

Final report on the Marie Curie INdAM COFUND Fellowship project

“**TOPOSESBRIDGES**” (1st December 2014 - 30th November 2016)

Olivia Caramello

The research on the project has been successful and produced the following outputs:

PAPERS/BOOKS WRITTEN:

1. *Motivic toposes*,
arxiv:math.AG/1507.06271, 41 pages
2. *Syntactic categories for Nori motives* (with L. Barbieri-Viale and L. Lafforgue),
arxiv:math.AG/1506.06113, 25 pages, revised version submitted to *Selecta Mathematica*
This work was the subject of a research course given by Prof. Lafforgue at IHES, entitled “*Catégories syntactiques pour les motifs de Nori*” (September and October 2015)
3. *General affine adjunctions, Nullstellensätze, and dualities* (with V. Marra and L. Spada),
arxiv:math.CT/1412.8692, 43 pages, revised version to be shortly submitted to the Journal of Pure and Applied Algebra
4. *Sur la dualité des topos et de leurs présentations et ses applications : une introduction* (with L. Lafforgue), available as a IHES preprint (September 2016), 61 pages
5. *On the geometric theory of local MV-algebras* (with A. C. Russo),
Journal of Algebra 479, 263-313 (2017)
6. During the period of the Fellowship I have completed the writing a 384 pages research monograph on topics pertaining to the project, entitled “*Theories, Sites, Toposes: Relating and studying mathematical theories through topos-theoretic ‘bridges’*”, which has been published by Oxford University Press in 2017.
7. In the last months of the Fellowship I have also written my French habilitation thesis, entitled *Grothendieck toposes as unifying ‘bridges’ in Mathematics* (102 pages), which was successfully defended in December 2016 at the University of Paris 7. The text of the thesis is available at the address <http://www.oliviacaramello.com/Unification/HDR OliviaCaramello.pdf> and the Jury’s report is available at the address <http://www.oliviacaramello.com/Unification/RapportSoutenanceHDR OliviaCaramello.pdf>

INVITED TALKS/RESEARCH COURSES GIVEN:

1. 21st - 24th June 2016 *Motivic toposes*, 8-hour research course given at the Department of Mathematical Sciences of the **University of Nottingham** (UK)
2. 17th March 2016 *Topos motiviques*, invited talk at the seminar SAGA_J of the Department of Mathematics of the **Université d’Orsay** (France)
3. 23rd - 24th Nov. 2015 *Introduction to categorical logic, classifying toposes and the ‘bridge’ technique*, 5-hour video-recorded research lecture course given at the conference “**Topos à l’IHES**” (23- 27 November 2015)
4. 10th November 2015 *De Fraïssé à Galois, en passant par les topos de Grothendieck*, invited talk at the Séminaire de Logique Mathématiques of the **Université de Lyon 1** (France)
5. 3rd September 2015 *Duality and Morita-equivalence: a topos-theoretic perspective*, invited talk at the workshop “**Duality in contemporary mathematics: philosophical aspects**” (Wuppertal, Germany, 2-5 September 2015)
6. 29th June 2015 *The theory of topos-theoretic ‘bridges’, five years later*, invited talk at **UNILOG 2015** (Istanbul, Turkey, 20-30 June 2015)
7. 25th June 2015 *The theory of topos-theoretic ‘bridges’, five years later*, invited lecture at **TACL 2015** (Ischia, Italy, 21-26 June 2015)

8. 8th June 2015 *Introduction à la théorie des ponts topos-théoriques*, invited talk at the **International Logic Workshop LIQ 5** (Paris, June 8-9, 2015)
9. 5th May 2015 *La théorie des 'ponts' topos-théoriques*, invited talk at the workshop « Théorie des catégories, dynamiques anciennes et nouvelles, mathématiques et philosophie », Paris
10. 17th April 2015 *Introduction informelle aux topos*, **IHÉS** (France)
11. 6th March 2015 *Unité et diversité en mathématiques: un point de vue topos-théorique*, Séminaire de Philosophie et Mathématiques, **Ecole Normale Supérieure, Paris**
12. 22nd January 2015 *Les topos de Grothendieck comme ponts unifiants en mathématiques*, Séminaire d'algèbre, topologie et géométrie, **Université de Nice**
13. 5th December 2014 *The Morita-equivalence between MV-algebras and abelian l-groups with strong unit*, invited talk at the conference **Beyond True and False: Logic, Algebra and Topology**, University of Florence, Italy, 3rd - 5th December 2014

CONFERENCE ORGANIZATION:

I have organized, together with Alain Connes, Pierre Cartier, Stéphane Dugowson and Anatole Khelif a five-day international conference on topos theory entitled "**Topos à l'IHÉS**" (IHÉS, 23-27 November 2015).

PH.D. STUDENT SUPERVISION:

During the period of the Fellowship I have supervised (with Proff. Antonio Di Nola and Mai Gehrke) the Ph.D. thesis of Anna Carla Russo (University of Salerno and Université Paris 7), which was successfully defended in May 2016.

EDITORIAL AND REFEREEING ACTIVITY:

During the period of the Fellowship I have acted as *Editor* for the journal **Logica Universalis** (starting from February 2016) and as *Referee* for the following journals: Advances in Mathematics, Journal of Symbolic Logic, Journal of Mathematical Physics.