

# Christopher Kottke

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

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).  
Preprint. 40 pages, (2020).
2.  $L^2$ -cohomology of quasi-fibered boundary metrics. (With F. Rochon).  
[arXiv:2103.16655](#), 33 pages, (2021).
3. Quasi-fibered boundary pseudodifferential operators. (With F. Rochon).  
[arXiv:2103.16650](#), 65 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).

## Awards and Academic Honors

2018–2021	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

## Academic Talks

### Invited Talks at Conferences and Seminars

2022	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 Activities

- 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 of Geometric Analysis*, *Journal de l'École Polytechnique: Mathématiques*, *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
- Service: Putnam exam supervisor: New College of Florida 2020, 2018, Northeastern University 2015  
 Provost Advisory (T&P) Committee, New College of Florida, Fall 2021–present  
 Scholarship Committee, New College of Florida, Fall 2018–Spring 2021  
 Campus Climate and Community Committee, New College of Florida, Fall 2020–present  
 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)
- Discrete Mathematics (Spring 2022)
- Distribution Theory (Spring 2019)
- First year seminar: Mathematical Thinking (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*