# Jackson Van Dyke

University of California, Berkeley
Department of Mathematics
Evans Hall
Berkeley, CA 94705

Phone: (952) 818-9448
Email: jacksontvandyke@berkeley.edu
Homepage: www.jacksontvandyke.com

## Education

**UC Berkeley** 2015-Present (Graduation 2019)
**Major:** Math
**Math courses:** abstract algebra, linear algebra, real analysis, complex analysis, graduate topology and analysis (*Folland*), graduate complex analysis (*Ahlfors*), graduate group theory (notes on my website[1]), graduate algebra (*Lang*), graduate commutative algebra (*Eisenbud/Matsumura*) graduate algebraic geometry (notes on my website[1]), graduate Lie theory (notes on my website[1])
**Physics courses:** graduate general relativity, graduate quantum field theory (notes on my website website[1]), electromagnetism, classical, quantum mechanics.

## Research Experience

**Research project on Dean's Scholarship:**
University College London Summer 2017
I was awarded the Dean's Summer Scholarship at UCL for the summer of 2017. **This opportunity was effectively equivalent to an REU.** I completed a research project under the supervision of Professor Michael Singer investigating the asymptotic behavior of partial density functions on hermitian line bundles. My particular work primarily involved Kähler geometry and complex analysis, and resulted in some original contributions.

**Directed reading program:**
UC Berkeley Fall 2017 - Present
Starting in the fall of 2017, I completed a guided reading project on a subject of my choosing. My first semester I focused primarily on category theory, learning from Tom Leinster's book "Basic Category Theory," as well as MacLane's "Categories for the Working Mathematician." I then spent some time learning algebraic geometry from a categorical point of view. I spent my second semester learning algebraic number theory also from a somewhat category theoretic point of view.

**Fission Reaction Event Yield Algorithm:**
Lawrence Berkeley National Laboratory Spring 2017 - Present
Over the past year I have worked on developing an analysis methodology that allows us to fix the parameters in the fission simulator FREYA.

## Publications

[1] A. Alfieri and J. Van Dyke, *An introduction to knot floer homology and curved bordered algebras*, ArXiv e-prints (September 2018), available at arXiv:1811.07348.

[2] J. Van Dyke, L.A. Bernstein, and R. Vogt, *Parameter optimization and uncertainty analysis of freyafor spontaneous fission*, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment **922** (2019), 36 –46.

[3] J. Ross, M. Singer, and J. Van Dyke, *Asymptotics of partial density functions*. In preparation.

[1] www.jacksontvandyke.com/notes

[4] A. Schmah, N. Buechel, S. Garrett, M. Lomnitz, X. Sun, J. Van Dyke, J. Xu, and J. Zhang, *Radiation Hardness Test of Eljen EJ-500 Optical Cement*, ArXiv e-prints (March 2017), available at arXiv:1703.10606.

## Talks Given

**Scholarship Project Presentation**
University College London August 2017
As part of the summer research program I participated in during the summer of 2017, I gave a talk summarizing the results of my project. This presentation included an overview of conformal mapping, partial differential equations (in particular solutions to the Dirichlet problem, and the Neumann problem), plurisubharmonic functions, and basic differential geometry. I used this background to discuss the relevant modern questions regarding partial density functions for divisors, and any recent developments, including the progress made during my project.

**University Program Review (UPR) Presentation**
University of Michigan, Ann Arbor June 2018
As part of my research optimizing the event-by-event fission code FREYA, I presented my findings and their impact on our understanding of nuclear fission.

**Nuclear Fission Conference (NA22 collaboration):**
Santa Fe, NM March 2017
I gave a presentation regarding my work with novel optimization methods for the FREYA simulation code. I discussed the details of how I applied simulated annealing to the project, and the results of this optimization both from a computational and physical perspective.

## Teaching Experience

**Undergraduate Student Instructor:** Calculus, ODEs, Linear Algebra
University of California, Berkeley Fall 2018
I ran two sections of math 10a, which covers calculus, differential equations, and linear algebra, and is targeted at life science majors. I held section, wrote and administered quizzes, graded assignments, and held office hours.

**Summer Program in Nuclear Physics:**
University of Oslo, Oslo, Norway May 2017
I helped developed the curriculum for, and teach a course concerning the physics of nuclear fission and our ability to model it. This happened in conjunction with my research in theoretical nuclear physics developing the fission event algorithm FREYA.

## Conferences Attended

**Enumerative Geometry Beyond Numbers:**
MSRI, Berkeley CA January 22, 2018 - January 26, 2018
From website:
Traditional enumerative geometry asks certain questions to which the expected answer is a number: for instance, the number of lines incident with two points in the plane (1, Euclid), or the number of twisted cubic curves on a quintic threefold (317 206 375). It has however been recognized for some time that the numerics is often just the tip of the iceberg: a deeper exploration reveals interesting geometric, topological, representation-, or knot-theoretic structures. This program will be devoted to these hidden structures behind enumerative invariants, concentrating on the core fields where these questions start: algebraic and symplectic geometry.

**Princeton Summer School in Low-dimensional Topology and Symplectic Geometry:**
Princeton University, Princeton, NJ June 11 - June 29, 2018
From website:
A three-week intensive program (June 11-29, 2018) at Princeton University for 25 advanced undergraduates and first year graduate students consisting of courses in low dimensional topology and symplectic geometry. Topics will include low-dimensional topology, gauge theory, and pseudo-holomorphic curves. There will be six courses, consisting of five lectures apiece. Daily lectures will be complemented by review and problem sessions.

## Honors and Awards

**International Dean's Summer Scholarship:**
University College London Summer 2017
I spent the summer of 2017 doing research under Professor Michael Singer with support from the International Dean's Summer Scholarship from UCL. This is analogous to an REU opportunity in the United States.

**Dean's Honors List - College of Letters and Science:**
UC Berkeley Spring 2018
The Dean's Honors List recognizes outstanding academic achievement each fall and spring semester. To earn Dean's Honors for a semester, the criteria are:

- 13 or more letter-graded units that semester
- Semester GPA in the top 10% of L&S undergraduates
- No disqualifying grades that semester (I, NR, or NP grades or courses for which no grades have been submitted).

**Princeton Summer School in Low-dimensional Topology and Symplectic Geometry:**
Princeton University, Princeton, NJ Summer 2018
See previous section for description.

## Skills

**Type-setting:** I have been typesetting all of my assignments and notes with LaTeX for multiple years. I take a large majority of my notes in real time.

**Computer science:** High level: Python, Low-level: C++, fortran, bash. I have also worked extensively with clusters and techniques such as parallel processing for working with computationally intensive projects. Specifically I have had experience with both computational geometry and analysis of large data sets.