



Guillaume Brunerie

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(Academic) Curriculum Vitae

Personal info

Birth 13th December 1989, in Montpellier (France)
Citizenship French
Email guillaume.brunerie@gmail.com
Website <https://guillaumebrunerie.github.io>
Languages French (native), English (fluent), Swedish (advanced), Russian (intermediate), Portuguese, Polish, Finnish (beginner)

Education/Employment

2020–current **Game Developer**, *ELK Studios*, Stockholm, Sweden.
2018–2020 **Postdoctoral researcher**, *Stockholm University*, Stockholm, Sweden.
2016–2018 **Postdoctoral member**, *Institute for Advanced Study*, Princeton, New Jersey, USA.
2013–2016 **PhD student**, *Université de Nice Sophia Antipolis*, Nice, France.
2012–2013 **Visiting student**, *Institute for Advanced Study*, Princeton, New Jersey, USA.
2009–2013 **Élève normalien**, *École Normale Supérieure de la rue d'Ulm*, Paris, France.
2007–2009 **Classes préparatoires MPSI/MP***, *Lycée Louis-le-Grand*, Paris, France.

Degrees

2016 PhD in mathematics at the university of Nice Sophia Antipolis
2012 Master 2 in mathematics at the ENS and Paris 7
2011 Master 1 in mathematics at the ENS
2010 Licence 3 in mathematics at the ENS

PhD Thesis

Title *On the homotopy groups of spheres in homotopy type theory*
Institution Université de Nice Sophia Antipolis, Laboratoire J.A. Dieudonné (mathematics)
Advisor Carlos Simpson
Defense date June 15th 2016

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Other awards

- 2007 *Concours général des lycées*: First prize in mathematics and *mention* (regional award) in physics
- 2007 International Mathematics Olympiads: Member of the French delegation and recipient of a bronze medal (Hanoi, Vietnam)

Teaching experience

- Spring 2020 Co-supervisor for two master theses in mathematical logic at Stockholm University
- Fall 2019 Teacher for the advanced level course *Type theory* at Stockholm University (total 30 hours)
- Spring 2019 Teacher for the bachelor-level course *Mathematics III – Logic* (second instance) at Stockholm University (total 30 hours)
- Spring 2019 Teaching assistant for the bachelor-level course *Mathematics III – Logic* (first instance) at Stockholm University (total 15 hours)
- Jun. 2017 Teaching assistant at a Mathematical Research Community (MRC) organized by the American Mathematical Society (AMS) in Snowbird, Utah (one week)
- May 2015 Mini-course on homotopy type theory for PhD students in the PhD colloquium *Inter'Actions 2015*, Grenoble, France (7 hours)
- 2013–2016 Exercise sessions in linear algebra, discrete mathematics and calculus, and oral interrogations in linear algebra, for students in first year of university, Nice, France (total 192 hours)

Refereeing

- 2018–2020 Referee for two bachelor theses and two master theses, at Stockholm University
- 2013–2020 Referee for more than ten articles, in various journals and peer-reviewed conferences

Publications

- 2018 **The James construction and $\pi_4(\mathbb{S}^3)$ in homotopy type theory**, Guillaume Brunerie, *Journal of Automated Reasoning, Special Issue on Homotopy Type Theory and Univalent Foundations*, Springer, *doi*: 10.1007/s10817-018-9468-2
- 2015 **A Cubical Approach to Synthetic Homotopy Theory**, Dan Licata and Guillaume Brunerie, *2015 30th Annual ACM/IEEE Symposium on Logic in Computer Science (LICS 2015)*, pages 92–103, IEEE, *doi*: 10.1109/LICS.2015.19
- 2013 **$\pi_n(\mathbb{S}^n)$ in Homotopy Type Theory**, Dan Licata and Guillaume Brunerie, *Certified Programs and Proofs (CPP 2013)*, volume 8307 of *Lecture Notes in Computer Science (LNCS)*, pages 1–16, Springer, *doi*: 10.1007/978-3-319-03545-1

Preprints and other writings of interest

- 2021 **Synthetic Cohomology Theory in Cubical Agda**, Guillaume Brunerie, Anders Mörtberg, Axel Ljungström, preprint

- 2017 **Cartesian Cubical Type Theory**, Carlo Angiuli, Guillaume Brunerie, Thierry Coquand, Kuen-Bang Hou (Favonia), Robert Harper, Daniel R. Licata, preprint
- 2013 **Homotopy Type Theory: Univalent Foundations of Mathematics**, The Univalent Foundations Program (collective book), Institute for Advanced Study, 2013, <http://homotopytypetheory.org/book/>

Invited talks at conferences

- Aug. 2019 **Formalization in Agda**, *Homotopy Type Theory 2019 Summer School (minicourse, 4h)*, Carnegie Mellon University, Pittsburgh, Pennsylvania.
- Jun. 2019 **La notion d'égalité en théorie des types homotopiques**, *École thématique du CNRS "Philosophie et mathématiques contemporaines"*, Paris, France.
- Jan. 2018 **Experiments in cubical type theory**, *Joint Mathematics Meetings, AMS Special Session on Homotopy Type Theory (a Mathematics Research Communities Session)*, San Diego, California.
- Jul. 2016 **Custom definitional equalities in Agda**, *International Congress on Mathematical Software 2016, Session on Univalent Foundations and Proof Assistants*, Berlin, Germany.
- May 2016 **The fourth homotopy group of the three-dimensional sphere**, *Workshop on Homotopy Type Theory and Univalent Foundations of Mathematics*, Fields Institute, Toronto, Ontario, Canada.
- May 2015 **Théorie des types dépendants et axiome d'univalence**, *Colloque Inter'Actions 2015*, Grenoble, France.
(minicourse of 7h)
- Nov. 2014 **The fourth homotopy group of the three-sphere**, *Homotopy Type Theory Workshop*, University of Oxford, United Kingdom.
- Sep. 2014 **Homotopy type theory**, *Conference on Homotopical Algebra, Operads and Grothendieck-Teichmüller groups*, Université de Nice Sophia Antipolis, Nice, France.
- May 2014 **Cubical homotopy type theory**, *Formalization of mathematics in proof assistant*, Institut Henri Poincaré, Paris, France.
- Jan. 2014 **Cubical homotopy type theory**, *Recent developments in Type Theory*, Lyon, France.
- Jan. 2014 **Homotopy Type Theory**, *Journées francophones des langues applicatifs*, Fréjus, France.
- Sep. 2013 **The Hopf Fibration**, *Conference on Type Theory, Homotopy Theory and Univalent Foundations*, Barcelona, Spain.
- Jun. 2013 **An elementary definition of weak ∞ -groupoids**, *Canadian Mathematical Society (CMS) Summer Meeting*, Halifax, Nova-Scotia, Canada.
- May 2013 **A type-theoretic definition of weak ∞ -groupoids**, *North American Annual Meeting of the Association for Symbolic Logic*, Waterloo, Ontario, Canada.

Contributed talks at conferences

- Aug. 2019 **Computations in homotopy type theory**, *Mathematical Logic and Constructivity*, Stockholm, Sweden.
- Aug. 2019 **A formalization of the initiality conjecture in Agda**, *Homotopy Type Theory 2019 Conference*, Carnegie Mellon University, Pittsburgh, Pennsylvania.
- Jun. 2017 **The Steenrod squares in homotopy type theory**, *International Conference on Types for Proofs and Programs (TYPES 2017)*, Budapest, Hungary.
- Jul. 2015 **A Cubical Approach to Synthetic Homotopy Theory**, *Annual ACM/IEEE Symposium on Logic in Computer Science (LICS 2015)*, Kyoto, Japan.

Talks at seminars and working groups

- Sep. 2020 **Initiality for Martin-Löf type theory**, *HoTT Electronic Seminar Talks*.
(together with Peter Lumsdaine)
- Mar. 2020 **A general class of dependent type theories**, *Mathematics and theoretical computing seminar*, Ljubljana, Slovenia.
- Jun. 2019 $\pi_4(\mathbb{S}^3)$ **in homotopy type theory (part II)**, *Stockholm Logic Seminar*, Sweden.
- May 2019 $\pi_4(\mathbb{S}^3)$ **in homotopy type theory (part I)**, *Stockholm Logic Seminar*, Sweden.
- Dec. 2018 **An Agda formalization of the initiality conjecture**, *Stockholm–Göteborg type theory seminar*, Göteborg, Sweden.
- Nov. 2018 **Computer-generated proofs for the monoidal structure of the smash product**, *HoTT Electronic Seminar Talks*.
- Sep. 2018 **A proposal for the initiality conjecture**, *Stockholm Logic Seminar*, Sweden.
- Aug. 2018 **Cubical type theory for beginners**, *Dagstuhl Seminar on Formalization of Mathematics in Type Theory*, Dagstuhl, Germany.
- Mar. 2018 **Démonstrations générée par ordinateur pour le produit smash**, *Journées PIR2*, INRIA Team PIR2, Fontainebleau, France.
- Mar. 2018 **Computer-generated proofs for the smash product**, *MURI Team Meeting*, Carnegie Mellon University, Pittsburgh, Pennsylvania.
- Mar. 2018 **Synthetic homotopy theory: Going beyond set-level mathematics**, *Mathematical Conversations*, Institute for Advanced Study, Princeton, New Jersey.
- Mar. 2018 **Introduction to synthetic homotopy theory**, *Algebraic topology seminar*, Princeton University, Princeton, New Jersey.
- Nov. 2017 **The Steenrod squares in homotopy type theory**, *Topology Seminar*, Western University of Ontario, London, Ontario, Canada.
- Sep. 2017 **Homotopy type theory: working invariantly in homotopy theory**, *Short talks by postdoctoral members*, School of Mathematics, IAS, Princeton, New Jersey.
- Mar. 2017 **The Steenrod squares in homotopy type theory**, *MURI Team Meeting*, Carnegie Mellon University, Pittsburgh, Pennsylvania.
- Mar. 2017 **Invariant homotopy theory in homotopy type theory**, *Topology seminar*, University of Illinois Urbana-Champaign, Urbana, Illinois.

- Sep. 2016 **Invariant homotopy theory in the univalent foundations**, *Short talks by post-doctoral members*, School of Mathematics, IAS, Princeton, New Jersey.
- Jun. 2016 **Examples of closed natural numbers in homotopy type theory**, *Séminaire Chocla*, Lyon, France.
- Dec. 2014 **Théorie des types cubiques**, *Séminaire Logique et Interactions*, Université d'Aix-Marseille, Marseille, France.
- Oct. 2014 **Cubical homotopy type theory**, *Agda Implementors' Meeting XX*, Tallinn, Estonia.
- Dec. 2013 **Introduction à la théorie des types homotopiques**, *Groupe de travail Algèbre supérieure*, Université de Nice Sophia Antipolis, Nice, France.
(series of 3 talks)
- Oct. 2013 **A type-theoretic definition of weak infinity-groupoids**, *Stockholm Logic Seminar*, Sweden.
- Oct. 2013 **Homotopy type theory and homotopy groups of spheres**, *Séminaire Chocla*, Lyon, France.
- Sep. 2013 **What is missing for Agda to be suitable for Univalent Foundations?**, *Agda Implementors' Meeting XVIII*, Gothenburg, Sweden.
- Apr. 2013 **Homotopy Theory in Type Theory**, *Seminar of the Institute for Advanced Study*, Princeton, New Jersey.
(together with Dan Licata and Peter Lumsdaine)
- Mar. 2013 **The James construction and $\pi_4(\mathbb{S}^3)$** , *Seminar of the IAS special year*, Princeton, New Jersey.
- Feb. 2013 **$\pi_2(\mathbb{S}^2)$ in HoTT**, *Seminar of the IAS special year*, Princeton, New Jersey.
- Jan. 2013 **Weak infinity-groupoids**, *Seminar of the IAS special year*, Princeton, New Jersey.
(series of 2 talks)
- Nov. 2012 **$\pi_k(\mathbb{S}^n)$ for $k < n$** , *Seminar of the IAS special year*, Princeton, New Jersey.
- Oct. 2012 **Higher inductive types**, *Tutorial of the IAS special year*, Princeton, New Jersey.
- May 2012 **Théorie des types homotopiques, fondations univalentes et types inductifs supérieurs**, *Mini-cours de l'équipe Analyse Algébrique de l'Institut de Mathématiques de Jussieu*, Paris, France.
(series of 2 talks)
- Apr. 2012 **Introduction à la théorie des types homotopiques, fondations univalentes des mathématiques**, *Groupe de travail « Algèbre et topologie homotopiques »*, Université Paris 7, France.
(series of 2 talks)
- Jan. 2012 **Théorie des types homotopiques**, *Groupe de travail d'élèves de logique de l'ENS*, Paris, France.
(series of 2 talks)
- Oct. 2011 **Introduction à la théorie des types homotopiques**, *Groupe de travail « Catégories supérieures, polygraphes et homotopie »*, Laboratoire PPS, Paris, France.
(series of 3 talks)
- Feb. 2009 **Le théorème de complétude de Gödel**, *Séminaire de mathématiques des élèves du lycée Louis le Grand*, Paris, France.

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