

# Curriculum Vitae and Publications

Antongiulio Fornasiero

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## Personal information

Born on 13th June 1976 in Venice (Italy).

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## Work, education, and training

Since October 2008 Assistant position at the University of Münster (Germany).

August 2007–September 2008 Post-doctoral scholarship at the University of Freiburg (Germany).

December 2003–July 2007 Post-doctoral scholarship at the University of Pisa (Italy).

January–March 2005 I visited the Algebra and Logic Group at the University of Saskatchewan (Saskatoon, Canada), where I worked with Salma and Franz-Viktor Kuhlmann.

January 2000–January 2004 I was a PhD student at the University of Edinburgh, under the supervision of Angus Macintyre; I was funded by a scholarship by the Istituto Nazionale di Alta Matematica, and by the Engineering and Physical Sciences Research Council. I graduated with the thesis “Integration on Surreal Numbers”.

October 1994–April 1999 I was a student in mathematics at the University of Pisa and at the Scuola Normale Superiore of Pisa. I specialised in mathematical logic, graduating *cum laude* with the thesis “O-minimalità del campo dei numeri reali con la funzione esponenziale”, under the direction of Alessandro Berarducci.

## Teaching

During the Summer semester 2008, I taught the course “O-minimality of Pfaffian functions” at the University of Freiburg.

Since 2009 I have been teaching assistant for various courses at the University of Münster.

## Research interests

My main research interests are in **model theory**, especially **ordered structures**, **o-minimality**, **valued fields**, **fields of power series**, and **lovely pairs**.

In my PhD thesis I studied Conway's field of surreal numbers. The main concern was the study of a class of functions on the surreals satisfying a certain general definition schema. I proved the existence of an integral for such functions, which, in favourable cases, satisfies the traditional formulae of analysis. Moreover, the sign-change property can be proved for such functions, giving a new proof of the existence of a logarithm [PhD, F05, F06b].

In [F06a], I studied valued fields, and, generalising a theorem of Mourgues and Ressayre, I proved that a Henselian field of residue characteristic 0 can be embedded in a field of generalised power series, and therefore admits an integer part. Similar results hold, with some additional hypothesis, in the finite and the mixed characteristic cases. An easy consequence is a different proof of the Ax-Kochen-Ershov theorem. In [FKK08], together with Franz-Viktor and Salma Kuhlmann, we studied more in details integer parts of valued fields, and investigated their connection to special (additive) complements of valuation rings in ordered fields.

In [FM08], together with Marcello Mamino, we studied the arithmetic of Dedekind cuts on ordered Abelian groups, obtaining an axiomatisation of the universal part of the theory of the such structures.

I am also interested in the correlations between o-minimality and other areas of mathematics, especially measure theory and algebraic topology. In [FV10], together with Elisa Vasquez-Rifo, we gave a notion of  $d$ -dimensional area for bounded sets definable in an o-minimal structure expanding a field, extending the work of Berarducci and Otero on the Lebesgue measure of definable sets. It is possible to give different definitions for area, and it turns out that they coincide, and that many of the formulae from classical geometric measure theory can be transferred to this context.

I also worked on the space of types of o-minimal structure, endowed with the spectral topology. In [F06d], I showed that the definability of a type can be apprehended from its specialisations. In my joint work with Alessandro Berarducci [BF07], we studied the Čech and sheaf cohomology of the spectrum of o-minimal structures expanding a group, and we showed that the cohomology of closed and bounded definable sets is finitely generated and in-

variant under elementary extensions and o-minimal expansions (generalising known results for structures expanding a field).

Together with Tamara Servi, we are studying definably complete Baire structures and we proved a generalization of Wilkie’s theorem of the complement to such structures [FS10a, FS09b, FS10c].

In [F10b, F10c, F10d, F11b] I study other “tame” definably complete structure (e.g., locally o-minimal and d-minimal structures), and prove that various results from o-minimality can be generalised to such structures, solving some conjectures by C. Miller.

I studied structures with a dimension function (such as d-minimal or geometric structures), and introduced a notion of dense pairs (also known as “lovely pairs” in a different context) for such structures [F11a]. In joint work with Gareth Boxall, we studied lovely pairs of structures endowed with an independence relation, bringing together the work on lovely pairs of geometric structures and of lovely pairs of simple structures [F10e].

## Publications

- [PhD] A. Fornasiero. Integration on Surreal Numbers. Doctoral thesis, University of Edinburgh, January 2004.
- [F06a] —. Embedding Henselian fields into power series. *J. Algebra*, 304:1 (2006), 112–156.
- [BF07] Alessandro Berarducci and —. O-minimal cohomology: finiteness and invariance results. *J. Mathematical Logic*, 9:2(2009) pp. 167-182
- [FKK08] —, Franz-Viktor and Salma Kuhlmann. Towers of complements to valuation rings and truncation closed embeddings of valued fields. *J. Algebra*, 323:1 (2010), 574–600. Also appeared in: *Séminaire de Structures Algébriques Ordonnées*, Prépublications de l’équipe de logique mathématique, Université Paris VII, Février 2008.
- [FM08] — and Marcello Mamino. Arithmetic of Dedekind cuts on ordered Abelian groups. *Annals of Pure and Applied Logic*, 156: 2–3 (2008), 210–244.
- [FS10a] — and Tamara Servi. Definably complete Baire structures. *Fund. Math.*, 209 (2010), no. 3, 215–241.
- [FS09b] — and Tamara Servi. Theorems of the complement. To appear in: the Proceedings of the Thematic Semester in o-minimality at

the Fields Institute of Toronto (Spring 2009). C. Miller, J.-P. Rolin, P. Speissegger editors. 27 pp., May 2009.

- [F10c] —. Definably complete structures are not pseudo-enumerable. To appear in: *Archive for Mathematical Logic*, 9 pp., August 2010.
- [F11a] —. Dimensions, matroids, and dense pairs of first-order structures. *Annals of Pure and Applied Logic*, 162:7 (2011), 514–543.

### Unpublished papers

- [F05] —. Recursive definitions on surreal numbers. Unpublished, 19 pp., 2005.
- [F06b] —. Initial embeddings in  $\mathbf{No}$  of models of  $T_{an}(\text{exp})$ . Unpublished, 13 pp., 2006.
- [F06d] —. O-minimal spectrum. Unpublished, 33 pp., 2006.
- [F10b] —. Locally o-minimal structures and structures with locally o-minimal open core. Submitted, 30 pp., September 2010.
- [F10d] —. D-minimal structures. Submitted, 25 pp., 2010.
- [FS10c] — and Tamara Servi. Relative Pfaffian closure for definably complete Baire structures. Submitted, 17 pp., May 2010.
- [FV10] — and Elisa Vasquez-Rifo. O-minimal Hausdorff measure. Submitted, 25 pp., 2010.
- [F10e] —. Lovely pairs for independence relations. Submitted, 24 pp., 2010.
- [F11b] —. Expansions of the reals which do not define the natural numbers Submitted, 14 pp., 2011.

### Talks I gave

*International Congress M.ARI.AN. 2004: Nonstandard Models of Arithmetic and Analysis*, Pisa, June 2004.

International Congress *NonStandard Methods and Applications in Mathematics*, Pisa, May 2006.

*Oxford Workshop in Model Theory*, September 2006.

*Colloque autour de l'o-minimalité*, Paris, September 2006.

*Joint meeting UMI-DMV*, Perugia, June 2007.

*Incontro Italiano Insiemi e Modelli*, Torino, April 2007.

*Logic Colloquium 2009*, Sofia, Bulgaria, August 2009.

*Model Theory: Around Valued Fields and Dependent Theories*, Oberwolfach, January 2010.

*British Postgraduate Model Theory Conference*, Leeds, January 2011.

### **Other conferences I attended**

*Singularity theory, in honour of Stanislaw Lojasiewicz*, Cracow, March 2004.

*Sixth Annual Colloquiumfest: Positivity, the Multi-Dimensional Moment Problem and Noncommutative Real Geometry*, Saskatoon, April 2005.

*MODNET Summer School*, Camerino, June 2007.

*MODNET Training Workshop*, Berlin, September 2007.

*Conference on the Model Theory of Fields*, Freiburg, September 2008.

Summer school *Geometry and Rigidity of Groups*, Münster, August 2009.

*Buildings 2009*, Münster, October 2009.

Summer school *Berkovich spaces*, Paris, June 2010.

*Colloquium Logicum 2010*, Münster, September 2010.

*Unlikely intersections in algebraic groups and Shimura varieties*, Pisa, March 2011.