

SEBASTIAN DE HARO

Curriculum Vitae

Assistant Professor in Philosophy of Science at the Institute for Logic, Language and Computation and the Institute of Physics of the University of Amsterdam

1. RESEARCH PROFILE

- Areas of specialisation:** Philosophy of Science, History and Philosophy of Physics, Theoretical Physics
- Areas of competence:** Epistemology, Metaphysics, Ethics, Philosophical and Social Aspects of Information, History of Science, History of Philosophy, Philosophy of Logic and Language, Philosophy of Mathematics

2. PREVIOUS POSITIONS

- **Lecturer (2009-2020), Amsterdam University College (AUC), University of Amsterdam.** Tasks: teaching, curriculum development and evaluation, thesis supervision, member of the BSA committee. Between 2009-2015 I also had tutoring responsibilities.
- **Lecturer (2019-2020, fixed term), Department of Philosophy, Free University Amsterdam**
- **Lecturer in theoretical physics (fixed term), Institute for Theoretical Physics, Faculty of Science, University of Amsterdam.** Teaching, research, thesis supervision. 02/12 - 07/14.
- **Research associate. Managing editor of *Foundations of Physics* on behalf of Gerard 't Hooft, Spinoza Institute/ITP, Utrecht University and Springer Verlag, 2008-2009.** Research, managing editorial office, setting up new projects, contact Editorial Board.

3. PUBLICATIONS

Total number of citations (all publications): 2,751. i10-index: 33. h-index: 22

Full list of publications and citation information via Google scholar profile:

<http://scholar.google.nl/citations?user=rmXDqN4AAAAJ&hl=nl&oi=ao>

Journal articles, book chapters, and book reviews

General philosophy of science: journal articles (6)

1. 'The Empirical Under-determination Argument Against Scientific Realism for Dual Theories'. *Erkenntnis*, 2021. <https://link.springer.com/article/10.1007%2Fs10670-020-00342-0>
2. 'Science and Philosophy: A Love-Hate Relationship'. *Foundations of Science*, 25, 2020, pp. 297-314.
3. 'Towards a Theory of Emergence for the Physical Sciences'. *European Journal for Philosophy of Science*, 2019, 9, 38, pp. 1-52.

4. 'The Heuristic Function of Duality'. *Synthese*, 2019, 196 (12), pp. 5169-5203.
5. De Haro, S., De Regt, H.W. 'A Precipice Below Which Lies Absurdity? Theories without Spacetime and Scientific Understanding'. *Synthese*, 2018, pp. 1-29.
6. 'On Artigas and Analytic Philosophy'. *Scientia*, 4 (2), 2016, pp. 215-243, invited contribution to special issue on the 10th anniversary of Mariano Artigas' death.

Philosophy of physics

Journal articles and book chapters (17)

7. 'Spacetime and Physical Equivalence'. In: *Beyond Spacetime. The Foundations of Quantum Gravity*, N. Huggett and C. Wüthrich (Eds.), Cambridge University Press, 2020, pp. 257-283.
8. 'On Empirical Equivalence and Duality'. *100 Years of Gauge Theory. Past, Present and Future Perspectives*, S. Bianchi and C. Kiefer (Eds.), Springer, in press. Invited contribution. <http://philsci-archive.pitt.edu/17069>
9. De Haro, S., van Dongen, J., Visser, M., Butterfield, J.N. 'Conceptual Analysis of Black Hole Entropy in String Theory'. *Studies in History and Philosophy of Modern Physics*, 69, 2020, pp. 82-111.
10. van Dongen, J., De Haro, S., Visser, M., Butterfield, J.N. 'Emergence and Correspondence for String Theory Black Holes'. *Studies in History and Philosophy of Modern Physics*, 69, 2020, pp. 112-127.
11. Castellani, E. and De Haro, S. 'Duality, Emergence, and Fundamentality'. *The Foundation of Reality*, D. Glick and A. Mormodoro (Eds.), Oxford University Press, 2020.
12. 'Theoretical Equivalence and Duality'. *Synthese*, topical collection on Symmetries. Editors: M. Frisch, R. Dardashti, G. Valente, 2019, pp. 1-39.
13. De Haro, S. and Butterfield, J.N. 'On Symmetry and Duality'. In a special issue of *Synthese* on 'Symmetries and Asymmetries in Physics', 2019, pp. 1-41. Editors: M. Frisch, R. Dardashti, G. Valente. In press, at present published only online.
14. De Haro, S., De Regt, H.W. 'Interpreting Theories without Spacetime'. *European Journal for Philosophy of Science*, 8 (3), 2018, pp. 631-670.
15. De Haro, S. and Butterfield, J.N. 'A Schema for Duality, Illustrated by Bosonization'. In: *Foundations of Mathematics and Physics one century after Hilbert*, 2018, pp. 305-376. Kounieher, J. (Ed.). Springer.
16. 'The Invisibility of Diffeomorphisms'. *Foundations of Physics*, 47 (11), 2017, p. 1464.
17. De Haro, S., Mayerson, D., Butterfield, J.N. 'Conceptual Aspects of Gauge/Gravity Duality'. *Foundations of Physics*, 46 (11), 2017, pp. 1381-1425.
18. De Haro, S., Teh, N., Butterfield, J.N. 'Comparing Dualities and Gauge Symmetries'. *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics*, 59, 2017, pp. 68-80.
19. 'Dualities and Emergent Gravity: Gauge/Gravity Duality'. *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics*, 59, 2017, pp. 109-125.

20. De Haro, S., Teh, N., Butterfield, J.N. 'On the relation between dualities and gauge symmetries'. *Philosophy of Science*, 83 (5), 2016, pp. 1059–1069.
21. Dieks, D., Dongen, J. van, Haro, S. de. 'Emergence in Holographic Scenarios for Gravity'. *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics*, 52, 2015, pp. 203-216.
22. De Haro, S., 't Hooft, G., Verlinde, E., Dieks, D. 'Forty Years of String Theory: Reflecting on the Foundations'. *Foundations of Physics* 43, 2013, 1-7. Editorial of special issue.
23. De Haro, S., van Dongen, J. 'On Black Hole Complementarity'. *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics*, 35/3, 2004, 509-525.

Theoretical Physics (25)¹

1. De Haro, S. and Petkou, A.C. (2014). 'Instantons and the Hartle-Hawking-Maldacena Proposal for dS/CFT'. *Journal of High-Energy Physics*, 1411 (2014) 126, arXiv:1406.6148.
2. De Haro, S. and Hahn, A. (2013). 'Chern-Simons Theory and the Quantum Racah Formula', arXiv:math-ph/0611084, *Reviews in Mathematical Physics*, 25, 1350004.
3. De Haro, S. (2009). 'Dual Gravitons in AdS₄/CFT₃ and the Holographic Cotton Tensor'. *Journal of High Energy Physics*, 0901:042, arXiv:0808.2054 [hep-th].
4. De Haro, S. and Petkou, A.C. (2008). 'Holographic Aspects of Electric-Magnetic Dualities'. *Journal of Physics Conference Series*, 110: 102003, arXiv:0710.0965 [hep-th].
5. De Haro, S. and Gao, P. (2007). 'Electric-magnetic Duality and Deformations of Three-Dimensional CFT's'. *Physical Review, D* 76, 106008 arXiv:hep-th/0701144.
6. De Haro, S., Papadimitriou, I., Petkou, A.C. (2007). 'Conformally Coupled Scalars, Instantons and Vacuum Instability in AdS₄'. *Physical Review Letters*, B 98, 231601, arXiv:hep-th/0611315.
7. De Haro, S., Ramgoolam, S., Torrielli, A. (2007). 'Large N Expansion of q-Deformed Two-Dimensional Yang-Mills Theory and Hecke Algebras'. *Communications in Mathematical Physics*, 273, pp. 317-355, arXiv:hep-th/0603056.
8. Arcioni, G., De Haro, S., Susskind, L. (2006). 'Holographic Views of the World', *Under the Spell of Physics*, Gerard 't Hooft's 60th birthday conference, arXiv:physics/0611143.
9. De Haro, S. and Petkou, A.C. (2006). 'Instantons and Conformal Holography'. With an appendix by Tom Koornwinder. *The Journal of High Energy Physics*, 12, 076, arXiv:hep-th/0606276.
10. Arcioni, G., De Haro, S., Gao, P. (2006). 'A Diffusion Model for SU(N) QCD Screening', *Physical Review, D*, 73, 074508, arXiv:hep-th/0511213.
11. De Haro, S. (2006). 'A Note on Knot Invariants and q-Deformed 2d Yang-Mills', *Physics Letters, B*, 634, pp. 78-83, arXiv:hep-th/0509167.

¹ Citation information based on Google scholar (accessed 23 September, 2020). Where incomplete, the data were taken from Inspire Beta (accessed 6 June, 2018).

12. De Haro, S. and Tierz, M. (2005). 'Discrete and Oscillatory Matrix Models for Chern-Simons Theory'. *Nuclear Physics B*, 731, pp. 225-241. arXiv:hep-th/0501123.
13. De Haro, S. (2005). 'Chern-Simons Theory, 2d Yang-Mills, and Lie Algebra Wanderers'. *Nuclear Physics B*, 730, 312, arXiv:hep-th/0412110.
14. De Haro, S. (2004). 'Chern-Simons Theory in Lens Spaces from 2d Yang-Mills on the Cylinder'. *Journal of High Energy Physics*, 0408, 041, arXiv:hep-th/0407139.
15. De Haro, S. and Tierz, M., (2004a). 'Brownian Motion, Chern-Simons Theory, and 2d Yang-Mills'. *Physics Letters B*, 601, 201-208, arXiv:hep-th/0406093.
16. de Boer, J., De Haro, S. (2004). 'The Off-Shell M5-Brane and Non-Perturbative Gauge Theory', *Nuclear Physics B*, 696, 174-204, arXiv:hep-th/0403035.
17. De Haro, S., Skenderis, K., Sinkovics, A. (2003). 'On α' -Corrections to D-Brane Solutions'. *Physical Review D*, 68, 66001, arXiv:hep-th/0302136.
18. Bena, I., De Haro, S., Roiban, R. (2003). 'Generalized Yukawa Couplings and Matrix Models'. *Nuclear Physics B*, 664, 45-58, arXiv:hep-th/0212083.
19. De Haro, S., Sinkovics, A., Skenderis, K. (2003). 'On a Supersymmetric Completion of the R^4 Term in IIB Supergravity'. *Physical Review D*, 67, 084010, arXiv:hep-th/0210080.
20. Arcioni, G., De Haro, S., O'Loughlin, M. (2001b). 'Boundary Description of Planckian Scattering in Curved Space-Times'. *The Journal of High Energy Physics*, 07, 035, arXiv:hep-th/0104039.
21. De Haro, S., Skenderis, K., Solodukhin, S.N. (2001a). 'Gravity in Warped Compactifications and the Holographic Stress Tensor'. *Classical and Quantum Gravity*, 18, 3171-3180, arXiv:hep-th/0011230.
22. De Haro, S., Skenderis, K., Solodukhin, S.N. (2001). 'Holographic Reconstruction of Spacetime and Renormalization in the AdS/CFT Correspondence' **[Note: 1,582 citations]**, *Communications in Mathematical Physics* 217, 595-622.
23. De Haro, S. (1999). 'S-matrices for Planckian Scattering', in: *Progress in String Theory and M-Theory*, 335-338, proceedings NATO Advanced Study Institute: TMR Summer School (Cargèse, 1999).
24. De Haro, S. (1998). 'Planckian Scattering and Black Holes'. *The Journal of High Energy Physics*, 10, 023. arXiv:gr-qc/9806028.
25. De Haro, S. (1998). 'Non-commutative Black Hole Algebra and String Theory from Gravity'. *Classical and Quantum Gravity*, 15, 519-535, arXiv:gr-qc/9707042.

Edited special issues (1):

1. Gerard 't Hooft, S. De Haro, Dennis Dieks and Erik Verlinde (eds.), *Forty Years of String Theory: Reflecting on the Foundations*. Special Issue *Foundations of Physics* 43 (2013).

Book reviews (3):

1. 'On Visual Representations in Science'. Review of *Visual Representations in Science – Concept and Epistemology*, Mößner, N. Routledge, 2018. Invited review. *Grazer Philosophische Studien*, 97 (3), 2020, pp. 529-538.

2. De Haro, S., Henke, J., Tang, D. 'Cappelli et al.: *The Birth of String Theory*', Cambridge University Press. *Foundations of Physics*, 45(6), 2015, 657-660. Invited review.
3. De Haro, S. and van Lier, T. 'J.R. Leibowitz: Hidden Harmony. The Connected Worlds of Physics and Art', Johns Hopkins University Press. *Foundations of Physics* 39, 2009, 407-410. Invited review.

Publications for a Broad Audience (invited contributions)

1. 'De zwaartekracht van paradigma's'. *De Gids* 2010/8, 993-1003, special issue on black holes. Contributions G. 't Hooft, V. Icke, E.v.d. Heuvel, M.v.d. Klis, H. Verlinde, M. Barnas.
2. 'Snaartheorie: een filosofische rechtvaardiging'. *Scientific American* 1 (2009) 40 (Dutch).
3. 'Stringtheorie und das antropisches Prinzip' (in German), *Komma* 36/2006, 46-49.
4. De Haro, S. (2008). Encyclopaedia entry on 'Stephen Hawking'. *Kritisch Denkers Lexicon*, 41 (in Dutch).

Academic articles published online or in national journals

1. 'Reply to James Read on Background-Independence'. Published together with J. Read, 'Reply to Sebastian De Haro on Background-Independence'. Published online at Beyond Spacetime: <https://beyondspacetime.net/2016/06/15/reply-to-read>.
2. '2000: Shall We Come Back from the Space-time Odyssey?' *Nederlands Tijdschrift voor Natuurkunde*, 65/12 (1999) 354-355. Special Issue 1999 Nobel Prize in Physics, G. 't Hooft and M. Veltman.
3. 'Dualities of string theory, or how to get a single flower by putting mirrors in the jungle'. *5th International Interdisciplinary Seminar, Proceedings*, Ponte di Legno, Italy (1998).
4. 'Achter de horizon van zwarte gaten: vermoedens', *Nederlands Tijdschrift voor Natuurkunde*, 64/11 (1998) with Jeroen van Dongen.
5. 'Een nieuwe complementariteit', *Nederlands Tijdschrift voor Natuurkunde*, 63/9 (1997) and *De Afleiding* 5/2 (1997) with Jeroen van Dongen.

4. EDUCATION

- 2014-2020: PhD in philosophy of science (part-time), Trinity College, Cambridge
 Department of History and Philosophy of Science, University of Cambridge
 Title: *On Inter-Theoretic Relations and Scientific Realism*
 Thesis defended on 4 May, awarded 18 July 2020.
 Supervisor: Jeremy Butterfield. Examiners: Harvey Brown and James Ladyman
- 2012-2013: Dutch Certificate in Learning & Teaching in Higher Education (BKO)
 i.e. the national certificate for proficiency as a University teacher.
- 1997-2001: PhD in theoretical and mathematical physics (18-06-2001), Utrecht University
 Supervisor: Gerard 't Hooft.
Quantum Gravity and the Holographic Principle
- 1991-1996: MSc in theoretical physics, Utrecht University. Supervisor: Gerard 't Hooft.

5. GRANTS, PRIZES, FELLOWSHIPS, AND AWARDS (TOTAL: € 719,525)

Major grants

1. **Fellow, Netherlands Institute for Advanced Study.** € 45,000 (declined – grant amount not counted towards the above total).
2. **Visiting fellow in philosophy,** Black Hole Initiative, Harvard University. Invitation by: Peter Galison, € 17,000 (10/18-02/19).
3. **The Turner scholarship of Trinity College, University of Cambridge,** € 77,000.
4. **EU Marie Skłodowska-Curie individual fellowship,** € 152,879 (declined – grant amount not counted towards the above total) (05/15).
5. **EU-RTN Postdoctoral Fellowship,** € 142,500. King's College London. 01/09/06 - 31/05/08.
6. **Fellowship Max-Planck-Gesellschaft** € 270,000. Potsdam Germany. 01/09/03 - 31/08/06
7. **Fellowship University of California, Los Angeles, CA, USA** € 180,000. 09/01-08/03.

Prizes and awards

8. **Dutch Institute for Emergent Phenomena,** € 15,000 awarded for a workshop on emergence (04/19).
9. **Essay prize,** 'Space and Time After Quantum Gravity' project of the University of Illinois at Chicago and the University of Geneva, € 1,000 (05/17).
10. **Faculty Development Fund,** University of Amsterdam, € 3,000 (08/15).
11. **EU-COST action MP1210** *The String Theory Universe.* € 550 for collaboration with University of Thessaloniki, Greece (05/14).
12. **EU-COST action MP1006** *Foundations of Quantum Mechanics and Gravity* € 675 for a workshop at Imperial College, London, UK (04/14).
13. **Twelve travel grants** to international meetings over the past eight years, totalling € 12,000.
14. **Award Brain Korea 2000,** € 800 by the Korean Research Foundation, Seoul National University Korea. 06/00 - 07/00.

6. TEACHING AND SUPERVISING EXPERIENCE

I have taught at a variety of institutions, including the University of Amsterdam, University of Cambridge, University of California, Los Angeles, Utrecht University, Vrije Universiteit Amsterdam: and for 11 years now at the **Amsterdam University College (AUC)**: the joint honours programme in liberal arts and sciences of the University of Amsterdam and the Vrije Universiteit Amsterdam. I teach philosophy, physics, and mathematics in the bachelor.

Undergraduate interdisciplinary courses:

- **Big Questions in Science:** teacher and course coordinator, 16 times, AUC 2009-2017
- **Quantum Information and Quantum Communication:** 2 times, AUC 2019-2020

Undergraduate teaching in philosophy:

- **Philosophy of Science:** students from all majors, 3 times, AUC 2018-2020
- **Philosophy of Science:** philosophy and non-philosophy majors, 2 times, VU 2019-2020
- **Philosophical Problems:** Epistemology and Metaphysics sections, 5 times, AUC 2014-19
- **Philosophy of Physics:** co-teaching, University of Cambridge, 2018
- **Undergraduate thesis supervision in both physics and philosophy:** 30 theses, AUC
- **Undergraduate research opportunities in physics and philosophy:** awarded 5 Educational Development Initiatives for student supervision, 50 students, AUC

Undergraduate teaching in physics:

- **Quantum Physics:** 10 times, AUC 2010-2020
- **Mathematics of Physics:** 10 times, AUC 2011-2020.
- **Statistical Mechanics:** 4 times, AUC 2014-2020
- **Mechanics:** 2 times, AUC 2009-2011
- **Electrodynamics and Special Relativity:** 3 times, IoP UvA 2011-2014
- **Physics 1b (Physics for Engineers):** teaching replacement, UCLA 2002
- **Statistical Mechanics and Thermodynamics:** TA, Utrecht University, 2 times 1998-2000
- **Quantum Mechanics:** TA, Utrecht University 1998

Graduate teaching in philosophy:

- **Philosophy of Science:** MA programmes in Philosophy of Bioethics and Health, Neuroscience, and Law and Governance, VU 2019
- **Dutch Research School for Philosophy:** workshop, PhD Spring 2018
- **Master's thesis supervision:** 3 theses in physics and philosophy, IoP UvA
- **Service in PhD committees:**
 - **Riccardo Pinosio**, ILLC, UvA (2017). *The Logic of Kant's Temporal Continuum*
 - **M. Holman**, Utrecht University ('14). *The Quest for a Fundamental Theory of Physics*
 - **Miguel Tierz**, U. of Barcelona (2008). *Random Matrix Models in Chern-Simons Theory*

Graduate teaching in physics:

- **Student Seminar on AdS/CFT:** IoP, UvA 2014
- **Quantum Field Theory:** teaching replacement, UCLA 2002
- **Advanced Classical Mechanics:** TA, Utrecht University 1998-2000.

Curriculum responsibilities and committees:

- **Curriculum development:**
 - **Position paper:** *AUC21 Curriculum Revision Report, Task Force on Interdisciplinarity*
 - I have designed and taught 8 different new courses
- **Track development and evaluation:**
 - Involved in designing the Physics and Mathematics tracks at AUC (2009-2012)
 - **Position paper:** *Physics Track Analysis 2012*, i.e. a comprehensive analysis of the effectiveness of the physics track at AUC

- **Member of the BSA (Binding Study Advice) committee, 2020**

Educational Activities: high-school teachers and pupils, and reflection on education

1. *Masters in Teaching*. I mentored a senior high-school teacher (St Ignatius gymnasium, Amsterdam) in teaching quantum mechanics at AUC's programme for high-school students. AUC (2014-2015).
2. *Big Questions in Science: From the Very Small to the Very Large*, lecture at AUC open day (17 Jan 2015).
3. *Science and Philosophy: A Love-Hate Relationship*. Talk at the international conference *Rethinking Liberal Education: Contemporary Challenges and Opportunities*, AUC (June 2013)
4. *Excellence in Science* for high-school teachers: *Excellence in Teaching Big Questions in Science*. Gave two sessions at the workshop. 30 Jan, 27 Feb 2013
5. Counselling and outreach at AUC open days for high-school students, 2010-2020.
6. Co-organizer 'AUC meets Amsterdam Science Park' for AUC's integration in the Amsterdam Science Park (05/12-09/13).

7. ORGANISATION OF SCHOLARLY MEETINGS

1. **Black Hole Philosophy**, symposium at the conference of the *European Philosophy of Science Association biennial conference*. 11-14 September 2019.
2. **Gerard 't Hooft's 1999 Nobel Prize in Physics, 20th Anniversary Conference**, Utrecht, July 2019. Member of the organising committee.
3. **Emergence: Conceptual and Philosophical Aspects**, workshop of the Dutch Institute for Emergent Phenomena, Amsterdam, 9-11 May 2019.
4. **Equivalence, Duality, and the Interpretation of Physical Theories**, symposium organiser at the Biennial Meeting of the Philosophy of Science Association (01-24/11/18).
5. **Foundations 2018**, member of the Programme Committee, UK and European Conference on Foundations of Physics (10-13/07/18).
6. **Can Science and Technology Shape a New Humanity?** Organiser of the workshop at Trinity College, Cambridge (04/01/17).
7. **Duality, Equivalence and Emergence** (co-organiser: Elena Castellani), organiser of the symposium at the European Congress of Analytic Philosophy, Munich (24/08/2017).
8. **New Perspectives on Quantum Gravity**, organiser of the symposium at Foundations 2016 Conference, LSE London (co-organisers: Dennis Dieks, Jeroen van Dongen) (16/07/2016).
9. **Beginnings. The Universe Out of Information?** Member of the organising committee, 17th International Interdisciplinary Seminar, London, UK (01-07/01/15).
10. **How Did it All Start?**, Member of the organising committee, 16th International Interdisciplinary Seminar, London, UK (01-07/01/14).

11. **Relational Realism and Quantum Gravity.** Member of the organising committee, Institute of Physics, University of Amsterdam. Participants: D. Dieks and J.v. Dongen: Utrecht; E. Zafiris: CPNS and Institute of Mathematics, U. of Athens; M. Epperson: CPNS, College of Natural Sciences and Mathematics, Cal State Sacramento, USA. 21-22 August 2013.

8. INSTITUTIONAL RESPONSIBILITIES

- **National grant-writing group of philosophers of science:** in 2019, I co-led the writing group in philosophy for a contribution to a €30-million NWO grant proposal, submitted by a national interdisciplinary consortium (the grant was not awarded in that round).
- **Member of the committee,** Fund for History of Science and History of the University of Amsterdam (Lid Comité Fonds Wetenschaps- en Universiteitsgeschiedenis), Faculty of Humanities, University of Amsterdam (since 2016).
- Member, board of **section Philosophy of Physics, Dutch Physics Association** (2008-2010 and 2017 to date)
- **Science Faculty representative** at the College Council and Board of Studies (paid office), AUC (06/13-08/14)
- **Search, hiring, and training of external faculty** for various courses at AUC

9. OTHER RESPONSIBILITIES

- **Amsterdam Philosophy and History of Gravity,** University of Amsterdam: member
- **Constitutive member,** *Dutch Institute for Emergent Phenomena:* an interdisciplinary research centre across fundamental sciences, with the purpose of furthering the understanding of emergent phenomena. DIEP is a collaboration between four Dutch universities. It has received initial funding from the National Science Agenda (Route 2).
- Research group Philosophy of Science and Technology (FWT), VU University of Amsterdam, active participant.
- Organiser of various *Who's in Town* seminars: philosophy of science, physics, AUC (2009-2020).
- Organiser Triangle Seminar (London joint theoretical physics seminar King's, Imperial, Queen Mary Colleges), London, UK (09/06-08/07)
- Organiser of the internal seminar, University of California, Los Angeles, CA (09/01-08/03)

10. SERVICE TO THE PROFESSION AND PROFESSIONAL MEMBERSHIPS

Certificate of Outstanding Contribution in Reviewing, *Studies in History and Philosophy of Modern Physics*, Elsevier, March 2017.

Refereeing:

- **Grants:** NWO (Dutch Organisation for Scientific Research), Swiss National Science Foundation (SNSF), Fonds de la Recherche Scientifique (FRS-FRNR, Belgium), National Science Centre (NCN, Poland), New York University Abu Dhabi Institute.
- **Journals:**
 - **Philosophical:** *The British Journal for the Philosophy of Science, Synthese, European Journal for Philosophy of Science, Techné: Research in Philosophy and Technology, Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics, Philosophy Compass, Foundations of Physics, Foundations of Science.*
 - **Physics and mathematics:** *Physical Review Letters, Journal of High-Energy Physics, Classical and Quantum Gravity, Journal of Physics A: Mathematical and General, Physical Review D, Nuclear Physics B, Physics Letters B.*
- **European Philosophy of Science Association (EPSA19),** Biennial Conference, Geneva 2019. Member of the Programme Committee.
- **Beyond Spacetime,** project funded by the John Templeton Foundation at the University of Chicago at Illinois and the University of Geneva: referee for the 2018 essay contest.

11. PRESENTATIONS (recent)

Presentations at International Scientific Conferences

(* = invited speaker)

1. ***Galilei Institute for Advanced Studies,** programme *Beyond the Standard Model: historical-critical perspectives* (15 October 2019).
2. **European Philosophy of Science Association biennial conference,** symposium 'Black Hole Philosophy'. *A Conceptual Analysis of Black Holes in String Theory.* Geneva (11-14 September 2019).
3. ***t Hooft Conference 2019: From Weak Force to Black Hole Thermodynamics and Beyond,** celebrating the 1999 Nobel Prize in Physics. Utrecht University (11-13 July 2019). **Opening speaker.**
4. ***New Directions in the Foundations of Physics,** Viterbo, Italy (24-26 May 2019).
5. ***Tsinghua Sanya International Mathematics Forum (TSIMF),** Sanya, Hainan, China. Workshop 'Black Holes and Holography'. Organisers: Shing-Tung Yau and Erik Curiel. *Conceptual Aspects of Black Holes in String Theory.* 7-11 January 2019.
6. ***HKUST Jockey Club Institute for Advanced Study (IAS),** Hong Kong. Workshop 'Black Holes, Inflation and Gravitational Waves'. *Conceptual Aspects of Black Holes in String Theory.* (3-5 January 2019).
7. **Biennial Meeting of the Philosophy of Science Association.** *Interpreting Dualities.* Seattle (1-4 November 2018).
8. ***Black Hole Initiative, Harvard University.** Miniworkshop focussing on my PhD work. *Duality and Emergence* (29 October 2018).
9. ***Boston Colloquium for Philosophy of Science.** *Towards a Theory of Emergence in the Physical Sciences,* 19 October 2018.

10. ***Symmetries, Observables, and the Noether's Theorems: A 100th Anniversary Conference for the Work of Emmy Noether**, London School of Economics. *Noether's Theorem and Gauge-Gravity Duality* (5-6 October 2018).
11. **Hundred Years of Gauge Theory, Bad Honnef**. *Duality, Symmetry, and Gauge* (30 July – 3 August 2018).
12. **19th UK and European Meeting Foundations 2018**. *Formulating Emergence in the Physical Sciences*. Utrecht University (10-14 July, 2018).
13. **Ninth Workshop on the Philosophy of Information**. *Visualisation and Interpretation in Theories with and without a Spacetime*. Brussels (26-27 June 2018).
14. **Philosophy of Science conference, Inter-University Centre Dubrovnik**. *Formulating Emergence in the Physical Sciences* (16 April 2018).
15. ***Quantum Gravity: Physics and Philosophy, IHES Paris**. *Duality and Emergence* (24-27 October 2017).
16. **European Congress of Analytic Philosophy**. Symposium on 'Duality and Emergence'. *Duality, Equivalence, and Emergence*, Munich (24 Aug 2017).
17. ***Probing the spacetime fabric: from concepts to phenomenology**. *On the Emergence of Space, Illustrated by Random Matrix Models*, Trieste (11 July 2017).
18. ***Symmetries in Physics**, Hannover, joint talk with Jeremy Butterfield. *Dualities and Symmetries* (7 July 2017).
19. ***Seven Pines Symposium, Minnesota**. *On the History and Philosophy of the Black Hole Information Paradox* (18 May 2017).
20. ***The Continuum in the Foundations of Mathematics and Physics**, Institute for Logic, Language and Computation, Amsterdam. *On the Emergence of Time in Quantum Gravity* (6 April 2017).
21. ***DICE 2016 Spacetime – Matter – Quantum Mechanics**, Castiglioncello. *Dualities and Emergence of Space* (15 September 2016).
22. ***Hopeless hopes? Conference on the history of quantum gravity at the Max-Planck-Institut für Gravitationsgeschichte**, Berlin (19-21 July 2016).
23. **Foundations 2016**, LSE London (16-18 July 2016).
24. **British Society for the Philosophy of Science, Annual Conference**, Cardiff UK (7-8 Jul '16)
25. **Sixth International Conference Integrated History and Philosophy of Science**, Edinburgh, Scotland, UK (3-5 July 2016). Joint talk with J. van Dongen
26. **Carlofest, Carlo Rovelli's 60th birthday conference** in Marseille (23-27 May 2016). Joint talk with J.N. Butterfield
27. **Philosophy of Science in a Forest**, three-yearly conference of the Dutch Association for Philosophy of Science (19-21 May, 2016)
28. **Conference on emergence** at the Université Catholique de Louvain, Louvain-la-Neuve. Joint talk with Elena Castellani (8-11 May 2016)
29. **Effective Theories, Mixed Scale Modeling, and Emergence**, University of Pittsburgh, USA (2-4 Oct 2015).

30. **Liberal Arts and Sciences and Core Texts in the European Context.** Talk on *Core Texts in Natural Science: Progressiveness in Science and the Recurrent Nature of the Big Questions*. Amsterdam University College, Amsterdam (11-12 September 2015)
 31. ***Duality in Contemporary Mathematics - Philosophical Aspects**, workshop at the Bergische Universität Wuppertal (3-5 Sept 2015).
 32. ***Equivalent Theories in Physics and Metaphysics**, Princeton University, NJ (20-22 March 2015).
 33. **Philosophy of Physics, Science, Technology, and Values Conference**, Inter University Centre Dubrovnik, Croatia (13-17 Apr 2015)
 34. **1st Munich Workshop on Mathematical Philosophy: Philosophy of Physics**, Munich Center for Mathematical Philosophy, LMU, 9-11 Apr 2015.
 35. ***Emergent Time and Emergent Space in Quantum Gravity**, Max Planck Institute for Gravitational Physics (Albert Einstein Institute) organized by D. Oriti and H. Nicolai (15-18 Dec 2014).
 36. **Philosophy of Science Association (PSA), Biennial conference**, (Chicago, 6-9 Nov 2014). Presentation together with J.N. Butterfield
 37. ***Foundations of Dualities**, conference organized by D. Rickles and E. Castellani Florence, Italy (15-16 Sep 2014).
 38. **Reduction and Emergence in the Sciences**, Munich Center for Advanced Studies, Ludwig-Maximilians-Universität München (14-16 Nov 2013)
 39. **Rethinking Liberal Education**, AUC, Amsterdam (June 2013)
 40. ***Recent Advances in Topological QFT**, University of Lisbon (14 September 2012).
- Invited Talks: Colloquia and Seminars**
41. Warsaw University of Technology, Warsaw Spacetime Colloquium (online, 13 November 2020), with Karen Crowther
 42. University of Florence, Department of Physics (18 October 2019).
 43. University of Cambridge, Cambridge Simplex seminar (7 June 2019).
 44. University of Oslo, Department of Philosophy (29 April 2019).
 45. University of Notre Dame, Department of Philosophy, colloquium (23 January 2019).
 46. University of Chicago at Illinois, Department of Philosophy, essay prize seminar Beyond Spacetime Project (14 November 2018).
 47. Colloquium, Harvard University, Black Hole Initiative, 6 November 2018.
 48. The Faraday Institute, University of Cambridge, research seminar (13 February 2018).
 49. Universitat Autònoma de Barcelona, Faculty of Philosophy, seminar (27 June 2017).
 50. University of Cambridge, HPS group (12 May 2017).
 51. Seminar Philosophy of Physics, Utrecht (18 November 2016). 'Symmetry and Equivalence'.
 52. Oxford Philosophy of Physics Seminar (9 June 2016)

53. LSE Sigma Club lecture, London School of Economics (6 June 2016)
54. Colloquium in Philosophy, Logic and Philosophy of Science: Munich Center for Mathematical Philosophy (1 June 2016)
55. Department of Philosophy, University of Geneva, Switzerland: Chicago-Geneva joint seminar series of the project *Beyond Spacetime*, live broadcasted on [YouTube](#) (14 January 2016)
56. Interdisciplinary Excellence Cluster Image Knowledge Gestaltung, Humboldt University Berlin, Research Seminar (24 Jun 2015)
57. Aristotle University of Thessaloniki (April 27-May 4, 2014)
58. Philosophical Brown Bag, Amsterdam University College (May 12, 2014)
59. École Polytechnique, Paris (23 Oct 2012)

Invited Talks: Schools, National Meetings and Conferences

60. **XXIV International Summer School in Philosophy of Physics: *Black Holes and the Information Loss Paradox***, University of Urbino, 7-10 June 2021.
61. **Radboud Summer School 2020: *Emergence in Physics***. Organised by the Dutch Institute for Emergent Phenomena. Radboud University Nijmegen. July 2020. Cancelled due to Covid-19.
62. **Spring Course of the Dutch Research School on Philosophy: 'Much Ado About Nothing: (Not) Being from Parmenides to Particle Physics'**. 3-hour workshop for PhD students: *On the Notions of Nothing, Vacuum, and Void in Particle Physics and Cosmology*. 2 Jun 2018.
63. **Dutch Institute for Emergent Phenomena**, constitutive discussion session. *Presentation on the Philosophy of Emergence*, 20 April 2018.
64. **Meeting of the National Science Agenda** (Nationale Wetenschapsagenda), workshop Route 5, showcase research directions in philosophy of physics in The Netherlands. Felix Meritis, Amsterdam (22 March 2016). Invited 4-minute pitch on *Philosophy of Spacetime*.
65. **Symposium *Op de rand van de wetenschap***, De Leische Flesch, Faculty of Physics and Astronomy, Universiteit Leiden. *Informatie in de natuurkunde. De zoektocht naar een unificerende theorie*. 10 Nov 2011
66. **Annual National Physics Conference Fysica 2011**, session *Interdisciplinarity of Reality*, Free University, Amsterdam. *Hiërarchisch of democratisch? Over de eenheid van de natuurwetenschap*. 15 April 2011.

Research Visits and Workshops (recent selection)

(* = invited visit)

67. *Galilei Institute for Advanced Studies, programme *Beyond the Standard Model: Historical-Critical Perspectives*, October-November 2019.
68. *University of Cambridge, *München-Cambridge Workshop on Black Holes* (30 September - 4 October 2019).
69. *Visit to Massimo Bianchi's String Theory Group at Tor Vergata, Rome (10-13 Nov. 2015).
70. *Interdisciplinary Cluster, Humboldt University, Berlin (May 2015).

71. **From Physics to Metaphysics*, Conference for Jeremy Butterfield's 60th birthday (6-7/02/15).
72. **Emergent Time and Emergent Space in Quantum Gravity*, Potsdam (15-18/12/14).
73. *String Theory Workshop*, University of Amsterdam (30 June-7 July, 2014).
74. *Foundations of Quantum Mechanics and Q. Gravity*, Imperial College London, 04/14.
75. *ITP, Aristotle University of Thessaloniki (26 Apr - 4 May 2014).
76. *Group of Mathematical Physics, University of Lisbon (Jul 2012).
77. *Historical Roots of Q. Gravity Research*, MPI-Wissenschaftsgeschichte, Berlin 06/11.

Outreach and Public Talks

78. **Can Science and Technology Shape a New Humanity?** Presentation on *Physics, Metaphysics, and Emergence*, London, 4-7 January 2018.
79. **Amsterdam Philosophy Festival Drift.** *Changing Views on Space, Time and Spacetime*, joint presentation with F.A. Muller, 13 May 2017.
80. **19th International Interdisciplinary Seminar**, London and Cambridge, 1-6 January 2017. *Emergence and Reduction in Physics*.
81. **Masterclass for high-school students** together with a high-school teacher as part of the programme 'Masters in Teaching', AUC, 15/04. *The Strange World of Quantum Mechanics*.
82. **Open day lecture**, AUC-UvA, 17 Jan 2015. *Big Questions in Science: From the Very Small to the Very Large*.
83. **17th International Interdisciplinary Seminar**, student conference *How Did it All Start?* London, 1-6 Jan 2015. Invited presentation: *A Holographic Universe?*
84. **16th International Interdisciplinary Seminar**, student conference *How Did it All Start?* London, 1-7 Jan 2014. Invited presentation: *A Universe from Information?*
85. **Excellence in Teaching for secondary school science teachers**, organized by Betaplatform, Amsterdam University College, 30 Jan 2013. Workshop taught: *Big Questions in Science*.
86. **15th International Interdisciplinary Seminar**, Institute for Interdisciplinary Studies, Madrid. Invited presentation: *Defining 'nothing'. On the Philosophy of Lawrence M. Krauss*, 2 Jan 2013.
87. **Open day lecture**, AUC: *From Einstein to Quantum Cryptography*, 14 Jan 2012.
88. **Het Wereldbeeld lecture**, Amsterdam University College, *The Quest for a Theory of Everything. Lessons for Reductionism*. 6 Jun 2011, Amsterdam.
89. **CREA series of lectures Physics and Philosophy**, Amsterdam. *Black Hole Horizons: The Gravity of Paradigms*. 9 Mar 2011.
90. **StudieMarathon**, Oude Manhuispoort, University of Amsterdam. Invited lecture: *Wat rechtvaardigt de eenheid van de wetenschap? Waar alfa, bèta en gamma samenkomen*. 19 Jan 2011.

91. Public talks and outreach prior to 2011 include: University of California Los Angeles, Studium Generale Delft.

Online Video Presentations (50,000 views)

1. **ERC project Philosophy of Canonical Quantum Gravity**, International Workshop Quantum Gravity, Physics & Philosophy, Institut des Hautes Études Scientifiques (IHES), Bures-sur-Yvette. *Duality and Emergence*. Invited speaker, 10/17.
2. **Beyond Spacetime**. Seminar, Department of Philosophy, University of Geneva, Geneva-Chicago project “Beyond Spacetime”, 14 January 2016.
3. **Colloquium, Department of Philosophy**, University of Navarra, Spain. *On the Philosophy of Quantum Gravity*: **YouTube: 46,463 views**. 21 June 2011.
4. **Class at the Amsterdam University College**, *Interpreting Quantum Mechanics: On the Problem of Measurement*: **YouTube: 3,685 views**. 21/11/12.
5. **Outreach presentation**, Amsterdam, *A Universe Out of Information*. April 2014.
6. **Conference presentation**, London, *The Universe Out of Information?* 18 January 2014.

12. REFERENCES

Due to the interdisciplinary nature of my work, and my research past in physics, I have included separate references from philosophy of science and from physics.

Philosophy of Science	
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