WILL HOFFER

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EDUCATION

Doctorate of Philosophy in Mathematics (Ongoing) September 2019 - Present
University of California, Riverside *Expected June 2025*

- Doctoral Candidate (Completion of written and oral qualifying examinations) Advanced June 2021
- Dissertation Advisor: Dr. Michel L. Lapidus
- Overall GPA: 3.99/4.00

Masters of Mathematics September 2019 - June 2021
University of California, Riverside *Awarded June 2021*

- Awarded while in progress toward completion of my doctorate
- Overall GPA: 3.98/4.00

Bachelors of Science in Mathematics and Physics August 2015 - May 2019
The Ohio State University *Awarded May 2019*

- Graduated with Honors in the Arts & Sciences
- Overall GPA: 3.68/4.00

PROFESSIONAL APPOINTMENTS

Associate Instructor Winter 2022 - Present
Mathematics Department *University of California, Riverside*

- I have been the primary instructor for five undergraduate mathematics courses. See the teaching experience section for more information.

Teaching Fellow Fall 2021
Mathematics Department *University of California, Riverside*

- I provided essential mentorship and teaching training for first year graduate students, including teaching observations, individual meetings, and progress reports.

UCR Graduate Division: Graduate Student Mentor Fall 2021 - Spring 2022
https://gradmentors.ucr.edu/ *University of California, Riverside*

- I mentor a group of first year graduate students, helping them to adjust and succeed at UCR.

Microtutorials in Mathematics Video Program Spring 2020
https://microtutorials.ucr.edu/ *University of California, Riverside*

- Content creator for UCR's mathematics supplementary instructional videos project

Teaching Assistant September 2019 - Present
Mathematics Department *University of California, Riverside*

- I have been the teaching assistant, additional lecturer, and/or grader for a variety of different courses, and have taught both online and in-person. See the teaching experience section for more information.

Student Instructional Associate August 2016 - Spring 2019
Mathematics Department *The Ohio State University*

- I was a teaching assistant and grader for lower division courses, and I was a tutor for the Mathematics and Statistics Learning Center. See the teaching experience section for more information.

RESEARCH & PUBLICATIONS

Research Interests

· My research interests include:

- **Asymptotic Analysis**, including resurgence theory, Borel summation, and Stokes phenomenona;
- **Fractal Geometry**, including theory of complex (fractal) dimensions, geometric and spectral zeta functions, and applications of fractality in topological data analysis;
- **Analytic Number Theory**, including explicit formulae for counting functions and study of error correcting codes through group algebras; and
- **Mathematical Physics**, including quantum mechanics and field theories, heat and Dirichlet equations on fractals, and places of overlap with the aforementioned subjects.

Publications

· W. Hoffer, A. Vengal, and V. Winstein, "The Structure of Biquandle Brackets," *Journal of Knot Theory and its Ramifications*, Vol. 29, Is. 6 (May 2020.) `https://doi.org/10.1142/S021821652050042X`

Undergraduate Research Mentorship April 2023-Present
University of California, Riverside

· I have been running an undergraduate research project in fractal geometry. The students are describing fractal sponges such as the Menger Sponge through their prefractal approximations. In the April-May 2023 and April-May 2024, this research program was supported through UCR's Math 197 courses. It has continued independently in the time between.

FELLOWSHIPS AND ACADEMIC ACCOLADES

The Jones Fellowship Winter 2023
https://mathdept.ucr.edu/jones-fellowship *University of California, Riverside*

· I received a fellowship for academic and research support equivalent to a half-teaching appointment based on academic merit and department service.

The John C. Fay Fellowship Winter-Spring 2023
https://sites.google.com/view/ucr-vsdl-fay-fellowship/ *U.C. Riverside*

· I organized and delivered a series of lectures and discussions to prepare graduate students for the invited Victor L. Shapiro Distinguished Lecture in Mathematics given by Sir Michael Berry.

Department of Mathematics Teaching Fellow Fall 2021
University of California, Riverside

· I mentored and trained first year graduate students becoming university teaching assistants through teaching observations, individual meetings, and progress reports.

Research Poster Competition: First Place Award Spring 2018
Shenandoah Undergraduate Mathematics
and Statistics Conference (SUMS) Conference *James Madison University*

· My co-authors Adu Vengal and Vilas Winstein and I were awarded the first place award for our research on knot theory conducted under the guidance of Sergei Chmutov at the Ohio State University.

Additional Academic Accolades

· Member of Phi Beta Kappa Honorary Society (Inducted Spring 2019)
· Ohio State Maximus Scholarship Recipient (2015-2019)

· Ohio State Mathematics Department Scholarship Recipient
· Ohio State Dean's List (Multiple semesters between 2015-2019)

TEACHING AND SERVICE ACCOLADES

Vernon A. Kramer Memorial Service Award 2022-2023
https://mathdept.ucr.edu/vernon-kramer-memorial-service-award U.C. Riverside

· I was awarded for above-and-beyond service to the department including my organization of two seminars, mentorship of graduate students, and leadership in two in student organizations.

University Teaching Certificate Spring 2023
GradSuccess at University of California, Riverside

· I received university certification for the completion of a training program in research-based pedagogy techniques and theory run through the Graduate Division of UC Riverside.

Outstanding Teaching Assistant Award 2021-2022
University of California, Riverside

· I received a department-level award through Graduate Division recognizing excellence in my role as a teaching assistant.

CONFERENCE PRESENTATIONS & INVITED SEMINAR TALKS

These are the conferences and institutions at which I have presented my research and/or been invited to give a talk.

Joint Mathematics Meeting January 2024
https://meetings.ams.org/math/jmm2024/meetingapp.cgi/Paper/31918

· *Tube Formulae for Generalized von Koch Fractals through Scaling Functional Equations* 01/05/2024

California State University: Graduate Mathematics Seminar Spring 2023
https://math.csuci.edu/current-students/seminar.htm

· *On Inexact Explicit Formulae in Fractal Geometry and Number Theory* 04/03/2023

California State University: Undergraduate Mathematics Seminar Spring 2023
https://math.csuci.edu/current-students/seminar.htm

· *Can One Hear the Shape of a Fractal Drum?* 04/03/2023

Joint Mathematics Meeting January 2023
https://www.jointmathematicsmeetings.org/meetings/national/jmm2023/2270_programspectss1.html

· *On Asymptotic Expansions with Complex Exponents and their Applications* 01/06/2023

7th Cornell Conference on Analysis, Probability, and Mathematical Physics on Fractals June 2022
https://alexander-teplyaev.uconn.edu/cornell7/speakers/

· *Tube Formulae for Generalized von Koch Fractals* 06/05/2022

American Mathematical Society, Western Sectional Meeting Spring 2022
https://meetings.ams.org/math/spring2022w/meetingapp.cgi

· *Borel Summability and Series with Complex Powers* 05/14/22

American Mathematical Society, Western Sectional Meeting Fall 2021
http://www.ams.org/amsmtgs/2283_abstracts/1172-30-203.pdf

· *On Stokes Phenomena and Geometric Zeta Functions* 10/23/2021

American Mathematical Society, Western Sectional Meeting May 2021
https://www.ams.org/amsmtgs/2282_abstracts/1167-51-151.pdf

· *On resurgent analysis of explicit formulae in fractal geometry* 05/01/2021

Functional Analysis and Mathematical Phyiscs Seminar Decemeber 2020
https://www.fresnostate.edu/csm/math/colloquia-seminars/famp.html *CSU Fresno*

· *From Rainbows to Resurgence: Asymptotics of the Airy Function* 12/11/20

CONFERENCES, WORKSHOPS, & RESEARCH PROGRAMS

These are the conferences, workshops, and research programs which I have attended, presented at, and/or been an active participant in.

Joint Mathematics Meeting January 2024
https://jointmathematicsmeetings.org/meetings/national/jmm2024/2300_program_spectss1.html

· I presented my research at the Joint Mathematics Meeting the the Spectra Special Session on Research by LGBTQ+ Mathematicians.

Machine Learning June 26-July 7, 2023
Summer Graduate School *SLMath Institute (Formerly MSRI) and U.C. San Diego*

· I participated in a series of lectures and problem sessions on topics in machine learning and topological data analysis, including topics such as deep neural nets, kernel methods, persistence homology and its implementation, and more.

Rethinking Number Theory June 12-23, 2023
AIM Research Community *American Institute of Mathematics*

· I contributed to a research project in number theory as well as discussions about how to improve social justice, equity, and inclusion in the mathematical community.

California State University Invited Talks Spring 2023
https://math.csuci.edu/current-students/seminar.htm

· I was invited to speak at California State University, and I gave two talks: one to undergraduate mathematicians and another about my PhD research.

Joint Mathematics Meeting January 2023
https://www.jointmathematicsmeetings.org/meetings/national/jmm2023/2270_program_spectss1.html

· I presented my research at the Joint Mathematics Meeting the the Spectra Special Session on Research by LGBTQ+ Mathematicians.

LGBTQ+ Math Day Annually on November 18
http://www.fields.utoronto.ca/activities/22-23/LGBTQplus *The Fields Institute*

· I attend the LGBTQ+ Math day conferences about research and experiences of LGBTQ+ mathematicians in 2020 and 2021.

7th Cornell Conference on Analysis, Probability, and Mathematical Physics on Fractals June 2022
https://alexander-teplyaev.uconn.edu/cornell7/speakers/

· I presented on my current research regarding tube formula and von Koch snowflakes.

American Mathematical Society, Western Sectional Meeting October 2021
http://www.ams.org/amsmtgs/2283_abstracts/1172-30-203.pdf

· I was an invited speaker for the Special Session on Research in Mathematics by Early Career Graduate Students.

Spectra LGBTQ+ in Mathematics Conference August 2021
https://icerm.brown.edu/topical_workshops/tw-21-smc/

· I attended the first official mathematics conference hosted by Spectra, which included both mathematical research and discussion of obstacles and current work to advance diversity, inclusion, and equity in the field of mathematics.

Summer Graduate School on Random Conformal Geometry July 2021
Program– The Analysis and Geometry of Random Spaces
https://www.msri.org/summer_schools/922 *Mathematical Sciences Research Institute (MSRI)*

· I was an active participant in a series of lectures and associated problem sessions.
· We covered topics such as Schramm-Loewner evolution (SLE), conformal and quasi-conformal geometry, conformal quantum field theories, etc.

American Mathematical Society, Western Sectional Meeting May 2021
https://www.ams.org/amsmtgs/2282_abstracts/1167-51-151.pdf

· I was an invited speaker for the Special Session on Research in Mathematics by Early Career Graduate Students.

Spring school on asymptotic methods and applications March 2021
Program– Applicable resurgent asymptotics: towards a universal theory
https://www.newton.ac.uk/event/araw01/ *Isaac Newton Institute (INI)*

· I was an active participant in a series of lectures and associated problem sessions.
· We covered resurgence as it appears in many forms, including topics such as saddle-point analysis, WKB semiclassical asymptotics, partial differential equations, and Jean Écalle's general theory.

Southern California Analysis and
Partial Differential Equations Conference November 2019
(SCAPDE) *University of California, San Diego*

· I attended the conference, with talks described here: `https://mathweb.ucsd.edu/~scapde/2019/SCAPDE_2019_TA.pdf`.

American Mathematical Society, Western Sectional Meetings Fall 2019 - Present

· I have been an attendee at many western sectional meetings, held twice a year in the fall and spring (with the exception of the year 2020.) I have listed those in which I was an active speaker separately.

Shenandoah Undergraduate Mathematics and Statistics Conference 10/13/18
http://www.jmu.edu/mathstat/sums/index.shtml *James Madison University*

· My collaborators and I presented our research poster on our work entitled: *Combining Biquandle Knot Invariants*

Young Mathematicians Conference August 2018
https://ymc.math.osu.edu/2018/program.php *Ohio State/National Science Foundation*

· My collaborators and I presented our research in a talk entitled: *Combining Quandle Cohomological and State-Sum Polynomial Knot Invariants*

Denman Research Forum March 2018
https://ugresearch.osu.edu/Pages/Initiatives-%20Denman-%20Accepted%20Abstracts.aspx *Ohio State*

· I presented a research posted entitled: *Invariants for tricolorable knots & links*

Knots & Graphs Program Summer 2017 & Summer 2018
https://people.math.osu.edu/chmutov.1/wor-gr-su18/wor-gr.htm *The Ohio State University*

· I participated in a research program focused on the mathematical theory of knots. As part of the program, I gave a series of talks with my collaborators and produced research that went on to be published in an academic journal.

HOME CAMPUS/DEPARTMENT TALKS

Fractal Analysis, Dynamical Systems, and Mathematical Physics Seminar 2020-Present
http://www.math.ucr.edu/~frgmpds/seminars.html *University of California, Riverside*

· *Fractal Tube Formula through Scaling Functional Equations* 02/01/24
· *Tube Formulae for Generalized von Koch Fractals* 10/12/23
· *On Complex Dynamics and Fractal Geometry - Orbits, Conjugacy, and Modern Machinery* 06/02/23
· *Studying Parabolic Diffeomorphisms through Resurgence and Fractal Analysis* 05/11/23
· *On Spaces of Formal and Analytic Expansions with Exponents in the Complex Plane* 02/23/23
· *Toward Tube Formulae for Generalized von Koch Fractals* 05/20/22
· *Borel Summation and Series with Complex Powers* 02/17/22
· *On the Stirling Series for the Gamma Function* 02/10/22
· *On Heat Content Asymptotics of some Planar Fractals* 11/04/21
· *On Zeta Functions and the Stokes Phenomenon* 04/15/21
· *Rainbows Quantum Billiards, and the Birth of Reflections: Segue into Resurgence* 11/12/20
· *Rainbows Quantum Billiards, and the Birth of Reflections: Stokes Phenomena Exemplified* 10/22/20
· *A First Introduction to Resurgence, Part II* 05/27/20
· *A First Introduction to Resurgence, Part I* 04/16/20

Mathematical Physics: Experiment, Structure, & Framework Seminar Winter 2022 - Present
University of California, Riverside

· *Discussion on Geometric Optics, Mathematical Catastrophes, and Related Topics* 04/14/23
· *Classifying Optical Caustics with Elementary Catastrophes* 02/24/23
· *Asymptotics of the Airy Function* 03/03/22

Analysis Seminar Spring 2022 - Present
https://sites.google.com/ucr.edu/ucranalysisseminar/home *University of California, Riverside*

· *On the Stirling Series for the Gamma Function* 02/10/22

Graduate Student Seminar Winter 2020 - Present
https://ams-at-ucr.github.io/gradsem/ *University of California, Riverside*

- *Lightning Talk (5 min) on my Research* 10/06/23
- *Snow White Light & the Seven Elementary Catastrophes* 02/17/23
- *Functions that Count* 01/27/23
- *Divergence is only the Beginning* 01/14/22
- *Sites & Bytes: Website Workshop* 11/19/21
- *Melting Snowflake Fractals* 11/12/21
- *This is not the title of this talk* 10/08/21
- *On Resurgent Analysis of Explicit Formulae in Fractal Geometry* 04/30/21
- *Resurgence & Fractals* 01/15/21
- *Keeping up with the Bernoulli's* 01/31/20

Analytic Number Theory Fall 2021
Mathematics Course Presentation (Math 245) *University of California, Riverside*

- *Explicit Formulae in Number Theory* 12/07/21

Fractal Geometry, Complex Dimensions, & Zeta Functions Fall 2020
Mathematics Course Presentation (Math 260) *University of California, Riverside*

- *Proof of the Pointwise Explicit Formula* 12/17/20

Mathematics of Quantum Mechanics Winter 2020
Mathematics Course Presentation (Math 242) *University of California, Riverside*

- *Deriving the Schrodinger Equation from Feynman's Path Integral* 03/13/20

Wave Equations and General Relativity Seminar Fall 2021-Spring 2020
Mathematics Seminar *University of California, Riverside*

- *Calculus on Manifolds, Part I* 12/03/2019
- *Calculus on Manifolds, Part II* 1/07/2020
- *Introduction to the Physics of Relativity* 4/13/20
- *The Einstein Equation Cauchy Problem* 05/11/20

Knots & Graphs Program Summer 2017 & Summer 2018
https://people.math.osu.edu/chmutov.1/wor-gr-su18/wor-gr.htm *The Ohio State University*

- *Enhanced Kauffman bracket* 7/7/17
- *Tricoloring number of links* 7/21/17
- *Tricolorings, Keis, and Quandles* 6/25/18
- *Two cocycles of quandles and the state sum invariants* 7/9/18
- *Cohomology, biquandles, and bracket invariants* 7/23/18

Reading Classics Seminar Spring 2017 - Autumn 2018
https://people.math.osu.edu/sinnott.1/ReadingClassics/ *The Ohio State University*

- *Origami & Geometry - Paper Folding and Greek Geometry* 3/28/18
- *Kepler's Laws in Newton's 'Philosophiae Naturalis Principia Mathematica'* 9/11/18
- *Euler's 'Principia pro motu de sanguinis per arterias determinando'* 10/31/18

What Is...? Seminar 6/14/18
https://math.osu.edu/whatis *The Ohio State University*

· *What is the Yang-Baxter Equation?*

Abstract Algebra, Math 5590H 11/29/18
https://people.math.osu.edu/gautam.42/A18/calendar.html *The Ohio State University*

· *The Stone-von Neumann-Mackey Theorem: Equivalence of Heisenberg Group Representations*

TEACHING EXPERIENCE

Associate Instructor Winter 2022-Present
Mathematics Department *University of California, Riverside*

· I have been the primary instructor of record for the following courses at UCR:

- Calculus for Life Sciences - Math 7A (Fall 2023)
  Undergraduate; Size: 101 Students; Format: In-Person
- Calculus of Several Variables - Math 10B (Summer 2023)
  Undergraduate; Size: 20 Students; Format: In-Person
- Calculus for Life Sciences - Math 7B (Fall 2022)
  Undergraduate; Size: 88 Students; Format: In-Person
- Calculus for Life Sciences - Math 7B (Spring 2022)
  Undergraduate; Size: 69 Students; Format: In-Person
- Calculus for Life Sciences - Math 7A (Winter 2022)
  Undergraduate; Size: 91 Students; Format: Hybrid (Online & In-Person)

Department Instructor Summer 2022-Present
Mathematics Department *University of California, Riverside*

· I have been employed as the primary instructor for several graduate level courses/workshops.

- Real Analysis Qualification Exam Workshop Summer 2023
  Graduate; Size: 6 Students; Format: In-Person
- Real Analysis Qualification Exam Preparation Seminar Summer 2022
  Graduate; Size: 4 Students; Format: Hybrid (Online & In-Person)
- Complex Analysis Qualification Exam Preparation Seminar Summer 2022
  Graduate; Size: 8 Students; Format: Hybrid (Online & In-Person)

Teaching Fellow Fall 2021
Mathematics Department *University of California, Riverside*

· I mentored and trained new graduate students, in particular those who are new to teaching.
· I observed graduate student teaching and provided feedback to the students. At the end of the quarter, I wrote reports on their progress to the department.

Microtutorials in Mathematics Video Program Spring 2020
https://microtutorials.ucr.edu/ *University of California, Riverside*

· I created content for UCR's mathematics supplementary instructional videos project. These instructional videos and materials are used as assignments in mathematics courses.

Teaching Assistant September 2019 - Present
Mathematics Department *University of California, Riverside*

· I have been the teaching assistant, additional lecturer, and/or grader for a variety of different courses, and have taught both online and in-person.
· Upper Division Courses:

- Ordinary and Partial Differential Equations
- Introduction to Chaotic and Complex Dynamical Systems
- Analysis/Introduction to Measure Theory
- Euclidean and non-Euclidean Geometry
- Undergraduate Research Projects

· Lower Division Courses:

- Introduction to College Mathematics for Business and the Social Sciences
- Precalculus (Study of Elementary Functions, Roots of Polynomials, etc.)
- First Year Calculus
- Calculus for Life Sciences
- Applied Linear Algebra
- Calculus of Several Variables

Student Instructional Associate August 2016 - Spring 2019
Mathematics Department *The Ohio State University*

· I was a teaching assistant and grader for lower division courses, and I was a tutor for the Mathematics and Statistics Learning Center.
· Courses Taught:

- College Algebra
- Trigonometry
- Precalculus

LEADERSHIP, PROFESSIONAL SERVICE, & OUTREACH

President of the UCR Student Chapter of Spectra Fall 2023-Present
University of California, Riverside (UCR) *Spectra: The Association for LGBTQ+ Mathematicians*

· I helped to officially found and now lead a student chapter of Spectra at the University of California, Riverside.

Co-Organizer and Scheduling Coordinator Fall 2021 - Fall 2023
Fractal Analysis, Dynamical Systems, and Mathematical Physics Seminar *University of California, Riverside*

· I invite and schedule the speakers for the FDMP seminar at UCR and collect and announce titles and abstracts on a weekly basis. Formerly, this seminar consisted of two distinct seminars (Fractal Research Group and the Mathematical Physics and Dynamical Systems seminars) before they were merged in 2022.

President of the AMS Graduate Student Chapter September 2021-Present
Local to the University of California, Riverside (UCR) *American Mathematical Society (AMS)*

· I am the lead officer, and I am in charge of running UCR's Graduate Student Seminar.

Vice President of UCR's GSA Department Chapter September 2022-Spring 2023
Graduate Student Association (GSA) *University of California, Riverside*

· I served as an officer for the department's local chapter of the university wide graduate student association. We interface with the organization as a whole and plan department events.

Recruitment Ambassador Fall 2022 - Spring 2023
Mathematics Department *University of California, Riverside*

· I helped recruit graduate students to our program through events such as Q&A sessions, meeting individually with students, giving tours, and attending recruitment events.

Spectra Outlist/D.E.I. Recruitment January 2021 - Present
Spectra: The Association for LGBTQ+ Mathematicians

· I am part of the Spectra Outlist, and in particular provide my contact information and university affiliation. I meet with interested students who reach out to me to tell them about the climate and mathematics program at my university, as well as any other questions they may have.

Professional Memberships

· American Mathematical Society (AMS) Member September 2019 - Present
· Spectra: The Association for LGBTQ+ Mathematicians Member November 2020 - Present

Mentorship Positions (Volunteer & Employment)

· University of California, Riverside: Graduate Student Mentor (Fall 2021 - Spring 2022)
· University of California, Riverside: Teaching Fellow (Fall 2021)
· University of California, Riverside: Women's Resource Center Graduate Mentor (Fall 2020-Spring 2021)
· Ohio State University Honors & Scholars Program Peer Mentor (August 2016-May 2019)

SOFTWARE PROFICIENCY

Programming Languages

· Proficient: Java/Javascript, Python, C/C++, HTML/CSS/SCSS
· Familiar: Ruby, R, Liquid, Julia

Software Programs/Tools

· Proficient: Mathematica, Sagemath, LaTeX, Git/GitHub, RStudio, VSCode
· Familiar: MatLab