Steven Patrick Flynn Curriculum Vitae

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Research Interest

- Semi-classical Analysis and PDEs on Lie groups and singular (sub-Riemannian) geometries. Inverse problems and Spectral Theory. Mechanics and Mathematical Physics.

Employment

- **University of Bath,** Postdoctoral Research Associate, Jan. 2021–present.
- **University of California, Santa Cruz,** Graduate Researcher/Graduate Student Instructor/Teaching Assistant, Sep. 2014–Jun. 2020.

Education

- **University of California, Santa Cruz,** Ph.D., Mathematics, June 2020.
  Thesis title: "*Unraveling Geodesic X-ray Transforms on the Heisenberg Group.*"
  Co-Advisors: François Monard, Richard Montgomery.
- **University of California, Santa Cruz,** M.A., Mathematics, June 2015.
- **University of California, Santa Cruz,** B.A., Pure Mathematics (with honors), Physics minor, June 2014.

Involvement in Research Programs

- 2021 - Quantum Limits for Subelliptic Operators
  Postdoctoral Position at University of Bath
  Funded by the Leverhulme Trust under Véronique Fischer (PI) and Clotilde Fermanian-Kammerer (Co-PI)
- 2019 - Microlocal Analysis
  Mathematics Sciences Research Institute, UC Berkeley
  Formally Invited as a Program Associate for the Fall 2019 semester.
- 2019 - *Explicit methods for linear and non-linear tomography*
  Supported by François Monard (PI) as a graduate students under their grant titled above.

Publications & Preprints

1. C. Fermanian-Kammerer, V. Fischer, and S. Flynn. "Some Remarks on Semi-Classical Analysis on Two-Step Nilmanifolds" (proceeding) To appear in the Springer INdAM Series (2022).
2. C. Fermanian-Kammerer, V. Fischer, and S. Flynn. "Geometric invariance of the semi-classical calculus on nilpotent graded Lie groups." To appear in the *Journal of Geometric Analysis* (2022).
3. S. Flynn. "Injectivity of the Heisenberg X-ray transform." *Journal of Functional Analysis 280.5* (2021): 108886.
4. S. Flynn. Unraveling Geodesic X-ray Transforms on the Heisenberg group. University of California, Santa Cruz, 2020. (Ph.D. Thesis.)

Grants, Fellowships, Funding

- June 2022 - Grant for travel and accommodation to attend the conference "Conformal Geometry, Analysis and Physics" at the University of Washington. Funded by the Clay Mathematics Institute Enhancement and Partnership Program. $1000.
- January 2022 - Travel Grant from the London Mathematics Society to attend the ICM 2022: £400 + accommodation (canceled)
- September 2021 - Fellowship to attend *The Unity of Mathematics: A conference in honor of Sir Michael Atiyah, Issac Newton Institute*: Travel and accommodation
- June 2020 - UC Santa Cruz Mathematics Department Summer Research Fellowship, $3000.
- August 2019 - Supported as a graduate student by PI: François Monard under their grant titled *Explicit methods for linear and non-linear tomography.* (NSF grant DMS-1814104.)
- June 2019 - UC Santa Cruz Mathematics Year-End Fellowship, $4000. Fellowship awarded to support research over the summer.
- July 2015 to Present - UC Santa Cruz Travel/Research Grants, totaling ≈ $5000.

Awards

- June 2015 - UC Santa Cruz Mathematics Early Academic Achievement Award ($500 funding award for early completion of Preliminary Exams).

Articles in preparation

1. C. Fermanian-Kammerer, V. Fischer, and S. Flynn. Working Title: "A Noncommutative Semi-classical calculus on Filtered Manifolds"
2. S. Flynn. Working Title: "Tomography on H-type Groups."

Invited Talks

- November 2022 - *Geometric Invariance of the Semi-Classical Calculus on Graded Lie groups.*
  Conference on Noncommutative Analysis and PDEs Link
  Queen Mary University of London.
- November 2022 - *Tensor Tomography on H-type groups.*
  Geometry and Analysis Seminar Link
  University of Bristol
- May 2022 - *The Heisenberg X-ray transform: A first approximation Inverse Problems on sub-Riemannian manifolds.*
  Analysis and Differential Geometry International Seminar Link
  University of Aveiro
- March 2022 - *The Spectral Decomposition of sR-Ray Transforms*
  AGeNT Seminar Link
  University of Bath
- November 2021 - *Unraveling the Heisenberg X-ray Transform*
  Problèmes Spectraux en Physique Mathématique Link
  Institut Henri Poincaré
- September 2021 - *Unraveling X-ray Transforms on Heisenberg group*
  Bath Analysis Seminar Link
  University of Bath

- April 2021 - *Unraveling the Heisenberg X-ray Transform*
  Sub-Riemannian Seminars Link.
  (Online).
- May 2020 - *Quantizing The Fourier Slice Theorem*
  UC Santa Cruz Geometry and Analysis Seminar.
- January 2020 - *Integral Geometry on Contact Manifolds*
  Joint Mathematics Meeting, Denver Colorado.
- September 2019 - *Integral Geometry on Contact Manifolds*
  Mathematics Sciences Research Institute, Berkeley CA.
- November 2019 - *Noncommutative methods for inverting the Subriemannian X-ray transform on the Heisenberg group*
  Mathematical Sciences Research Institute, Berkeley, CA.
- April 2019 - *Inverting the Heisenberg X-ray Transform*
  AMS Sectional meeting, Sub-Riemannian and CR Geometric Analysis, University of Connecticut, Hartford.
- March 2019 - *Inverting the Heisenberg X-ray Transform*
  Graduate Student Geometry and Topology Conference, University of Illinois, Urbana-Champaign.
- June 2018 - *The Heisenberg X-ray Transform*
  UC Santa Cruz Geometry and Analysis Seminar.
- April 2017 - *X-rays and Heisenberg*
  Eastern Illinois Integrated Conference in Geometry, Dynamics and Topology.

Service

- 2022 - Reviewer for the *Journal of Functional Analysis.*
- 2022 - Organizer of the Bath Analysis Seminar, University of Bath
- 2022 - Organizer of the University of Bath Postdoc Away Day.
- Fall 2019 - Organizer, Graduate Student Seminar, MSRI.
- Spring 2018 - Organizer, Graduate Differential Geometry Seminar, UC Santa Cruz.
- Fall 2018 - Organizer, Microlocal Analysis Seminar, UC Santa Cruz.
- Spring 2018 - Mentor for the UCSC Directed Reading Program. Guided an undergraduate mathematics student through a research project on the isoperimetric problem. The student presented their work at the end of the semester.

Workshop Participation

- 2022 - Conference on Noncommutative Analysis and PDEs.
  London Mathematical Society and Queen Mary University
- 2022 - Tomography Across the Scales: Geometrical Inverse Problems
  Johann Radon Institute
- 2022 - Inverse Problems in Analysis and Geometry
  University of Helsinki
- 2022 - AMS-SMF-EMS Joint International Meeting 2022, Special Session in Sub-Riemannian Geometry
  Université Grenoble Alpes
- 2022 - Conformal Geometry, Analysis and Physics
  University of Washington
- 2022 - Winter School: Foliations, Pseudodifferential Operators and Groupoids
  Mathematical Institute of the University of Göttingen.

- 2021 - Pauda Paris Sub-Riemannian Seminar
  Università di Padova.
- 2021 - The Unity of Mathematics: A conference in honor of Sir Michael Atiyah
  Isaac Newton Institute.
- 2019 - Holomorphic Differentials in Mathematical Physics
  MSRI, UC Berkeley.
- 2019 - Recent Developments in Microlocal Analysis
  MSRI, UC Berkeley.
- 2019 - Subriemannian Geometry and Beyond II
  University Jyvaskyla (Invited to give a poster presentation).
- 2018 - Hamiltonian Systems from Topology to Applications through Analysis
  MSRI, UC Berkeley.
- 2018 - Subriemannian Geometry and Beyond
  University of Jyvaskyla.
- 2017 - Seminaire de Mathematiques Superieures: Contemporary Dynamical Systems, University of Montreal.
- July 2015 - Seminaire de Mathematiques Superieures: Geometric and Computational Spectral Theory, University of Montreal.

Teaching Experience

- **University of Bath, Bristol, Imperial, Oxford, Warwick and Swansea** (planned)
  I am preparing to a graduate level course in Geometric Mechanics to be delivered through the Taught Course Center in the January to March 2023 session. TCC is a collaboration between the Mathematics Departments at the Universities of Bath, Bristol, Imperial, Oxford, Warwick and Swansea. TCC offeres graduate courses to all participating universities, delivered through Microsoft Teams.
- **University of California, Santa Cruz**
  Graduate Student Instructor: As a GSI, I independently taught one lower and three upper division mathematics classes for 20 hours per week concurrently with my graduate studies. I was responsible to give lectures, write exams, assign homework, manage a teaching assistant, assess students' work and distribute grades.

  Lower Division:
  Summer 2017 Math 3 Precalculus

  Upper Division:
  Summer 2019 Math 105A Real Analysis
  Spring 2019 Math 105B Real Analysis
  Summer 2018 Math 105A Real Analysis
- **Teaching Assistant**: I have six years experience working as a teaching assistant 20 hours per week concurrently with my graduate program. My duties included delivering axillary lectures, review sessions, grading work/exams and holding office hours.

  Elementary Courses:
  Math 2 CL (Collaborative Learning), College Algebra (Funded by Title V HSI grant)*
  Math 3, Precalculus

Physics 5, 5L, Intro to Physics (Lab)

*For Math 2 CL, I revived additional training to address the needs of students from disadvantaged background.

Lower Division:
Math 11A, Calculus with Applications
Math 19A, Calculus for Science, Engineering, and Mathematics
Math 19B, Calculus for Science, Engineering, and Mathematics
Math 21, Linear Algebra
Math 23A, Vector Calculus
Math 23B, Vector Calculus

Upper Division:
Math 100, Intro to Proofs
Math 105A, Real Analysis
Math 105B, Real Analysis II
Math 152, Programming for Math (Python)**
**I taught students to use Python (in Jupyter) to visualize, formulate and test number-theoretic conjectures, such as the Collatz conjecture.

Relevant Skills Software Experience: Python, C++, MATLAB, Git, LeTeX.