Antoine Bourget

Personal Data

Birth:	Colombes, France | 3 January 1989
Email:	antoine.bourget@polytechnique.org
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Languages:	French, English, Spanish (fluent). Chinese (intermediate).
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Work Experience

2021-2023 | IPhT, CEA Saclay, and ENS, Paris, France
Junior Research Chair

2018-2021 | Imperial College, London, UK
Postdoctoral researcher in High Energy Physics

2016-2018 | University of Oviedo, Spain
Postdoctoral researcher in High Energy Physics

2011-... | Ministry of Economic Affairs, Paris, France
Ingénieur du Corps des Mines (actuellement en détachement).

Education

Jul 2016 | PhD, École Normale Supérieure, Paris, France
Mention très bien avec les félicitations du jury
Thesis: Modularity and Vacua in $\mathcal{N} = 1^*$ Supersymmetric Gauge Theories
Advisor: J. Troost
Examiners: O. Aharony, C. Bachas, A. Hanany, M. Petrini, S.P. Kumar, H. Samtleben

2011-2012 | École Nationale Supérieure des Mines, Paris, France
Admission to the *Corps des Mines* (rank: 3rd).

2008-2011 | École Polytechnique, Palaiseau, France
Major in Mathematics and Theoretical Physics. GPA: 4.0
Admission from the MP* Classe Préparatoire (rank: 2nd).

Teaching

2022-2023	TA in Symmetries in Physics (with F. Chevy). MSc level, ENS Paris.
2021-2023	TA in Particle Physics and the Standard Model (with A. Kashani-Poor). Undergrad level, ENS Paris.
2021	50th British Universities Summer School in Theoretical Elementary Particle Physics (BUSSTEP) Queen Mary University, London.
2020-2021	Lecture on Algebraic singularities in Physics. MSc in Quantum Fields and Fundamental Forces Imperial College London.
2014-2016	TA in Quantum Mechanics (with F. Chevy). Undergrad level, ENS Paris.
2015-2016	TA in General Relativity (with G. Esposito-Farèse). MSc level, ENS Paris.

Student supervision:

- 2022-2023: Loïc Honet (M2 Theoretical and Mathematical Physics, Ludwig-Maximilians University, Germany, *Generalized symmetries in QFT*)
- 2022-2023: Simon Astrup-Gay (M1, ENS Paris, *Magnetic monopoles*)
- 2022: Rodrigue Orageux (M1, ENS Paris, *Formalisme ADM de la Relativité Générale*)
- 2021: Théodore Bertrand (M1, ENS Paris, *Quivers in String Theory: an Introduction*)
- 2021: Diogo Santos (M3R, Imperial College London, *An Introduction to Quivers in 3d $N = 4$ Superconformal Field Theories*)
- 2020: Min Lin (Undergraduate Research Opportunities Programme, Imperial College London, *Theories of class S*)
- 2020: Hai Châu Nguyên (L3, ENS Lyon, *Classification des algèbres de Lie complexes, motivations physiques et carquois*)

Activities

- **Organizer** of the following international conferences and workshops:
  1. Workshop on *Geometry and Symmetries of SCFTs*, Mainz Institute for Theoretical Physics, Germany. June 17-21, 2024.
  2. School and Workshop on *Symplectic Singularities and Quantum Theory* (Amiens, July 10-21, 2023).
     https://sites.google.com/view/symplectic-singularities-susy/home
  3. Workshop on *The Geometry, Algebra, and Physics of Higgs Bundles*, Banff International Research Station (UBC Okanagan), Canada. May 28 to June 2, 2023.
     https://www.birs.ca/events/2023/5-day-workshops/23w5082

4. Workshop at the Simons Center for Geometry and Physics, *5d N=1 SCFTs and Gauge Theories on Brane Webs* (October 17-21, 2022). https://scgp.stonybrook.edu/archives/35039
5. SCGSC 2016, Imperial College London, January 7-8, 2016. https://sites.google.com/site/scgsc2016/

- **Reviewer** for JHEP, SciPost, Nuclear Physics B, AMS Math Reviews, zbMATH.
- Organizer of several seminar series: Paris Rencontres Théoriciennes (2022-2023), the Imperial College String Theory Seminars (2020-2022), the London Triangle and Polygon seminars (2018-2021), the Theory Group Colloquium (2018-2020). Creation and organization of the student and postdoc seminar series at IPhT, Saclay.
- Animation and Organization of the Institute Retreat of IPhT, Autrans, France (May 2022).

Outreach

- **Channel Scientia Egregia** on Youtube, filling the gap between undergrad and research level in math and theoretical physics ($> 300,000$ hours total views). https://www.youtube.com/user/antoinebrgt
- Other outreach activities:
  - *I'm a Scientist* (connecting scientists with highschool in the UK)
  - Imperial College Science Forum
  - TALENS association (maths and physics classes in disadvantaged highschools)
  - Phyique pour tous (lectures at ENS).

Publications

All my publications are available at https://inspirehep.net/authors/1394491.

- A Bourget, J. F. Grimminger, A. Hanany, R. Kalveks, M. Sperling, Z. Zhong, *A tale of N cones.* [arXiv:2303.16939]
- A. Bourget, S. Giacomelli and J. F. Grimminger, *FI-flows of 3d N=4 Theories.* JHEP 04 (2023) 015. [arXiv:2302.03698]
- A. Bourget, A. Collinucci and S. Schafer-Nameki, *Generalized Toric Polygons, T-branes, and 5d SCFTs.* [arXiv:2301.05239]
- A. Bourget and J. F. Grimminger, *Fibrations and Hasse diagrams for 6d SCFTs.* JHEP 12 (2022) 159 [arXiv:2209.15016]
- A. Bourget, J. F. Grimminger, A. Hanany, and Z. Zhong, *The Hasse Diagram of the Moduli Space of Instantons.* JHEP 08 (2022) 283. [arXiv:2202.01218]
- A. Bourget, A. Dancer, J. F. Grimminger, A. Hanany, and Z. Zhong, *Partial Implosions and Quivers.* JHEP 07 (2022) 049. [arXiv:2112.10825]
- A. Bourget, J. F. Grimminger, A. Hanany, Rudolph Kalveks and Z. Zhong, *Higgs Branches of U/SU Quivers via Brane Locking.* JHEP 08 (2022) 061. [arXiv:2111.04745]
- A. Bourget, J. F. Grimminger, M. Martone and G. Zafrir, *Magnetic quivers for rank 2 theories.* JHEP 03 (2022) 208. [arXiv:2110.11365]

- A. Bourget and A. Hanany, *Hasse diagrams and Higgs branches*, in *The Pollica perspective on the (super)-conformal world*. J.Phys.A 54 (2021) 30, 303001. [CERN Document Server]
- A. Bourget, J. F. Grimminger, A. Hanany, Rudolph Kalveks, M. Sperling and Z. Zhong, *Folding Orthosymplectic Quivers*. JHEP 12 (2021) 070. [arXiv:2107.00754]
- G. Arias-Tamargo, A. Bourget and A. Pini, *Discrete gauging and Hasse diagrams*, SciPost Phys. 11 (2021) 2, 026. [arXiv:2105.08755]
- A. Bourget, A. Dancer, J. F. Grimminger, A. Hanany, F. Kirwan and Z. Zhong, *Orthosymplectic Implosions*, JHEP 08 (2021) 012. [arXiv:2103.05458]
- A. Bourget, J. F. Grimminger, A. Hanany, M. Sperling and Z. Zhong, *Branes, Quivers, and the Affine Grassmannian*. [arXiv:2102.06190]
- M. van Beest, A. Bourget, J. Eckhard and S. Schafer-Nameki, *(5d RG-flow) Trees in the Tropical Rain Forest*, JHEP 03 (2021) 241. [arXiv:2011.07033]
- A. Bourget, Simone Giacomelli, J. F. Grimminger, A. Hanany, M. Sperling and Z. Zhong, *S-fold magnetic quivers*, JHEP 02 (2021) 054. [arXiv:2010.05889]
- M. van Beest, A. Bourget, J. Eckhard and S. Schafer-Nameki, *Symplectic Leaves and 5d Higgs Branches in the Polygonesian Tropical Rain Forest*, JHEP 11 (2020) 124. [arXiv:2008.05577]
- A. Bourget, J. F. Grimminger, A. Hanany, Rudolph Kalveks, M. Sperling and Z. Zhong, *Magnetic Lattices for Orthosymplectic Quivers*, JHEP 12 (2020) 092. [arXiv:2007.04667]
- A. Bourget, J. F. Grimminger, A. Hanany, M. Sperling, G. Zafrir and Z. Zhong, *Magnetic quivers for rank 1 theories*, JHEP 09 (2020) 189. [arXiv:2006.16994]
- A. Bourget, A. Hanany, and D. Miketa, *Quiver origami: discrete gauging and folding*. JHEP 01 (2021) 086 [arXiv:2005.05273]
- A. Bourget, J. F. Grimminger, A. Hanany, M. Sperling and Z. Zhong, *Magnetic Quivers from Brane Webs with O5 Planes*, JHEP 07 (2020) 204. [arXiv:2004.04082]
- P. Argyres, A. Bourget and M. Martone, *On the moduli spaces of 4d N=3 SCFTs I: triple special Kähler structure*, arXiv:1912.04926. [arXiv:1912.04926]
- A. Bourget, S. Cabrera, J. F. Grimminger, A. Hanany and Z. Zhong, *Brane Webs and Magnetic Quivers for SQCD*, JHEP 03 (2020) 176. [arXiv:1909.00667]
- A. Bourget, S. Cabrera, J. F. Grimminger, A. Hanany, M. Sperling, A. Zajac and Z. Zhong, *The Higgs Mechanism - Hasse Diagrams for Symplectic Singularities*, JHEP 01 (2020) 157. [arXiv:1908.04245]
- P. Argyres, A. Bourget and M. Martone, *Classification of all $\mathcal{N} \geq 3$ moduli space orbifold geometries at rank 2*, SciPost Phys. 9 (2020) 083. [arXiv:1904.10969]
- Guillermo Arias-Tamargo, A. Bourget, A. Pini and D. Rodríguez-Gómez, *Discrete gauge theories of charge conjugation*, Nucl.Phys. B946 (2019) 114721. [arXiv:1903.06662]
- A. Bourget, D. Rodríguez-Gómez and J. Russo, *Universality of Toda equation in N=2 superconformal field theories*, JHEP 1902 (2019) 011. [arXiv:1810.00840]
- A. Bourget, A. Pini and D. Rodríguez-Gómez, *Gauge theories from principally extended disconnected gauge groups* , Nucl.Phys. B940 (2019) 351-376. [arXiv:1804.01108]
- A. Bourget, D. Rodríguez-Gómez and J. Russo, *A limit for large R-charge correlators in N=2 theories*, JHEP 1805 (2018) 074. [arXiv:1803.00580]

- A. Bourget and J. Troost, *The Conformal Characters*, JHEP 1804 (2018) 055. [arXiv:1712.05415]
- A. Bourget, A. Pini, D. Rodríguez-Gómez, *Towards the deconstruction of the type D (2,0) theory*, JHEP **1712** (2017). [arXiv:1710.10247]
- A. Bourget and J. Troost, *Permutations of Massive Vacua*, JHEP **1705** (2017) 042. [arXiv:1702.02102]
- A. Bourget and A. Pini, *Non-Connected Gauge Groups and the Plethystic Program*, JHEP **1710** (2017) 033. [arXiv:1706.03781]
- A. Bourget and J. Troost, *The Arithmetic of Supersymmetric Vacua*, JHEP **07** (2016) 036. [arXiv:1606.01022]
- A. Bourget, *Modularity and Vacua in $\mathcal{N} = 1^*$ Supersymmetric Gauge Theory*, July 2016, PhD thesis. [PDF on tel.archives-ouvertes.fr]
- A. Bourget and J. Troost, *The Covariant Chiral Ring*, JHEP **03** (2016) 163. [arXiv:1512.03649]
- A. Bourget and J. Troost, *On the $\mathcal{N} = 1^*$ Gauge Theory on a Circle and Elliptic Integrable Systems*, JHEP **01** (2016) 097. [arXiv:1511.03116]
- A. Bourget and J. Troost, *Counting the massive vacua of $\mathcal{N} = 1^*$ super Yang-Mills theory*, JHEP **1508** (2015) 106. [arXiv:1506.03222]
- A. Bourget and J. Troost, *Duality and modularity in elliptic integrable systems and vacua of $\mathcal{N} = 1^*$ gauge theories*, JHEP **1504** (2015) 128. [arXiv:1501.05074]

Proceedings:

- F. Alday, P. Argyres, M. Lemos, M. Martone, L. Rastelli *et al*, *The Pollica perspective on the (super)-conformal world*. J.Phys.A 54 (2021) 30, 303001 (2021).
- A. Bourget, *Affine Grassmannians and Brane Systems*, in the Nankai Symposium on Mathematical Dialogues, ISBN 978-981-19-2327-2
- A. Bourget, *The Geometry of Quivers*, MaxEnt 2022—the 41st International Workshop on Bayesian Inference and Maximum Entropy Methods. DOI: 10.3390/psf2022005042

Invited Speaker at International Conferences

- 16/06/2023, New Pathways in Exploration of Quantum Field Theory and Quantum Gravity beyond Supersymmetry, ICTP, Trieste, Italy. "Phase diagrams of susy theories".
- 13/10/2022, Geometry of (S)QFT, Simons Center for Geometry and Physics, USA. " Full Vacuum Moduli Spaces in 6d SCFTs". (video)
- 15/07/2022, String Math 2022, University of Warsaw, Poland. "Magnetic Quivers for Symplectic Singularities". (video)
- 21/07/2022, MaxEnt2022, Institut Henri Poincaré, Paris, France. "The Geometry of Quivers".
- 27/04/2022, Eurostrings, Lyon, France. "Exploring the Landscape of SCFTs with Magnetic Quivers". (slides)
- 11/02/2022, Geometrization of (S)QFT in $D \leq 6$, Winter Conference at Aspen, USA. "On the Moduli Space of Instantons".

- 10/01/2022, Connections between String Theory and Special Holonomy Workshop, Oxford, UK. "Magnetic quivers for singular hyperKähler spaces".
- 23/09/2021, Geometry of (S)QFT, Simons Center for Geometry and Physics, Stony Brook, USA. "Higgs branches after lockdown". [video link]
- 03/08/2021, Nankai Symposium on Mathematical Dialogues, Chern Institute of Mathematics, Nankai University, Tianjin, China. "Branes, Quivers and Affine Grassmannians". [video link] (slides)
- 20/07/2021, Workshop on Strings, Branes and Gauge Theories, APCTP Pohang, South Korea. "Non simply laced quivers and Moduli spaces of 4d SCFTs".
- 04/12/2020, Recent Advances in QFT and Geometry "Moduli space of 5d SCFTs, a walk in the tropical rainforest".
[video link] (slides)
- 01/06/2020 Simons Collaboration: Moduli of special holonomy metrics and their periods Lectures on Hasse diagrams for Symplectic Singularities via Magnetic Quivers
[video link] (notes)
- 09/12/2019 Joburg Workshop on String Theory, Calabi–Yaus, Machine Learning, and Aspects of 6D QFT, South Africa. "Symplectic Singularities".
- 18/07/2018 Supersymmetric theories, dualities and deformations, Albert Einstein Center, Bern, Switzerland. "The importance of being disconnected".

Other talks and seminars

- 26/06/2023, DESY, Hamburg, Germany. "Quiver algorithms".
- 29/05/2023, University of British Columbia, Kelowna, Canada. Workshop on *The Geometry, Algebra, and Physics of Higgs Bundles*: "Discussion on 3d mirror symmetry".
- 11/04/2023, CEA-List, "Symmetries and generalizations in QFT".
- 07/03/2023, Quantum Computing Workshop, IPhT Saclay. "Traversable wormholes on quantum computers".
- 20/02/2023, University of Oxford, Mathematical Institute. "Generalized Toric Polygons, T-branes, and 5d SCFTs".
- 10/02/2023, Imperial College London, Quiver meeting, "Generalized Toric Polygons, T-branes, and 5d SCFTs". [video link]
- 07/09/2022, Ecole Normale Supérieure, Paris. "Supersymmetry, between Physics and Mathematics". (slides)
- 10/05/2022, Albert Einstein Institute, Potsdam. "Exploring the landscape of SCFTs". (slides)
- 06/04/2022, SISSA, Trieste. "Brane Webs and Quivers".
- 10/03/2022, Ecole des Mines de Paris, "Quantum field theory in the third millenium". (slides)
- 24/11/2021, Institut de Mathématiques de Bourgogne, Dijon. "What is a Magnetic Quiver?".

- 15/11/2021, IPhT Saclay, Mathematical Physics group, "Quiver subtraction and Hasse diagrams".
- 06/10/2021, Institut de Physique théorique, CEA Saclay, "A very short introduction to quivers".
- 05/10/2021, ENS Paris, "What is a Magnetic Quiver?".
- 04/12/2020, Imperial College, "The Higgs branch of 5d SCFTs: updates and challenges". https://www.imperial.ac.uk/theoretical-physics/seminars/quiver-meetings/
- 17/09/2020 SISSA, Workshop on Geometric Correspondences of Gauge Theories X, "Magnetic quivers for rank-1 4d $\mathcal{N} = 4$ theories".
- 17/07/2020 Quiver Meeting, Imperial College, "The Affine Grassmannian and Quivers". [video link]
- 19/12/2019 Rencontres théoriciennes, Institut Henri Poincaré, Paris, France. "Hasse diagrams and Higgs branches".
- 06/12/2019 Utrecht University, "Hasse diagrams and Higgs branches".
- 25/10/2019 Durham University, "Hasse diagrams and Higgs branches".
- 21/10/2019 University of Oxford, "Hasse diagrams and Higgs branches".
- 09/10/2019 Joint seminar, Institute for Theoretical Physics, Leuven, "Hasse diagrams and Higgs branches".
- 30/09/2019 CEICO, Prague, "Hasse diagrams and Higgs branches".
- 21/05/2019 Oviedo University, "Magnetic quivers and Brane Webs for 4d N=2 SQCD".
- 03/04/2019 DESY, Hamburg, "Brane webs and the SQCD Higgs Branch".
- 30/11/2018 Quiver Meeting, Imperial College, "Computing Hilbert series from free resolutions".
- 09/10/2018 Imperial College London, "Extremal correlators in 4d $\mathcal{N} = 2$ SCFTs and Toda equations".
- 02/07/2018 Institut de Physique Nucléaire de Lyon, "Moduli spaces of theories with disconnected gauge groups".
- 05/06/2018 University of Torino, "The importance of being disconnected: principal extension gauge theories".
- 12/02/2018 Oviedo University, "Nilpotent orbits and quiver theories".
- 24/01/2018 Uppsala University, "Towards deconstruction of type D (2,0) theory".
- 22/01/2018 Nordita, "Towards deconstruction of type D (2,0) theory".
- 07/10/2017 Universitat de Barcelona, "Towards deconstruction of type D (2,0) theory".
- 04/12/2017 CPHT, Ecole Polytechnique, "Quivers, Hilbert series and Deconstruction"
- 30/11/2017 LPMT, Tours, "Théories de carquois et Séries de Hilbert"
- 31/10/2017 Università Milano-Bicocca, "Towards deconstruction of type D (2,0) theory"
- 27/09/2017 Imperial College London, "Higgs branch Hilbert series and non-connected gauge groups"

- 04/10/2016 Universidad de Oviedo, "A dance with supersymmetric vacua"
- 01/07/2016 LPTENS (Soutenance de thèse), "Modularity and Vacua in N=1* supersymmetric gauge theories"
- 10/11/2015 CNAM Paris (RJP), "Do we live in a hologram ?".
- 19/02/2015 LPTHE Jussieu, "Duality and Modularity in Elliptic Integrable Systems".
- 23/05/2014 ENS Paris, "Beyond the Standard Model, an overview".
- 29/01/2014 Student seminar, ENS Paris, "Introduction to string theory".