

# Christopher Kottke

New College of Florida  
Mathematics, Division of Natural Sciences  
5800 Bay Shore Rd  
Sarasota, FL 34243 USA

[ckottke@ncf.edu](mailto:ckottke@ncf.edu)  
<https://ckottke.ncf.edu/>  
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## Education

- 2010 Ph.D. Mathematics, Massachusetts Institute of Technology
- 2004 B.A. Mathematics, B.A. Physics, Tufts University

## Professional Appointments

- 2021– Associate Professor, New College of Florida
- 2016–2021 Assistant Professor, New College of Florida
- Fall 2019 Research Member, Mathematical Sciences Research Institute
- 2013–2016 Research Instructor, Northeastern University
- 2010–2013 Tamarkin Assistant Professor, Brown University

## Research Interests

Global analysis and topology of moduli spaces, geometric microlocal analysis, mathematical physics.

## Publications and Preprints

1. Products of manifolds with fibered corners. (With F. Rochon).  
[arXiv:2206.07262](#), 53 pages, (2022).
2.  $L^2$ -cohomology of quasi-fibered boundary metrics. (With F. Rochon).  
[arXiv:2103.16655](#), 31 pages, (2021).
3. Quasi-fibered boundary pseudodifferential operators. (With F. Rochon).  
[arXiv:2103.16650](#), 127 pages, (2021).
4. Low energy limit of the resolvent of some fibered boundary operators. (With F. Rochon).  
*Communications in Mathematical Physics*, 390:231–307, (2022).  
[arXiv:2009.10108](#).
5. Biggerbes. (With R. Melrose).  
*Algebraic and Geometric Topology*, 21(7):3335–3399, (2021).  
[arXiv:1905.03081](#).
6. Monopoles and the Sen conjecture: Part I. (With K. Fritzsche and M. Singer).  
[arXiv:1811.00601](#), 28 pages, (2018).
7. Functorial compactification of linear spaces.  
*Proceedings of the AMS*, 147(9):4067–4081, (2019).  
[arXiv:1712.03902](#).
8. Partial compactification of monopoles and metric asymptotics. (With M. Singer).  
*Memoirs of the AMS*, to appear.  
[arXiv:1512.02979](#), 113 pages, (2015).
9. Blow-up in manifolds with generalized corners.  
*International Mathematical Research Notices*, 2018(8):2375–2415, (2018).  
[arXiv:1509.03874](#).
10. Equivalence of string and fusion loop-spin structures. (With R. Melrose).  
[arXiv:1309.0210](#), 48 pages, (2013).

11. Dimension of monopoles on asymptotically conic 3-manifolds.  
*Bulletin of the LMS*, 45(5):818–834, (2015).  
[arXiv:1310.2974](#).
12. Loop-fusion cohomology and transgression. (With R. Melrose).  
*Mathematical Research Letters*, 22(4):1177–1192, (2015).  
[arXiv:1309.7674](#).
13. A Callias-type index theorem with degenerate potentials.  
*Communications in PDE*, 40(2):219–264, (2015).  
[arXiv:1210.3275](#).
14. Generalized blow-up of corners and fiber products. (With R. Melrose).  
*Transactions of the AMS*, 367(1):651–705, (2015).  
[arXiv:1107.3320](#).
15. An index theorem of Callias type for pseudodifferential operators.  
*Journal of K-Theory*, 8(3):387–417, (2011).  
[arXiv:0909.5661](#).
16. Accurate finite-difference and time-domain simulation of anisotropic media by subpixel smoothing. (With A.F. Oskooi and S. Johnson).  
*Optics Letters*, 34(18):2778–2780, (2009).
17. Perturbation theory for anisotropic dielectric interfaces, and application to sub-pixel smoothing of discretized numerical methods. (With A.F. Oskooi and S. Johnson).  
*Physical Review E*, 77(3):6611–6621, (2008).
18. Vortex core identification in viscous hydrodynamics. (With L. Finn and B. Boghosian).  
*Philosophical Transactions of the Royal Society A*, 386(1833):1937–1948, (2005).

## Grants and Awards

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|-----------|---|
| 2018–2023 | NSF Grant DMS-1811995 <i>RUI: Analysis on HyperKähler Moduli Spaces</i> , PI  |
| 2017–2018 | Simons Foundation Collaboration Grant for Mathematicians, Award ID: 524260    |
| 2011–2012 | AMS-Simons Postdoctoral Travel Grant  |
| 2009      | Charles and Holly Housman Award for Excellence in Undergraduate Teaching, MIT |
| 2005      | Presidential Fellowship, MIT  |

## Invited Talks

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|------|-----|---|
| 2022 | Aug | <i>Introductory Workshop: Analytic and Geometric Aspects of Gauge Theory</i> , MSRI |
|      | Jul | <i>Geometry and physics of ALX metrics in gauge theory</i> , AIM                    |
| 2021 | Nov | Seminar, Purdue University  |
|      | Jun | <i>Analysis, Geometry and Topology of Singular PDE</i> , Oberwolfach, online        |
|      | Feb | Seminar, University of Quebec at Montreal, online                                   |
|      | Feb | <i>Geometry, Analysis, and Quantum Physics of Monopoles</i> , BIRS, online          |
| 2020 | Oct | <i>Recent developments in Gauge Theory</i> , AMS sectional, online                  |
| 2019 | Nov | Colloquium, University of California Santa Cruz                                     |
|      | Oct | Seminar, MSRI   |
|      | Jan | Seminar, Michigan State University  |
| 2018 | Oct | Seminar, Purdue University  |
|      | Oct | <i>Index Theory: Interactions and Applications</i> , University of Toulouse         |
|      | Sep | <i>Geometric Analysis and Mathematical Physics</i> , University of Oldenburg        |
|      | Apr | <i>Workshop on Geometric Quantization</i> , BIRS                                    |
| 2017 | Jun | <i>Analysis and topology in interaction</i> , Cortona                               |
|      | Jan | Seminar, University of Waterloo   |
| 2016 | Dec | <i>Geometric and spectral methods in PDE</i> , BIRS Oaxaca                          |
|      | Oct | Seminar, MIT  |

- Mar Seminar, Duke University
- 2015 Dec *Analysis on singular manifolds*, CMS Winter Meeting, Montreal
- Oct Seminar, Stanford University
- Sep Seminar, MIT
- Jan Seminar, Boston University
- Jul–Aug *Metric and analytic aspects of moduli spaces*, visiting fellow, Newton Institute
- 2014 Dec Seminar, Purdue University
- Nov *Geometric scattering theory and applications*, BIRS
- Jul *String geometry and loop spaces*, Greifswald University
- Jun *Analysis and topology in interaction*, Cortona
- Apr Seminar, Boston University
- Mar Seminar, Worldwide Center of Mathematics
- 2013 Nov Seminar, University of Quebec at Montreal
- Oct *Geometric and spectral analysis*, AMS Sectional, Temple University
- Sep Seminar, Northeastern University
- May Seminar, University College London
- Mar *Geometric and singular analysis*, Potsdam University
- Mar Seminar, Boston University
- 2012 Jun *Spectral invariants on singular and non-compact spaces*, CRM
- May *Analysis and geometric singularities*, Oberwolfach
- Apr *Spring lecture series*, University of Arkansas
- Mar Seminar, Purdue University
- 2011 Jun *Microlocal methods in mathematical physics and global analysis*, University of Tübingen
- Mar Seminar, Temple University
- Mar Seminar, Northeastern University
- 2010 Aug *Topics in spectral and scattering theory*, Penn State University
- Jun *Talbot workshop on loop groups and twisted K-theory*, Breckenridge
- 2009 Dec Seminar, Brown University
- Oct *Microlocal analysis and spectral theory on singular spaces*, AMS Sectional, Penn State
- Apr *Singularities at MIT*, MIT
- 2008 Aug *Second symposium on spectral and scattering theory*, Federal University of Pernambuco

## Other Conferences Attended

- 2022 Mar *Geometry and Analysis on Non-Compact Manifolds*, CIRM
- 2021 May *Analysis on Singular Spaces*, BIRS Oaxaca, online
- 2019 Oct *Recent developments in microlocal analysis*, MSRI
- May *Microlocal methods in analysis and geometry*, CIRM
- 2016 Jun *Geometry and topology of stratified spaces*, CIRM
- 2013 May *Control, index, traces and determinants*, Conference for Jean-Michel Bismut, Orsay
- 2011 Oct *Microlocal methods in spectral and scattering theory*, Northwestern University
- Jan *Geometric analysis*, CIRM
- 2010 Mar *Geometric scattering theory and applications*, BIRS
- 2009 Jul *Spectral theory and geometric analysis*, Northeastern University
- 2008 Jun *Geometric applications of microlocal analysis*, CIRM

## Professional and Collegiate Service

- Member: American Mathematical Society, 2016–present
- Reviewer: *Advances in Mathematics*, *American Mathematical Monthly*, *Annales Henri Poincaré*, *Annals of Global Analysis and Geometry*, *Communications in PDE*, *Compositio Mathematica*, *Geometry and Topology*, *Journal de l'École Polytechnique: Mathématiques*, *Journal of Geometric Analysis*, *Springer Graduate Texts*.
- Organizer: *Geometry of Gauge Theoretic Moduli Spaces*, AMS Sectional, U. Florida, November 2019

*The Sen Conjecture and Beyond*, University College London, June 2017

Geometry and Topology Seminar, Brown University, 2011–2013

Committees: Faculty Planning and Budget Committee, New College of Florida, Fall 2022–present

Mathematics Pathway Committee, Florida State College and University System, 2021–2022

Provost Advisory (T&P) Committee, New College of Florida, 2021–2022

Campus Climate and Community (DEI) Committee, New College of Florida, Fall 2020–present

Scholarship Committee, New College of Florida, 2018–2021

Other: Treasurer, United Faculty of Florida, New College Chapter, Fall 2022–present

Putnam exam supervisor: New College of Florida 2020, 2018, Northeastern University 2015

Author and maintainer of `ncfthesis`, open source L<sup>A</sup>T<sub>E</sub>X class for New College of Florida theses

## Teaching

### New College of Florida

Advanced Linear Algebra (Spring 2017)

Complex Analysis (Spring 2021, Fall 2018, Spring 2017)

Calculus with Theory I (Fall 2022)

Discrete Mathematics (Spring 2022)

Distribution Theory (Spring 2019)

First year seminar: Mathematical Thinking (Fall 2022, Fall 2021, Fall 2020)

Functional Analysis (Fall 2016)

Multivariable Calculus (Fall 2020, Fall 2018, Fall 2017, Fall 2016)

Partial Differential Equations (Spring 2020, Spring 2018)

Real Analysis I (Fall 2021, Fall 2017)

Real Analysis II (Spring 2022, Spring 2018)

Writing in Mathematics (Spring 2021, Spring 2020, Spring 2019)

Tutorial: Category Theory (Spring 2020, Spring 2019)

Tutorial: Differential Topology and Geometry (Spring 2021, Spring 2019, Fall 2017, Fall 2016)

Tutorial: Geometry and Topology for Physics (Spring 2022, Fall 2021)

Tutorial: Mathematical cryptography (Spring 2018)

Tutorial: Math GRE preparation (Fall 2018, Fall 2017)

Tutorial: Putnam exam preparation (Fall 2020, Fall 2018, Fall 2017, Fall 2016)

Tutorial: Riemann Surfaces (Spring 2019)

Tutorial: Topology/Algebraic Topology (Fall 2020, Spring 2020, Fall 2018, Spring 2018, Fall 2017, Spring 2016)

Tutorial: Writing in Mathematics (Spring 2018)

### Northeastern University

Graduate Topics in Differential Geometry (Spring 2016)

Multivariable Calculus (Fall 2015, Spring 2015, Spring 2014)

Real Analysis (Fall 2015, Fall 2014, Fall 2013)

Undergraduate Directed Study: Differential Topology (Spring 2014)

### Brown University

Abstract Algebra (Spring 2013)

Differential Equations and Nonlinear Dynamics (Fall 2012)

Graduate Algebraic Topology II (Spring 2012)

Honors Linear Algebra (Spring 2013, Spring 2011)

Honors Vector Calculus (Fall 2010)

Intermediate Calculus (Fall 2011)

Introduction to Mathematical Cryptography (Fall 2011)

**Massachusetts Institute of Technology**

TA: Differential Equations (Spring 2010, Spring 2009, Spring 2007)

TA: Multivariable Calculus (January 2010, January 2009, January 2008)

**Mentoring****Undergraduate theses supervised**

2021 Samuel Herman, *Abstract Synecdoche in Finite Semigroups*

2019 David (Bruce) Guild, *Disruptive Mathematicians*

2019 Zachary Halladay, *Topological K-theory and Bott periodicity*

2017 Jacob Price, *Knot Theory and the Alexander Polynomial*