JAMES BENN

Research Scientist - Mathematics & Statistics

CONTACT

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iksiri

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SKILLS

Teaching 10 + yrs

Commercially Applied Statistics 3 + yrs

R Int

Python Beg

French Language Beg

EMPLOYMENT HISTORY

Research Scientist — **Jul 20 - Present**
INRIA, Sophia Antipolis and Université Côte d'Azur, France

I work on applications of finite and infinite dimensional geometry to the the Euler equations of hydrodynamics and the analysis of data; in particular, mathematical representations of shapes and graphs, and their statistical analysis.

Claims Assessor — **Feb 19 - Jul 20**
Ministry for Primary Industries, Wellington, New Zealand

Conducted business valuation and performance analysis · Prepared legal memoranda for the Crown Law Office and the Minister for Biosecurity.

Visiting Researcher — **Sep 18 - Nov 18**
Bu-Ali Sina University, Hamadan, Iran

Research in the geometry of diffeomorphism groups, the Euler equations, and geophysical phenomena.

Visiting Researcher — **Jul 18 - Sep 18**
Goethe University, Frankfurt, Germany

Research on the geometry of diffeomorphism groups, the Euler equations, and geophysical phenomena.

Statistical Process Control Analyst and Maintenance Support Analyst — **Jan 18 - Jun 18**
Higgins Group, Palmerston North, New Zealand

Wrote and implemented software for analysing and simulating road roughness, machine learning algorithms for asphalt manufacture and statistical process controls · Developed a nationwide accreditation scheme for asphalt manufacture in small and large production runs.

Mathematics Tutor — **Jan 15 - Jan 18**
The Maths Clinic, Palmerston North, New Zealand

Provided mathematics tutoring services to middle school and high school students

Postdoctoral Researcher — **Jan 17 - Jan 18**
Massey University, Palmerston North, New Zealand

Investigated the modelling of biological evolution through Levy Processes.

Lecturer — **Jan 16 - Dec 16**
Massey University, Palmerston North, New Zealand

Taught Calculus, linear algebra, discrete mathematics, abstract algebra, and mathematical physics · conducted research in geometric/symplectic hydrodynamics, information geometry, and medical imaging.

Statistical Consultant Dec 15 - Dec 16
Midcentral District Health Board, Palmerston North, New Zealand

Applied operations research techniques to stream-line staff and resource allocation within the emergency department.

EDUCATION

PhD, MS - Mathematics 2010 - 2015
University of Notre Dame - South Bend, IN, USA

Hydrodynamics, Differential Geometry, Functional Analysis.

"The L^2 Geometry of the Symplectomorphism Group", supervised by Professor Gerard Misiolek.

MSc - Mathematics 2010 - 2010
Massey University - Palmerston North, New Zealand

Numerical Analysis, Runge-Kutta Methods, B-Series

"The Algebraic Structure of B-Series", supervised by Professor Robert McLachlan.

BInfSc 2007 - 2009
Massey University - Palmerston North, New Zealand

Passed with 1st Class Honors.

PUBLICATIONS

J. Benn, S. Marsland, *Knotted Solutions to the Euler Equations on the 3-Sphere*
(2024)

Status: In preparation

J. Harrison, J. Benn, *Improving Neural Network Surface Processing with Principal Curvatures*
(2024)

Status: In preparation

J. Benn, S. Marsland, *Towards a BCH formula on the Diffeomorphism Group with a Right-Invariant Metric*
Status: In preparation

M. Akhøj, J. Benn, E. Grong, S. Sommer, X. Pennec, *Principal Subbundles for Dimension Reduction*
arXiv:2307.03128 (2023)

Status: submitted for review at Foundations of Computational Mathematics

J. Benn, A. Calissano, S. Marsland, X. Pennec *The Current Space of Graphs*
hal-03910825 (2022)

J. Benn, S. Marsland, *The Measurement and Analysis of Shapes: An application of hydrodynamics and probability theory*
Annals of Global Analysis and Geometry (ISSN: 1572-9060) https://doi.org/10.1007/s10455-022-09839-z, 2022

J. Benn, *Conjugate Points on $\mathcal{D}^s_\mu\left(S^2\right)$*
Journal of Geometry and Physics (ISSN: 0393-0440) Vol 170, 2021

J. Benn, A. Suri, *Sobolev H^1 Geometry of the Symplectomorphism Group*
Differential Geometry and Applications (ISSN: 0926-2245) Vol 67, 2019

J. Benn, S. Marsland, R. I. McLachlan, K. Modin, O. Verdier, *Currents and Finite Elements as Tools for Shape Space*
Journal of Mathematical Imaging and Vision (ISSN: 1573-7683) Vol 61, Issue 8, 2019

J. Benn, G. Misiolek, S. C. Preston, *The Exponential Map of the Group of Area Preserving Diffeomorphisms of a Surface with Boundary*
Archive for Rational Mechanics and Analysis (ISSN: 1432-0673) Vol 229, Issue 3, 2018

J. Benn, *The Coadjoint Operator, Conjugate Points, and the Stability of Ideal Fluids*
Arnold Mathematics Journal (ISSN: 2199-6806) Vol 2, 2016

J. Benn, *Fredholm Properties of the Exponential Map on the Symplectomorphism Group*
Journal of Geometric Mechanics (ISSN: 1941-4889) Vol 2, 2016

J. Benn, *Conjugate Points on the Symplectomorphism Group*
Annals of Global Analysis and Geometry (ISSN: 1572-9060) Vol 48, Iss 2, 2015

INVITED TALKS

Conjugate Points on $\mathcal{D}_\mu(S^2)$; but what are they really? — **Mar 2023**
Maynooth University, Maynooth, Ireland

Department of Mathematics and Statistics Colloquium

The Measurement and Analysis of Shapes — **Nov 2021**
Universite Paris 1 (Pantheon Sorbonne), Paris, France

SAMM Seminar

Conjugate Points on $\mathcal{D}^s_\mu\left(S^2\right)$ and Resonant Wave Interactions — **Aug 2018**
Goethe University, Frankfurt am Main

Mathematics Colloquium

Conjugate Points in Diffeomorphism Groups — **Aug 2017**
Bu-Ali Sina University, Hamadan, Iran

48th Annual Iran Mathematics Conference

Exponential Maps of Right-Invariant Metrics — **Feb 2016**
Massey University, Palmerston North, New Zealand

IFS Mathematical Physics Seminar

Fredholm Properties of the L^2 Exponential Map on the Symplectomorphism Group — **Jan 2015**
Erwin Schrodinger Institute for Mathematical Physics, Vienna, Austria

Conference on Infinite Dimensional Riemannian Geometry

The L^2 Geometry of the Symplectomorphism Group — **Oct 2014**
Vanderbilt University, Nashville (TN), USA

Partial Differential Equations Seminar

The L^2 Geometry of the Symplectomorphism Group — **Oct 2014**
University of Colorado at Boulder, Boulder (CO), USA

Ulam Seminar

The Euler Equations of Hydrodynamics and Symplectic Analogues — **March 2011**
University of Notre Dame, Notre Dame (IN), USA

PDE, Complex Analysis, Differential Geometry Seminar

SCHOLARSHIPS & GRANTS

Travel grant to participate in the Workshop on Geometry and Analysis — **Jan 2023**
SUNY at Stonybrook

New York, USA

Scholarship to participate in the Thematic Workshop on Geometry and Statistics in Data Science — **Sep - Dec 2022**
Institut Henri Poincare

Paris, France

Travel grant to participate in the Workshop on Infinite Dimensional Riemannian Geometry — **Jan 2015**
Erwin Schrodinger Institute for Mathematical Physics

Vienna, Austria

TEACHING

Lecturer — **2021/2022**
Introduction to Riemannian Manifolds (PhD Course)

Inria, Sophia-Antipolis, France

Lecturer 2016

- **Mathematical Physics 160.737 (Masters)**
- **Applied Linear Algebra 160.211 (Undergraduate)**
- **Differential Equations I 160.204 (Undergraduate)**
- **Abstract Algebra 160.302 (Undergraduate)**
- **Mathematics for Engineering 228.171 (Undergraduate)**

Massey University, Palmerston North, New Zealand

Lecturer 2014
Principles of Calculus (Undergraduate)

University of Notre Dame, South Bend, IN, USA

Lecturer 2013
Discrete Mathematics (Undergraduate)

University of Notre Dame, South Bend, IN, USA

Teaching Assistant 2015
Linear Algebra and Differential Equations

University of Notre Dame, South Bend, IN, USA

Teaching Assistant 2014

- **Calculus III**
- **Linear Algebra and Differential Equations**

University of Notre Dame, South Bend, IN, USA

Teaching Assistant 2013

- **Calculus III**
- **Calculus I**

University of Notre Dame, South Bend, IN, USA

Teaching Assistant 2012

- **Calculus III**
- **Calculus B**

University of Notre Dame, South Bend, IN, USA

EXTRACURRICULAR

- I love listening to and playing music.
- I'm interested in writing and literature - especially cultural history and fiction (anything by Diane Williams or the literary annual NOON).
- I'm a (very) amateur travel photographer on the look out for spontaneous uncanniness.