

SOPHIE RAYNOR

Citizenship Netherlands and UK citizenship
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CURRENT EMPLOYMENT

*Post-doc,
Category theory* From 01/2019 Macquarie University, NSW, Australia.
 Two year post-doctoral fellowship at **Centre of Australian Category Theory**,
 mentored by Steve Lack and Richard Garner, funded by the Australian Research Council.

EDUCATION

*PhD,
Mathematics* 2012-2017 University of Aberdeen, UK.
 Title: **Compact symmetric multicategories and the problem of loops**
 Fully funded by an award from the **Blue Brain Project, EPFL, CH**.
 Supervisors: R. Levi (University of Aberdeen) and K. Hess (EPFL, Switzerland).
 Examined in *January 2018* by R. Hepworth (University of Aberdeen) and D. Spivak (MIT).

*BScMSc,
Mathematics* 2002-2010 Leiden University, The Netherlands.
Cum Laude (First Class Honours)
 Thesis: **The Riemann-Roch theorem is a special case of the Atiyah-Singer index formula**.
 MSc courses in geometry and analysis

*BA Hons,
Philosophy* 1997-2000 King's College, Cambridge University, UK.
 (MA Cantab 2004).

RESEARCH INTERESTS

- Operad theory. In particular, modular operads, compact closed categories (and other structures described by graphs with cycles) and their applications, particularly in topology.
- Higher (modular) operads, higher categories, and their applications.

ARTICLES (IN PREPARATION)

*Exp. publication
2020* · Graphical combinatorics and a distributive law for modular operads.
 Current version available at
<https://www.sophieraynor.org/files/2020.08.09ModOpsDistributive.pdf>

Preprint. · An infinity operad of normalized cacti.
 Together with Luciana Bonatto, Safia Chetih, Abigail Linton, Marcy Robertson and Nathalie Wahl. ArXiv preprint available at <https://arxiv.org/abs/2007.01588>

*Exp. submission:
2020.* · Compact closed categories, modular operads, wheeled props and circuits.

*Exp. submission:
2020.* · Modular operads with product: an iterated distributive law for compact closed categories.

*Exp. submission:
2020.* · Enriched categories of plastic networks.
 Together with Kathryn Hess and Ran Levi.

BLOGPOST

July 2018.

· *Beyond Classical Bayesian Networks.*
Together with Pablo Andrez Martinez, blog post at [The \$n\$ -Category Café](#).

STUDENTSHIPS

Doctoral funding

2012-2016 · My PhD was fully funded by an award from the **Blue Brain Project, EPFL, CH.**

Doctoral funding

2010, *declined* · Offer of full studentship with Professor J. Gray, **Open University, UK.**
Developments in topology from Hirzebruch-Riemann-Roch to Atiyah-Singer.

ACADEMIC TEACHING

Undergraduate
tutor

Late 2019 · Macquarie University, AU.
Workgroup tutor complex analysis and vector calculus.

Undergraduate
tutor

06-12/2018 · Rotterdam University of Applied Sciences, NL..
· Principles of programming tutor, Computer Science degree.

Undergraduate
tutor

2003-2004 · Mathematical Institute, Leiden University, NL.
· **Academic tutor** for analysis and linear algebra courses for BSc students.

SELECTED INVITED AND CONTRIBUTED TALKS

Operads Pop-Up

Aug 2020 · 24hr online meeting.
· Invited talk: **Unpacking the combinatorics of modular operads.**

Geocat 2020

July 2020 · Paris, online.
· Invited talk: **A distributive law for modular operads.**

Topology Seminar

Sep. 2019 · EPFL, Switzerland.
· **A distributive law for compact symmetric multicategories.**

Topology Seminar

May. 2019 · Melbourne University, Aus.
· **A new nerve theorem for compact symmetric multicategories.**

Topology Seminar

Feb. 2018 · Aberdeen University, UK.
· **An operad-style generalisation of compact closed categories.**

MATRIX Research
Institute

June 2016 · Conference **Higher structures in geometry and physics**, Melbourne, AU
Contributed talk: **Hierarchical networks and coloured modular operads.**

Joint Mathematics
Meetings

Jan. 2016 · AMS special session **Applied and Computational Topology**, Seattle, USA.
· Invited talk: **Formal perspectives on hierarchical networks.**

Oxford Junior
Seminar

Oct. 2013 · Oxford junior topology and group theory seminar, Oxford University, UK.
· Invited talk: **Learning spaces.**

Scottish Topology
Seminar

Sept. 2013 · Glasgow University, UK.
· Invited talk: **Towards a topological model of the brain.**

Leiden Student
Seminar

April 2005 Student functional analysis seminar, Leiden University, NL.
· Introductory talk: **Holomorphic functional calculus.**

Topology, Category
Seminars

2013-19 · A number of seminars at home institutions (Australian Category Seminar, Aberdeen and EPFL Topology Seminars).

SELECTED WORKSHOPS, CONFERENCES AND MINI-COURSES

Research visit

Sep. 2019 · **University of Oxford, UK.** Guest of Prof. Ulrike Tillmann, Mathematics, and Quantum Group, Computer Science. · **EPFL, CH.** Guest of Prof. Kathryn Hess, Mathematics.

<i>Women in Topology</i>	2018-19 · Hausdorff Institute of Mathematics, Bonn, DE. · Project: 'Operads and props for surfaces' .
<i>Applied Category Theory</i>	Jan. - April 2018 · http://www.appliedcategorytheory.org/school/ Online reading seminar and a research week at the Lorentz Center, Leiden, NL . · Project: 'Unification of the logic of causality' .
<i>Quantum Theory</i>	March 2018 · ICMS, Edinburgh, UK. · Multi-disciplinary workshop on 'combining viewpoints in quantum theory' .
<i>Women in Topology</i>	29 Nov. - 1 Dec. 2017 · MSRI, Berkeley, USA. · Project: 'Direct proofs of properties and structures of model structures for $(\infty;1)$-categories' .
∞ -Operads	12 - 14 Jul. 2017 · University of Osnabrück, Germany. · Workshop on ∞ - operads and applications .
<i>Junior Hausdorff Trimester</i>	5 - 9 Dec. 2016 · Hausdorff Research Institute for Mathematics, Bonn, Germany. · Research guest of Dr. M. Robertson (Melbourne). Trimester program 'Topology' .
<i>Higher Structures</i>	5- 17 June 2016 · MATRIX Research Institute, Victoria, Australia. · Workshop and conference on higher structures in geometry and physics .
<i>Hochschild complexes</i>	12 - 16 Oct. 2015 · University of Copenhagen, Denmark. · Masterclass on algebraic structures of Hochschild complexes .
<i>Applied Category Theory</i>	15 - 18 Sept. 2015 · EPFL, Switzerland. · Mini-course tutored by Dr. David Spivak (MIT) on Applied category theory: information structures and modular systems .
<i>Algebraic Topology</i>	9 - 13 Sept. 2015 · Université Catholique de Louvain, Louvain-la-Neuve, Belgium. · Workshop in category theory and algebraic topology .
<i>Applied Topology</i>	2 - 6 Feb. 2015 · EPFL, Switzerland. · Mini-course tutored by Dr. Pawel Dlotko (Swansea University) on Applied and computational topology .
<i>Atiyah 80</i>	20 - 22 April 2009 · Informatics Forum, Edinburgh, UK. · Geometry and Physics , 80 th birthday conference for Sir Michael Atiyah.

ACADEMIC TEACHING

<i>Undergraduate tutor</i>	Late 2019 · Macquarie University, AU. Workgroup tutor complex analysis and vector calculus.
<i>Undergraduate tutor</i>	06-12/2018 · Rotterdam University of Applied Sciences, NL.. · Principles of programming tutor, Computer Science degree.
<i>Undergraduate tutor</i>	2003-2004 · Mathematical Institute, Leiden University, NL. · Academic tutor for analysis and linear algebra courses for BSc students.

VOCATIONAL TRAINING

<i>Academic Teaching Training</i>	2003 · ICLON, Leiden University, NL. · Academic teaching course completed at Leiden University Graduate School of Teaching (ICLON) for mathematics department teaching staff.
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SELECTED PAST EMPLOYMENT

<i>Machine learning</i>	06-12/2018 · Hoppinger, Rotterdam, NL. · Machine learning developer at full service IT agency.
<i>Own Business, Teaching</i>	2010-2012 · Yoga Maya, Rotterdam, NL.

- I founded and ran a succesful yoga studio in Rotterdam. Main tasks included business administration, daily teaching and mentoring junior teachers.

*Mathematics
Education*

2002-2005 · Vierkant voor Wiskunde, Leiden, NL.

- **Project manager** developing materials for enhancing mathematics eduction in Dutch schools.

*Educational
Publishing*

2000-2001 · Cambridge Publishing Management, Cambridge, UK.

- **Project editor** for school mathematics textbooks at publishing packager.

OTHER INFORMATION

*Australian
Category Seminar
Institute Council*

Since June 2019 · Organiser · [Australian Category Seminar](#).

2002-2003 · Student member of the *instituutsraad*, the council of the Mathematical Institute of the University of Leiden.

Life Saving

2019 · Australian Surf Life Saving, Bronze lifesaving certificate. Patrolling member, Mona Vale.