Girls' Middle School but independently continued to follow my academic curiosities in fields such as information theory, machine learning, neuroscience, and dynamical systems. I particularly enjoyed John Baez's online Applied Category Theory course and chatting with other like-minded mathematicians and scientists. Since returning to graduate school, I have been learning about algebraic geometry and symplectic geometry and even gave a talk on derived categories.

Order of Project Preference

1. David Spivak
2. Mehrnoosh Sadrzadeh
3. Tobias Fritz
4. Pieter Hofstra
5. Miriam Backens
6. Bartosz Milewski

Ability to commit to coming to Oxford

I have a \$1000 stipend from my university for travel. I am excited to go to Oxford and will attend if I am accepted.

Statement of Interest

I am interested in attending the ACT2019 school for two main reasons. First, it aligns with my academic interests of using category theory to understand complex systems. Second, as a first year graduate student I am eager to meet like-minded individuals and find my mathematical home.

Although I began studying category theory in the vein of *abstract nonsense* (she says lovingly), I have slowly become aware of its potential for attacking questions in science. To me, there is an intuitive connection between themes in category theory (like the Yoneda-perspective, naturality, and compositionality) and the fascinating mystery of how complex systems transform simple local interactions into remarkable global phenomenon. I often find myself marking the margins of my non-math reading materials with ideas like “a thing is EXACTLY its relationship to other things!” or “this reminds me of stuff/structure/property from category theory!” or “this feels like a sheaf!” Working on a concrete question, exploring different applications, and connecting with a like-minded community at ACT school will be a powerful step towards transforming my enthusiasm and intuitions into a grounded research direction.

Lastly, I am deeply impressed by the ACT community’s commitment to inclusivity, openness, and diversity, which I experienced firsthand in John Baez’s online course as well as while reading *Seven Sketches in Compositionality* and Bradley’s summary of last year’s ACT school. From my years teaching math and computer science to middle school girls, I know that a welcoming community and creative exposition can make mathematical thinking both joyful and practical to even the most skeptical students. I hope that ACT school will give me the vocabulary and background to confidently share the promise of applied category theory with other mathematicians and scientists.

EDUCATION

Stanford University Stanford, CA expected 2023
PhD in Mathematics

The University of Cambridge Cambridge, United Kingdom November 2017¹
Master of Advanced Study Degree in Mathematics, Pass with Distinction.
- *Courses*: Algebraic Topology, Homotopy Theory, Homological and Homotopical Algebra, Geometric Group Theory, Category Theory.
- *Essay*: Fibered Categories and Stacks.

Swarthmore College Swarthmore, PA June 2014
Bachelors of Arts in Mathematics and Computer Science.
- *Directed Readings*: Homotopy Type Theory, Communication Complexity.

PUBLICATIONS

- Donzé A., Valle R. Akkaya I., **Libkind S.**, Seshia S. A., and Wessel D. *Machine Improvisation with Formal Specifications*. International Computer Music Conference, 2014.

TALKS

Introduction to Derived Categories Stanford University, 2018
Symplectic Geometry Student Seminar

Not an Elective! Seventeen Years of Teaching CS as a Required Class New York, 2016
The 2016 Global Forum on Girls' Education

Control Improvisation with Applications to Jazz Music Washington DC, 2013
NSF Conference of Research Experiences for Undergraduate Student Scholarship

Control Improvisation with Application to Music Montreal, 2013
First International Workshop on the Swarm at the Edge of the Cloud

What is Computer Science? Swarthmore College, 2012
Expanding Your Horizons Conference

TEACHING EXPERIENCE

Teaching Assistant Stanford University 2018-present
Courses: Applied Group Theory

Computer Science Teacher The Girls' Middle School 2015-2018
- Taught a required computer science course to 6th and 7th grade students.
 Topics covered: digital citizenship, Scratch programming, robotics, HTML, CSS, Python.
- Pioneered an elective math class on the fundamentals of logical reasoning and proof-based math.
 Topics covered: logic, set theory, combinatorics, graph theory, number systems, group theory.

Teaching Assistant, Tutor, Grader Swarthmore College 2011- 2013
Subjects: Python, C++, Calculus, Multivariable Calculus, Real Analysis, Abstract Algebra

Camp Counselor MathPath Summers 2011 and 2014

¹all requirements completed in June 2015. Degree was not granted until November 2017 due to an administrative error.

PROFESSIONAL AND RESEARCH EXPERIENCE

Prototype Software Engineer ForUsAll Summer 2016

SUPERB-ITS Computer Science Department, UC Berkeley Summer 2013
- Research on control improvisation of jazz music. *Supervisor:* Sanjit Seshia

HONORS AND AWARDS

- Sunseri Fellowship, Stanford University awarded 2018
- Kate Bertram Prize for First Class Results, nominated and awarded 2015 by Lucy Cavendish College, University of Cambridge
- Awarded Highest Honors by external examiners for Swarthmore College Honors program
- Phi Beta Kappa fellowship for graduate study, awarded 2014
- Nominated and chosen to present at the NSF Conference of Research Experiences for Undergraduates Student Scholarship, 2013
- Pedrozzi Foundation Scholar, awarded 2010

LEADERSHIP EXPERIENCE

Advocate for Women in the Sciences

- Involved in clubs and activities for women in the sciences with the goals of discussing issues about women in STEM fields, building support networks, and engaging younger girls in the sciences.
- Secretary for Society of Women Engineers Swarthmore chapter (2010-2011); Board member of Women in Computer Science club (January 2012-June 2014); Member of Women in the Sciences club (September 2012-June 2014); Expanding Your Horizons conference workshop leader (March 2011) and keynote speaker (March 2012); Swarthmore Women in Mathematics club (April 2013-June 2014); Grace Hopper Celebration for Women in Computer Science (October 2013); Stanford Women in Math Mentoring (2018-present).

TECHNICAL SKILLS

Python, JavaScript, C++, Racket, Haskell, postgresSQL, L^AT_EX, HTML, CSS



ACT2019 School Application

1 message

Sophie Libkind <slibkind@stanford.edu>

Wed, Jan 30, 2019 at 10:06 PM

To: act2019school@gmail.com

Hello,

I am writing to apply to ACT2019 School. My statement of interest is below and is also included in the attached document.

Thank you so much!

Best,
Sophie

Statement of Interest

I am interested in attending the ACT2019 school for two main reasons. First, it aligns with my academic interests of using category theory to understand complex systems. Second, as a first year graduate student I am eager to meet like-minded individuals and find my mathematical home.

Although I began studying category theory in the vein of *abstract nonsense* (she says lovingly), I have slowly become aware of its potential for attacking questions in science. To me, there is an intuitive connection between themes in category theory (like the Yoneda-perspective, naturality, and compositionality) and the fascinating mystery of how complex systems transform simple local interactions into remarkable global phenomenon. I often find myself marking the margins of my non-math reading materials with ideas like "a thing is EXACTLY its relationship to other things!," or "this reminds me of stuff/structure/property from category theory!" or "this feels like a sheaf!" Working on a concrete question, exploring different applications, and connecting with a like-minded community at ACT school will be a powerful step towards transforming my enthusiasm and intuitions into a grounded research direction.

Lastly, I am deeply impressed by the ACT community's commitment to inclusivity, openness, and diversity, which I experienced firsthand in John Baez's online course as well as while reading *Seven Sketches in Compositionality* and Bradley's summary of last year's ACT school. From my years teaching math and computer science to middle school girls, I know that a welcoming community and creative exposition can make mathematical thinking both joyful and practical to even the most skeptical students. I hope that ACT school will give me the vocabulary and background to confidently share the promise of applied category theory with other mathematicians and scientists.

2 attachments



Sophie Libkind - Application.pdf

60K



Sophie Libkind - CV.pdf

104K