

Christopher Elliott

Contact Details

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

2019–2022 Visiting Assistant Professor, **University of Massachusetts, Amherst**
2016–2019 ERC 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- and five-dimensional supersymmetric gauge theories.
- The theory of factorization algebras as a model for perturbative quantum field theory.

Papers and Preprints

- *A Taxonomy of Twists of Supersymmetric Yang–Mills Theory* (joint with Pavel Safronov and Brian Williams), arXiv:2002.10517 (Submitted)
- *Multiplicative Hitchin Systems and Supersymmetric Gauge Theory* (joint with Vasily Pestun), *Selecta Mathematica*, Vol 25, Issue 64, 2019, arXiv:1812.05516
- *Topological Twists of Supersymmetric Algebras of Observables* (joint with Pavel Safronov), *Communications in Mathematical Physics*, Vol 371, pages 727– 786, 2019, arXiv:1805.10806

- *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
- *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
- *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
- *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

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 <i>Algebraic Structures for Kapustin-Witten Twisted Gauge Theories</i>
Jan 2017	Quantization and Moduli Spaces, Université du Luxembourg, <i>Algebraic Structures for Kapustin-Witten Twisted Gauge Theories</i>
Nov 2016	Algebraic Analysis Seminar, Institut de Mathematiques de Jussieu Paris Rive Gauche, <i>Algebraic Structures for Kapustin-Witten Twisted Gauge Theories</i>
Nov 2016	Higher Differential Geometry Seminar, MPIM Bonn, <i>Algebraic Structures for Kapustin-Witten Twisted Gauge Theories</i>
Dec 2014	Geometry and Physics Seminar, Boston University <i>Fourier Duality in Higher Abelian Gauge Theories</i>
Oct 2014	Homological Methods in Quantum Field Theory, Simons Center <i>Non-perturbative Descriptions for Twists of Classical Field Theories</i>
May 2014	Representation Theory, Integrable Systems and Quantum Field Theory, Northwestern University <i>Fourier Duality in Higher Abelian Gauge Theories</i>
Mar 2014	MAGIC Seminar, Imperial College London <i>Fourier Duality in Higher Abelian Gauge Theories</i>
Apr 2013	GRASP Seminar, UC Berkeley <i>Abelian Duality for Generalised Maxwell Theories</i>

Contributed and Expository Talks

Jan 2020	Geometry and Topology Seminar, University of Massachusetts, Amherst <i>The Multiplicative Hitchin System</i>
Oct 2019	Representation Theory Seminar, University of Massachusetts, Amherst <i>Supersymmetric Field Theory and its Twists</i>
Jul 2019	QFT for Mathematicians, Perimeter Institute (teaching assistant) <i>Supersymmetry Algebras Yang-Mills Theory and Asymptotic Freedom</i>
Aug 2018	Higher Algebra and Mathematical Physics, MPIM Bonn <i>Topological Twists of Supersymmetric Factorization Algebras</i>
Feb 2017	Introductory Seminar, Universität Heidelberg <i>An Introduction to the BV Formalism</i>
Jan 2015	Northwestern Graduate Student Seminar <i>Representations of the Poincaré Group</i>
Oct 2013	Northwestern Graduate Student Seminar <i>The Feynman Path Integral</i>
Mar 2013	Brownbag Seminar, Northwestern Physics Department <i>Topological Quantum Field Theory</i>
Oct 2012	Northwestern Graduate Student Seminar <i>Dirac Quantisation</i>
Aug 2012	Categorical Representation Theory Workshop, University of Oregon <i>TQFTs from Quasicoherent Sheaves on Stacks</i>
Mar 2012	Simons Center Graduate Workshop in Supersymmetric Gauge Theory <i>Supersymmetric Lagrangians</i>
Feb 2012	Northwestern Preseminar for Simons Center Supersymmetric Gauge Theory Workshop <i>Classical Lagrangian Field Theory</i>
Oct 2011	Northwestern Graduate Student Seminar <i>What is Intersection Homology?</i>
May 2011	MIT Talbot Workshop, <i>The Non-Abelian Hodge Correspondence for Non-Compact Curves</i>

Apr 2011 Northwestern Pre-Talbot Seminar
Twistor Space Constructions of Hyper-Kähler Manifolds

Conference Organisation

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

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

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

Referee reports for Communications in Number Theory and Physics, Contemporary Math, Journal of Geometry and Physics, JHEP. Reviewer for Math Reviews.

References

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