

PERSONAL DETAILS

Name: FOSCO LOREGIAN
Birth: May 23, 1987
Address: Via Bonomea 265, 34136 Trieste – ITALY
Phone: (+39) 040 3787 860
Mail: floregi@sissa.it
Homepage: <http://people.sissa.it/~floregi/>

CURRENT POSITION

Ph.D. in Mathematics

SISSA – Trieste, Italy

Oct 2012 – (Jun 2016)?

EDUCATION

MSc. in Mathematics

Università degli studi di Padova – Padua, Italy

Oct 2010 – Jul 2012

BSc. in Mathematics

Università degli studi di Padova – Padua, Italy

Jan 2008 – Oct 2010

BSc. in Physics (unfinished)

Università degli studi di Padova – Padua, Italy

Oct 2006 – Dec 2007

Dropped to start a B.Sc. in Mathematics; after realizing that I was only following and appreciating Mathematics courses I decided to slightly change my initial idea following another vocation. I've had no other notable career shifts, but I know almost for sure that this change has been one of the most fortunate choices of my academic (and to a certain extent personal) life.

RESEARCH INTERESTS

Category Theory applied to Algebra, Geometry and Physics; Synthetic Differential Geometry; Higher Category Theory; monoidal and enriched categories; Topos Theory in Geometry, Logic, Homotopy Theory and Physics; Homological Algebra and Algebraic Topology; Topological and Algebraic Quantum Field Theories; Homotopical Algebra; Derived Algebraic Geometry; higher dimensional Algebra; plot theory; Computational Homology; Haskell.

THESES

PhD thesis: *t*-structures in stable ∞ -categories

D. FIORENZA, Università degli Studi di Roma “La Sapienza”, ITALY

exp. Jul 2016

We are translating the theory of *t*-structures on triangulated categories to the language of stable ∞ -categories (in the quasi-categorical model of Joyal-Lurie).

Master thesis: Orlov's reconstruction theorem

JUL 2012

F. BOTTACIN, *Università degli studi di Padova, ITALY*

As a consequence of the reconstruction theory paradigm, lots of algebraic properties of the bounded derived category $\mathbf{D}^b(X)$ of a sufficiently nice space X reflect into geometric properties of the space itself, to the point that you are often able to rebuild the whole X from scratch.

PUBLICATIONS

Récollements in stable ∞ -categories

AUG 2015

j/w D. FIORENZA, *Università degli Studi di Roma "La Sapienza"*

<http://arxiv.org/abs/1507.03913>

We develop the theory of *recollements* in a stable ∞ -categorical setting. In the axiomatization of Beilinson, Bernstein and Deligne these diagrams provide a generalization of Grothendieck's "six functors" between derived categories. The adjointness relations between functors in a recollement $\mathbf{D}^0 \rightsquigarrow \mathbf{D} \rightsquigarrow \mathbf{D}^1$ induce a "recollée" t -structure on the central category \mathbf{D} , given t -structures t_0, t_1 on the extremal $\mathbf{D}^0, \mathbf{D}^1$. In the stable ∞ -categorical world, this construction enjoys unexpected autoduality properties. In the geometric case of a stratified space, various recollements arise, which "interact well" with the combinatorics of the intersections of strata to give a well-defined, associative operation. From this we deduce a generalized associative property for n -fold gluings, valid in any stable ∞ -category.

Hearts and Postnikov towers in stable ∞ -categories

JAN 2015

j/w D. FIORENZA, *Università degli Studi di Roma "La Sapienza"*

<http://arxiv.org/abs/1501.04658>

We exploit the equivalence between t -structures and normal torsion theories on stable ∞ -categories to unify two apparently separated constructions in the theory of triangulated categories: the characterization of bounded t -structures in terms of their hearts, the decomposability of each arrow into a "Postnikov tower" and semiorthogonal decompositions on triangulated categories.

This is the co/end, my only co/friend

JAN 2015

<http://arxiv.org/abs/1501.02503>

A short survey about co/end calculus. After having given a series of preliminary definitions, we characterize co/ends as particular co/limits; then we derive a number of results directly from this characterization. The last sections discuss the most interesting examples where co/end calculus serves as a powerful abstract way to do explicit computations in diverse fields like Algebra, Algebraic Topology and Category Theory. The appendices serve to sketch a number of results heavily relying on co/end calculus: weighted limits, the theory of profunctors, and operads.

t -structures are normal torsion theories

AUG 2014

j/w D. FIORENZA, *Università degli Studi di Roma "La Sapienza"*

Applied Categorical Structures (2014), pp. 1-28.

We characterize t -structures in stable ∞ -categories as suitable *quasicategorical factorization systems*, showing that a t -structure t on a stable ∞ -category \mathbf{C} is equivalent to a normal torsion theory \mathbb{F} on \mathbf{C} , i.e. to a factorization system $\mathbb{F} = (\mathcal{E}, \mathcal{M})$ where both classes satisfy the 3-for-2 cancellation property, and a certain compatibility with pullbacks/pushouts.

SKILLS

| | |
|------------------|---|
| <i>Languages</i> | Italian (mother tongue), English (fluent), French (beginner) |
| <i>Software</i> | Mathematica, L ^A T _E X, TikZ, Matlab, Haskell |

TALKS DELIVERED

Categorical Resolutions of singularities, categorically

JAN 2015

Two lectures on Kuznetsov-Lunts' "Categorical resolution of irrational singularities", using enriched profunctors and weighted limits.

held in English, SISSA - Trieste

Lurification

JAN 2015

A gentle introduction to stable quasicategories, with examples.

held in English, SISSA - Trieste

For the sake of well-completeness

JUNE 2014

Opening short-seminars of $\pi\tau$ 2014, Cambridge (UK)

Held in English, Winstanley Lecture Theatre in Trinity College

How I learned to love the first quadrant

MAY 2014

A gentle intro to the Serre spectral sequence, with examples and computations

seminars in Algebraic Geometry, SISSA - Trieste

It's turtles all the way down

MAY 2014

A (not so) gentle introduction to Higher Category Theory

Università degli studi di Bologna

Fourier-Mukai type transforms, categorically

AUG 2013

A glance to the categorical properties of the Fourier-Mukai functors.

COG-GOC 2013

This is the coend, my only cofriend

AUG 2013

3 lectures about co/end calculus: basic constructions, operads, profunctors.

COG-GOC 2013

The Algebra and Geometry of Categorical Groups

JUN 2013

a brief survey of the Representation Theory and Homotopy Theory of 2-groups.

exam in Representation Theory, SISSA - Trieste

Homotopical interpretation of stack theory

APR 2013

following Joyal-Tierney "Strong stacks and classifying spaces" (with a crash course on Topos theory).

seminars in Algebraic Geometry, SISSA - Trieste

Categorification on AQFT

MAR 2013

Following M. Comeau's "Von Neumann Categories".

exam in Noncommutative Geometry, SISSA - Trieste

Homotopical Algebra for C^* -algebras

DEC 2012

following O. Uuye's [arXiv:1011.2926](https://arxiv.org/abs/1011.2926) and A. Østvær

exam in C^* -algebras, SISSA - Trieste

TEACHING & ORGANIZATIONAL ACTIVITIES

Homotopical Algebra

OCT-Nov 2014

teacher (held in Italian)

Università degli studi di Pavia

A bottom-up introduction to the language of Homotopical Algebra; starting from a series of visually easy topological examples, it's rather immediate to grasp the meaning of fibrations and cofibrations in abstract terms. This paves the way to the definition of the Serre model structure on a (suitably nice) category of topological spaces, and gives a motivation for the general definition of a model category: examples of such categories are given, like chain complexes of modules over a ring, and categories (Thomason and "folk" model structure with comparison between the two).

Kan Extension Seminar

JAN-JUN 2014

supervised by E. Riehl

webinar with students from Italy, Usa, Australia, UK, France. . .

A graduate Category Theory reading course. Each of the twelve participants composed a blog post for the *n*-Category Café <https://golem.ph.utexas.edu/category/> over the course of the first six months of 2014, which has been published every other week. The other participants commented and interacted together, often creating stimulating discussions.

Categorical Tools

JAN 2014

Università degli studi di Padova

organizer and speaker (held in Italian)

A project (similar to the *Jacobians mathematicians*, see below) where I tried to propose a bit of categorical language to the “heathens” (pieces of enriched category theory, topos theory, groupoids in Algebraic Topology, categorical Homotopy Theory, weighted limits, coend-juggling, all adapted to an unexperienced audience).

CoG-GoC 2013

AUG 2013

SISSA, Trieste

organizer and speaker (held in English/Italian)

Categories of Geometry, Geometry of Categories: the first experiment of an informal meeting with friends and colleagues working in fields nearby Category Theory. Geometry is, and will always be, the *terra incognita* where new mathematical structures can be found, new phenomena observed, new/old ideas stretched to solve old/new problems; Category Theory is becoming nowadays the natural language to do Geometry, or better to say, to constantly expand the meaning of the word “Geometry”. The other side of the coin is that categories are secretly *geometric objects*: their nature is best understood when geometric ideas (model categories, simplicial stuff, topological and homotopical techniques. . .) come into play. This is the reason for the intertwining of cog (Category Theory adapted to understand Geometry) and goc (geometric ideas adapted to understand what categories really are).

The Jacobian Mathematicians

JAN 2011

Università degli studi di Padova

organizer and speaker (held in Italian)

A kind of “open window” towards the scientific attitude to knowledge, “to do Mathematics instead of taking exams about Mathematics”, developing interesting interconnection with other disciplines. I delivered six talks (but three more people talked about Game Theory, Fourier analysis, and analytical solutions to PDEs):

- Fibrations between spheres and Hopf theorem (suitable for freshmen);
- *The importance of being abstract*, a gentle introduction to the categorical point of view to reality (suitable for outsiders in Mathematics);
- low dimensional Topological Quantum Field Theories *à la* Atiyah;
- Chatting about complex geometry (symplectic, complex and Kahler manifolds);
- Connections and Fiber Bundles, with a glance to the geometry of Classical Field Theory;
- A short lecture about *Computational Homological Algebra*, my first piece of applied Mathematics.