Christopher Elliott

Contact Details

Full Name	Christopher James Elliott
Date of Birth	20th Sep, 1987
Nationality	British
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Work Experience

2019–	Visiting Assistant Professor, **University of Massachusetts, Amherst**
2016–2019	Postdoctoral Fellow, **Institut des Hautes Études Scientifiques**

Education

2010–2016	PhD, **Northwestern University** Advisors: Kevin Costello and David Nadler Thesis Title: *Gauge Theoretic Aspects of the Geometric Langlands Correspondence*.
2009–2010	MMath (Mathematics Tripos: Part III), **University of Cambridge**, With Distinction. Part III Essay: *D-Modules and Hodge Theory*
2006–2009	BA (hons) (Mathematics), **University of Cambridge**, 1st Class.

Research Visits

2014–2018	**Perimeter Institute** (7 visits, each 1-3 weeks)
Oct–Nov 2017	**MPIM**, Bonn
Oct 2017	**Hausdorff Institute**, Bonn
Nov 2016	**MPIM**, Bonn

Research Interests

I'm interested in mathematical aspects and applications of quantum field theory. In particular

- The construction and classification of (not necessarily topological) twists of classical and quantum field theories, especially using techniques of derived algebraic geometry and homotopical algebra.
- The connection between structures appearing in various versions of the geometric Langlands correspondence and twists of four-, five- and six-dimensional supersymmetric gauge theories.
- The theory of factorization algebras as a model for perturbative quantum field theory, possibly with boundary conditions and defects.

Publications and Preprints

1. *Quantum Geometric Langlands Categories from $\mathcal{N} = 4$ Super Yang–Mills Theory* (joint with Philsang Yoo), arXiv:2008.10988
2. *Spontaneous Symmetry Breaking: a View from Derived Geometry* (joint with Owen Gwilliam), Journal of Geometry and Physics, Vol 162, 2021, arXiv:2008.02302

3. *Holomorphic Poisson Field Theories* (joint with Brian Williams), accepted for publication in Higher Structures, arXiv:2008.03599
4. *A Taxonomy of Twists of Supersymmetric Yang–Mills Theory* (joint with Pavel Safronov and Brian Williams), arXiv:2002.10517
5. *Multiplicative Hitchin Systems and Supersymmetric Gauge Theory* (joint with Vasily Pestun), Selecta Mathematica, Vol 25, Issue 64, 2019, arXiv:1812.05516
6. *Topological Twists of Supersymmetric Algebras of Observables* (joint with Pavel Safronov), Communications in Mathematical Physics, Vol 371, pages 727– 786, 2019, arXiv:1805.10806
7. *A Physical Origin for Singular Support Conditions in Geometric Langlands* (joint with Philsang Yoo), Communications in Mathematical Physics, Vol 368, Issue 3, Pages 985–1050, 2019, arXiv:1707.01292
8. *Asymptotic Freedom in the BV Formalism* (joint with Brian Williams and Philsang Yoo), Journal of Geometry and Physics, Vol 123, Jan 2018, Pages 246–283, arXiv:1702.05973
9. *Geometric Langlands Twists of $N = 4$ Supersymmetric Gauge Theory from Derived Algebraic Geometry* (joint with Philsang Yoo), Advances in Theoretical and Mathematical Physics, Vol 22, Number 3, Pages 615–708, 2018, arXiv:1507.03048
10. *Abelian Duality for Generalised Maxwell Theories*, Mathematical Physics, Analysis and Geometry, Vol 22, Issue 22, 2019, arXiv:1402.0890

Invited Lecture Series

Oct 2017 — Hausdorff Institute for Mathematics,
An Algebraic Introduction to Kapustin-Witten Theory

Invited Research Talks

Mar 2021 — Mathematical Physics Seminar, University of Nottingham
Gauge Symmetry via Derived Geometry

May 2020 — Higgs Bundles & Related Topics, Online Workshop
The Multiplicative Hitchin System

May 2020 — Holomorphic Quantum Field Theories, IPMU
Cancelled due to COVID-19

Oct 2019 — Geometric Representation Theory Seminar, Fields Institute
A Catalogue of Twists for Supersymmetric Quantum Field Theory

Sep 2019 — Mathematical Physics Seminar, Boston University
Supersymmetric Quantum Field Theory and its Twists

Mar 2019 — MAGIC Seminar, Imperial College London
Supersymmetric Quantum Field Theory and its Twists

Feb 2019 — Geometry and Mathematical Physics Seminar, University of Birmingham
The Multiplicative Hitchin System in Supersymmetric Gauge Theory

Jan 2019 — Colloquium, Rutgers University, Newark
Twisted Classical and Quantum Field Theory

Nov 2018 — Geometry, Symmetry and Physics Seminar, Yale University
The Multiplicative Hitchin System in Supersymmetric Gauge Theory

Nov 2018 — Geometry, Physics, and Representation Theory Seminar, Northeastern University
The Multiplicative Hitchin System in Supersymmetric Gauge Theory

May 2018 — Algebraic Geometry Seminar, IST Austria,
Topological Twists of Supersymmetric Factorization Algebras

Apr 2018 — Edinburgh Geometry Seminar, University of Edinburgh,
The Multiplicative Hitchin System in Supersymmetric Gauge Theory

Dec 2017 — Higher Categories and Mirror Symmetry, KIAS Seoul,
Singular Support Conditions for Coherent Sheaves Coming From Vacua

Oct 2017	Topology Seminar, MPIM Bonn, *Topological Twists of Factorization Algebras*
Jun 2017	Séminaire Groupes de Lie et Espaces des Modules, Université de Genève, *Vacua and Singular Supports*
May 2017	Mathematical Physics Seminar, Perimeter Institute, *Vacua and Singular Supports*
Mar 2017	Formal Aspects of String Theory Kickoff Meeting, University of Amsterdam, *Algebraic Structures for Kapustin-Witten Twisted Gauge Theories*
Feb 2017	Physical Mathematics Seminar, Universität Heidelberg *Algebraic Structures for Kapustin-Witten Twisted Gauge Theories*
Jan 2017	Quantization and Moduli Spaces, Université du Luxembourg, *Algebraic Structures for Kapustin-Witten Twisted Gauge Theories*
Nov 2016	Algebraic Analysis Seminar, Institut de Mathematiques de Jussieu Paris Rive Gauche, *Algebraic Structures for Kapustin-Witten Twisted Gauge Theories*
Nov 2016	Higher Differential Geometry Seminar, MPIM Bonn, *Algebraic Structures for Kapustin-Witten Twisted Gauge Theories*
Dec 2014	Geometry and Physics Seminar, Boston University *Fourier Duality in Higher Abelian Gauge Theories*
Oct 2014	Homological Methods in Quantum Field Theory, Simons Center *Non-perturbative Descriptions for Twists of Classical Field Theories*
May 2014	Representation Theory, Integrable Systems and Quantum Field Theory, Northwestern University *Fourier Duality in Higher Abelian Gauge Theories*
Mar 2014	MAGIC Seminar, Imperial College London *Fourier Duality in Higher Abelian Gauge Theories*
Apr 2013	GRASP Seminar, UC Berkeley *Abelian Duality for Generalised Maxwell Theories*

Contributed and Expository Talks

Mar 2021	TWIGS (The What Is Graduate Seminar), University of Massachusetts, Amherst *What is Supersymmetry?*
Jan 2020	Geometry and Topology Seminar, University of Massachusetts, Amherst *The Multiplicative Hitchin System*
Oct 2019	Representation Theory Seminar, University of Massachusetts, Amherst *Supersymmetric Field Theory and its Twists*
Jul 2019	QFT for Mathematicians, Perimeter Institute (teaching assistant) *Supersymmetry Algebras Yang-Mills Theory and Asymptotic Freedom*
Aug 2018	Higher Algebra and Mathematical Physics, MPIM Bonn *Topological Twists of Supersymmetric Factorization Algebras*
Feb 2017	Introductory Seminar, Universität Heidelberg *An Introduction to the BV Formalism*
Jan 2015	Northwestern Graduate Student Seminar *Representations of the Poincaré Group*
Oct 2013	Northwestern Graduate Student Seminar *The Feynman Path Integral*
Mar 2013	Brownbag Seminar, Northwestern Physics Department *Topological Quantum Field Theory*
Oct 2012	Northwestern Graduate Student Seminar *Dirac Quantisation*
Aug 2012	Categorical Representation Theory Workshop, University of Oregon *TQFTs from Quasicoherent Sheaves on Stacks*

Mar 2012	Simons Center Graduate Workshop in Supersymmetric Gauge Theory *Supersymmetric Lagrangians*
Feb 2012	Northwestern Preseminar for Simons Center Supersymmetric Gauge Theory Workshop *Classical Lagrangian Field Theory*
Oct 2011	Northwestern Graduate Student Seminar *What is Intersection Homology?*
May 2011	MIT Talbot Workshop, *The Non-Abelian Hodge Correspondence for Non-Compact Curves*
Apr 2011	Northwestern Pre-Talbot Seminar *Twistor Space Constructions of Hyper-Kähler Manifolds*

Conference Organisation

Jun 2021	Co-organiser *Quantum Fields, Geometry and Representation Theory 2021*, ICTS, Bangalore
Aug 2020	Co-organiser *Physical Mathematics of Quantum Field Theory*, University of Massachusetts, Amherst (Postponed due to COVID-19)
Jan 2019	Co-organiser *Non-Local Aspects of Holomorphic and Topological Field Theory*, IHÉS
Dec 2014	Co-organiser *Workshop on Mathematical Aspects of Six-Dimensional Quantum Field Theories*, Berkeley
Jan 2012	Co-organiser *Northwestern Masterclass in Gauge Theory*, Northwestern University

Other Organisation

2020	Co-organiser *QFT and Representation Theory Working Seminar*, Online
2019 –	Co-organiser *Representation Theory Seminar*, University of Massachusetts, Amherst
2012 – 2015	Co-organiser Series of learning seminars on various topics in mathematical physics and representation theory.
Jan–Feb 2012	Organiser *Northwestern Preseminar for Simons Center Supersymmetric Gauge Theory Workshop*

Teaching

Fall 2021	University of Massachuestts, Amherst Instructor, Abstract Algebra I.
Spring 2021	University of Massachuestts, Amherst Co-instructor, Moduli Spaces in Representation Theory and Physics (graduate course). Instructor, Calculus II (two sections).
Fall 2020	University of Massachusetts, Amherst Instructor, Calculus II honors (two sections) Undergraduate reading course on Lie theory and mathematical physics.
Spring 2020	University of Massachusetts, Amherst Instructor, Calculus II (two sections).
Fall 2019	University of Massachusetts, Amherst Instructor, Calculus I Honors (two sections).
2011 – 2015	Northwestern University Teaching Assistant for courses including Introductory Calculus, Multivariate Calculus, Linear Algebra, Group Theory, Fourier Analysis, Graph Theory, Number Theory, and Algebraic Topology.

Aug 2011	Northwestern University Summer Bridge Program Teaching Assistant (Preparatory summer course in precalculus)

Service

Summer 2020	University of Massachusetts Amherst Honors thesis committee member: Lucy Grossman –"Elliptic Curves, Manifolds, and Hodge Theory".
2017–2020	Referee reports for Advances in Mathematics, Annales Henri Poincaré, Communications in Number Theory and Physics, Contemporary Mathematics, Journal of Geometry and Physics, Journal of High Energy Physics. Reviewer for Math Reviews.