

# Christopher Elliott

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## Contact Details

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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

- *Multiplicative Hitchin Systems and Supersymmetric Gauge Theory* (joint with Vasily Pestun), accepted for publication in *Selecta Mathematica*, 2019, arXiv:1812.05516
- *Topological Twists of Supersymmetric Algebras of Observables* (joint with Pavel Safronov), accepted for publication in *Communications in Mathematical Physics*, 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

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 Mathématiques 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

- Oct 2019      Representation Theory Seminar, Amherst University  
*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

- 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

- 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 for *Communications in Number Theory and Physics*, *Contemporary Math*. Reviewer for *Math Reviews*.

## References

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