

# Antoine BOURGET

Theoretical physicist, IPhT, CEA Saclay.

## PERSONAL DATA

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BIRTH: Colombes, France | 3 January 1989  
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WEBSITE: [antoinebourget.org](http://antoinebourget.org)  
LANGUAGES: French, English, Spanish (fluent). Chinese (intermediate).  
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## WORK EXPERIENCE

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SINCE 2023 | INSTITUT DE PHYSIQUE THÉORIQUE, CEA Saclay, France  
*Permanent Researcher*

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

2018-2021 | IMPERIAL COLLEGE, London, UK  
*Postdoctoral researcher in High Energy Physics*

2016-2018 | UNIVERSITY OF OVIEDO, Spain  
*Postdoctoral researcher in High Energy Physics*

SINCE 2011 | MINISTRY OF ECONOMIC AFFAIRS, Paris, France  
*Ingénieur du Corps des Mines (actuellement en détachement).*

## EDUCATION

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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: 3<sup>rd</sup>).  
Research engineer in Fastlite (Orsay, France).

2008-2011 | ÉCOLE POLYTECHNIQUE, Palaiseau, France  
Major in Mathematics and Theoretical Physics. GPA: 4.0  
Thesis: Higgs boson decay at LHC (advisor: J. Iliopoulos).

2006-2008 | LYCÉE CHAMPOLLION, Grenoble, France  
Classes préparatoires MPSI/MP\*: Admission to École Polytechnique (rank: 2<sup>nd</sup>).

## TEACHING

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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	Lectures 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:

- 2023-2024: Quentin Lamouret (M2 Theoretical Physics, ENS Paris).
- 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 Nguyễn (L3, ENS Lyon, *Classification des algèbres de Lie complexes, motivations physiques et carquois*)

## SCIENTIFIC RESPONSABILITIES AND ACTIVITIES

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- **Organizer** of the following international conferences and workshops:
  1. Workshop *Symplectic Singularities, Supersymmetric QFT, and Geometric Representation Theory*, Simons Center for Geometry and Physics, USA. March 31st – April 4, 2025.  
<https://scgp.stonybrook.edu/archives/42708>
  2. Workshop on *Geometry and Symmetries of SCFTs*, Mainz Institute for Theoretical Physics, Germany. June 17-21, 2024.  
<https://indico.mitp.uni-mainz.de/event/354/>

3. School and Workshop on *Symplectic Singularities and Supersymmetric QFT* (Amiens, July 10-21, 2023).  
<https://sites.google.com/view/symplectic-singularities-susy/home>
  4. 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>
  5. 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>
  6. SCGSC 2016, Imperial College London, January 7-8, 2016.  
<https://sites.google.com/site/scgsc2016/>
- Member of the Advisory Board of the [quanTA Centre](#), University of Saskatchewan, Saskatoon, Canada.
  - **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.
  - Since 2023: Mentor in the [String theory Mentoring Program](#).
  - Animation and Organization of the Institute Retreat of IPhT, Autrans, France (May 2022).

## OUTREACH

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- **Since 2018: 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:
  - 2023: Forum Timeworld (Conservatoire National des Arts et Métiers) [Conférence : Quel est le rôle de l'énergie en théorie quantique des champs ?](#) (slides)
  - 2019: *I'm a Scientist* (connecting scientists with highschool in the UK)
  - 2018-2020: [Imperial College Science Forum](#)
  - 2012-2016: [TALENS](#) association (maths and physics classes in disadvantaged high-schools)
  - 2013-2016: [Physique pour tous](#) (physics lectures at ENS for non physicists).

## PUBLICATIONS

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

- A Bourget, M. Sperling, Z. Zhong, *Higgs branch RG-flows via Decay and Fission*. [[arXiv:2401.08757](#)]
- A Bourget, M. Sperling, Z. Zhong, *Decay and Fission of Magnetic Quivers*. [[arXiv:2312.05304](#)]
- A Bourget, J. F. Grimminger, A. Hanany, R. Kalveks, M. Sperling, Z. Zhong, *A tale of N cones*. JHEP 09 (2023) 073. [[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

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- 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, SEMINARS AND WORKSHOPS

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- 14/03/2024, Université de Lorraine, Nancy. "The problem of Quantum Gravity". ([slides](#))
- 16/02/2024, Quiver Meeting (online). "The Decay and Fission Algorithm". ([video](#))
- 07/02/2024, University of Saskatchewan, Saskatoon, Canada. "Fission and Decays of magnetic quivers".
- 08/01/2024 to 26/01/2024, visitor at KITP, University of California Santa Barbara, workshop "What is String Theory? Weaving Perspectives Together".

- 20/12/2023, ENS Paris, L3 seminar, "Why is Quantum Gravity a hard problem?".
- 13/12/2023, Séminaire de vulgarisation de l'IPhT, "Les symétries et leur brisure en physique". ([video](#))
- 08/11/2023, University of Mons, "Symplectic singularities and moduli spaces".
- 26/10/2023, LMU Munich, "Why Symplectic Singularities?" ([slides](#)).
- 19/10/2023, Institut Poincaré, Paris, Rencontres Théoriciennes. "Why Symplectic Singularities?"
- 09/10/2023 and 16/10/2023, IPhT Saclay, Mathematical Physics Seminar, "Nilpotent orbits". ([video](#))
- 24/07/2023, LMU Munich, Erzabtei Sankt Ottilien, "Dimer models, statistical physics and strings". ([slides](#))
- 21/07/2023, LAMFA, Amiens, Workshop on Symplectic Singularities and Supersymmetric QFT, "The case for decorated quivers".
- 26/06/2023, DESY, Hamburg, Germany. "Quiver algorithms and geometry". ([link](#))
- 29/05/2023, University of British Columbia, Kelowna, Canada. Workshop on *The Geometry, Algebra, and Physics of Higgs Bundles*: "Discussion on 3d mirror symmetry".
- 16/05/2023, Groupe de Travail Quantique, IPhT Saclay, "Algorithme de Shor" ([video](#))
- 11/04/2023, CEA-List, Palaiseau : "Symmetries and generalizations in QFT". ([slides](#))
- 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 Seminar, "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".
- 11/12/2019 Joburg Workshop on String Theory, Wits Rural Facility, South Africa. "Introduction to symplectic singularities".
- 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  $\mathcal{N}=2$  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  $\mathcal{N}=1^*$  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".