

Curriculum Vitae  
**Alberto Marcone**

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PERSONAL

- Born November 3, 1962 in Ivrea, Italy
- Italian citizenship
- Married, three children

RESEARCH INTEREST

Reverse Mathematics, Descriptive Set Theory, WQO and BQO theory, Computable Mathematics, Computable Analysis.

EDUCATION

- 1993: Ph.d. in Mathematics, The Pennsylvania State University (thesis advisor: Stephen G. Simpson)
- 1986: Laurea in Matematica, Università di Torino, Italy (110/110 *summa cum laude*, thesis supervisors: Flavio Previale and Franco Parlamento)

EMPLOYMENT

- 2017–present: Università di Udine, Italy, full professor
- 1998–2017: Università di Udine, Italy, associate professor
- 1990–1998: Università di Torino, Italy, ricercatore (roughly corresponding to assistant professor)
- 1989–1990: The Pennsylvania State University, Department of Mathematics, Instructor

SERVICE

- Member of the Editorial Board of the journal *Computability* since 2023
- Guest editor for the special issue of *Computability* devoted to the workshop *Measuring the Complexity of Computational Content: From Combinatorial Problems to Analysis*
- Referee for several funding agencies in different countries
- Referee for many scientific journals, volumes and conferences
- Organizer and/or member of the program committee for several workshops and conferences

PH.D. STUDENTS ADVISED

- Andrea Volpi, current, since 2022.
- Martina Iannella, current, since 2019 (cosupervisor Vincenzo Dimonte).
- Vittorio Cipriani, graduated 2023 (thesis “Many problems, different frameworks. Classification of problems in computable analysis and algorithmic learning theory”, cosupervisor Luca San Mauro).
- Manlio Valenti, graduated 2021 (thesis “A journey through computability, topology and analysis”).
- Marta Fiori Carones, graduated 2020 (thesis “Filling cages. Reverse mathematics and combinatorial principles”).

- Emanuele Frittaion, graduated 2014 (thesis “Reverse Mathematics and partial orders”).

#### POSTDOCS MENTORED

- Manlio Valenti, 2021–22.
- Peter Holy, 2020–22.
- Matthew Hendtlass, 2012–13.

#### PUBLICATIONS

[Publications are listed in order of submission, rather than of publication.]

- [1] Theory of sets and classes and systems used in reverse mathematics, *Rendiconti del seminario matematico dell’Università e del Politecnico di Torino* **46** (1988), 189–215.
- [2] Borel quasi-orderings in subsystems of second-order arithmetic, *Annals of Pure and Applied Logic* **54** (1991), 265–291.
- [3] Foundations of bqo theory, *Transactions of the American Mathematical Society* **345** (1994), 641–660.
- [4] The set of better quasi orderings is  $\Pi_2^1$ -complete, *Mathematical Logic Quarterly* **41** (1995), 373–383, arXiv:math/9405207.
- [5] On the logical strength of Nash-Williams’ theorem on transfinite sequences, in: W. Hodges, M. Hyland, C. Steinhorn, J. Truss (eds.), *Logic: From Foundations to Applications*, Clarendon Press, 1996, pp. 327–351, arXiv:math/9408204.
- [6] Ordinary differential equations and descriptive set theory: uniqueness and globality of solutions of Cauchy problems in one dimension (with Alessandro Andretta), *Fundamenta Mathematicae* **153** (1997), 157–190, arXiv:math/9609204.
- [7] Lebesgue numbers and Atsugi spaces in subsystems of second-order arithmetic (with Mariagnese Giusto), *Archive for Mathematical Logic* **37** (1998), 343–362, arXiv:math/9602203.
- [8] Finite families with few symmetric differences (with Franco Parlamento and Alberto Policriti), *Proceedings of the American Mathematical Society* **127** (1999), 835–845.
- [9] Extensions of functions which preserve the continuity on the original domain (with Camillo Costantini), *Topology and its Applications* **103** (2000), 131–153.
- [10] Projective sets and ordinary differential equations (with Alessandro Andretta), *Transactions of the American Mathematical Society* **353** (2001), 41–76.
- [11] Pointwise convergence and the Wadge hierarchy (with Alessandro Andretta), *Commentationes Mathematicae Universitatis Carolinae* **42** (2001), 159–172.
- [12] Definability in function spaces (with Alessandro Andretta), *Real Analysis Exchange* **26** (2000/01), 285–308.
- [13] Fine analysis of the quasi-orderings on the power set, *Order* **18** (2001), 339–347.
- [14] WQO and BQO theory in subsystems of second order arithmetic, in: S.G. Simpson (ed.), *Reverse Mathematics 2001*, Lecture Notes in Logic 21, Association for Symbolic Logic, 2005, pp. 303–330.
- [15] Classification problems in continuum theory (with Riccardo Camerlo and Udayan B. Darji), *Transactions of the American Mathematical Society* **357** (2005), 4301–4328.
- [16] The complexity of continuous embeddability between dendrites (with Christian Rosendal), *The Journal of Symbolic Logic* **69** (2004), 663–673.
- [17] Reverse mathematics and the equivalence of definitions for well and better quasi-orders (with Peter Cholak and Reed Solomon), *The Journal of Symbolic Logic* **69** (2004), 683–712.

- [18] Complexity of curves (with Udayan B. Darji), *Fundamenta Mathematicae* **182** (2004), 79–93.
- [19] Complexity of sets and binary relations in continuum theory: a survey, in: J. Bagaria, S. Todorcevic (eds.), *Set Theory. Centre de Recerca Matemàtica Barcelona, 2003-2004*, Trends in Mathematics, Birkhäuser, 2006, pp.121–147.
- [20] Equivalenze tra teoremi: il programma di ricerca della reverse mathematics, *La Matematica nella Società e nella Cultura, Rivista dell’Unione Matematica Italiana* **2** (2009), 101–126.
- [21] Interval orders and reverse mathematics, *Notre Dame Journal of Formal Logic* **48** (2007), 425–448, arXiv:math/0609022.
- [22] Coloring linear orders with Rado’s partial order (with Riccardo Camerlo), *MLQ Mathematical Logic Quarterly* **53** (2007), 301–305.
- [23] On Fraïssé’s conjecture for linear orders of finite Hausdorff rank (with Antonio Montalbán), *Annals of Pure and Applied Logic* **160** (2009), 355–367.
- [24] How incomputable is the separable Hahn-Banach theorem? (with Guido Gherardi), *Notre Dame Journal of Formal Logic* **50** (2009), 393–425, arXiv:0808.1663.
- [25] The Veblen functions for computability theorists (with Antonio Montalbán), *The Journal of Symbolic Logic* **76** (2011), 575–602, arXiv:0910.5442.
- [26] Invariantly universal analytic quasi-orders (with Riccardo Camerlo and Luca Motto Ros), *Transactions of the American Mathematical Society* **365** (2013), 1901–1931, arXiv:1003.4932.
- [27] The maximal linear extension theorem in second order arithmetic (with Richard A. Shore), *Archive for Mathematical Logic* **50** (2011), 543–564, arXiv:1009.1528.
- [28] The Bolzano-Weierstrass Theorem is the Jump of Weak König’s Lemma (with Vasco Brattka and Guido Gherardi), *Annals of Pure and Applied Logic* **163** (2012), 623–655. Addendum (with Vasco Brattka, Andrea Cettolo, Guido Gherardi e Matthias Schröder), *Annals of Pure and Applied Logic* **168** (2017), 1605–1608, arXiv:1101.0792.
- [29] Computing maximal chains (with Antonio Montalbán and Richard A. Shore), *Archive for Mathematical Logic* **51** (2012), 651–660, arXiv:1201.4408.
- [30] Linear extensions of partial orders and Reverse Mathematics (with Emanuele Frittaion), *MLQ Mathematical Logic Quarterly* **58** (2012), 417–423, arXiv:1203.5207.
- [31] Reverse mathematics and initial intervals (with Emanuele Frittaion), *Annals of Pure and Applied Logic* **165** (2014), 858–879, arXiv:1303.2926.
- [32] Epimorphisms between linear orders (with Riccardo Camerlo and Raphaël Carroy), *Order* **32** (2015), 387–400, arXiv:1403.2158. Erratum *Order* **33** (2016), 187.
- [33] On isometry and isometric embeddability between ultrametric Polish spaces (with Riccardo Camerlo and Luca Motto Ros), *Advances in Mathematics* **329** (2018) 1231–1284, arXiv:1412.6659.
- [34] Reverse mathematics, well-quasi-orders, and Noetherian spaces (with Emanuele Frittaion, Matthew Hendtlass, Paul Shafer, and Jeroen Van der Meeren), *Archive for Mathematical Logic* **55** (2016), 431–459, arXiv:1504.07452.
- [35] The logic of the reverse mathematics zoo (with Giovanna D’Agostino), *Mathematical Structures in Computer Science* **28** (2018), 412–428, arXiv:1512.08035.
- [36] Linear orders: when embeddability and epimorphism agree (with Riccardo Camerlo and Raphaël Carroy), *Journal of Mathematical Logic* **19.01** (2019), arXiv:1701.02020.
- [37] The reverse mathematics of wqos and bqos, in: P. Schuster, M. Seisenberger, A. Weiermann (eds.), *Well quasi-orders in computation, logic, language and reasoning*, Trends in Logic, Vol. 53, Springer, 2020, pp. 189–219, arXiv:1707.08365.

- [38] Projection operators in the Weihrauch lattice (with Guido Gherardi and Arno Pauly), *Computability* **8** (2019), 281–304, arXiv:1805.12026.
- [39] Polish metric spaces with fixed distance set (with Riccardo Camerlo and Luca Motto Ros), *Annals of Pure and Applied Logic* **171** (2020), article 102832, arXiv:1809.06588.
- [40] Searching for an analogue of  $\text{ATR}_0$  in the Weihrauch lattice (with Takayuki Kihara and Arno Pauly), *The Journal of Symbolic Logic* **85** (2020), 1006–1043, arXiv:1812.01549.
- [41] To reorient is easier than to orient: an on-line algorithm for reorientation of graphs (with Marta Fiori-Carones), *Computability* **10** (2021), 215–233, arXiv:1910.01879.
- [42] The open and clopen Ramsey theorems in the Weihrauch lattice (with Manlio Valenti), *The Journal of Symbolic Logic* **86** (2021), 316–351, arXiv:2003.04245.
- [43] On the descriptive complexity of Salem sets (with Manlio Valenti), *Fundamenta Mathematicae* **257** (2022), 69–93, arXiv:2009.09888.
- [44] Uniquely orderable interval graphs (with Marta Fiori-Carones), *Discrete Mathematics* **345** (2022), article 112935, arXiv:2101.09111.
- [45] (Extra)ordinary equivalences with the ascending/descending sequence principle (with Marta Fiori-Carones, Paul Shafer and Giovanni Soldà), *The Journal of Symbolic Logic*, to appear, arXiv:2107.02531.
- [46] Effective aspects of Hausdorff and Fourier dimension (with Manlio Valenti), *Computability* **11** (2022), 299–333, arXiv:2108.06941.
- [47] The Weihrauch lattice at the level of  $\Pi_1^1\text{-CA}_0$ : the Cantor-Bendixson theorem (with Vittorio Cipriani and Manlio Valenti), submitted, arXiv:2210.15556.
- [48] Provable better quasi orders (with Anton Freund, Fedor Pakhomov and Giovanni Soldà), submitted, arXiv:2305.01066.
- [49] Convex embeddability and knot theory (with Martina Iannella, Luca Motto Ros and Vadim Weinstein), submitted, arXiv:2309.09910.
- [50] Piecewise convex embeddability on linear orders (with Martina Iannella, Luca Motto Ros and Vadim Weinstein), submitted, arXiv:2312.01198.
- [51] A jump operator on the Weihrauch degrees (with Uri Andrews, Steffen Lempp, Joseph S. Miller and Manlio Valenti), submitted, arXiv:2402.13163.

#### SELECTED TALKS

- Predicativism/impredicativism and mathematical practice: results and techniques in reverse mathematics, invited talk, *Operations, Sets and Types*, Castiglioncello (Italy), October 3–6, 1998.
- Wqo and bqo theory in subsystems of second order arithmetic, invited talk, special session on Proof Theory and Complexity, *1999-2000 ASL Annual Meeting*, Urbana-Champaign (Illinois), June 3–7, 2000.
- Logical aspects of wqo theory, plenary talk, *Logic Colloquium 2004*, Torino (Italy), July 25–31, 2004.
- Finite better quasi orders, invited talk, special AMS-ASL session on Reverse Mathematics, *2005 Joint Mathematics Meetings*, Atlanta (USA), January 5–8, 2005.
- Descriptive Set Theory and Continuum Theory: classification of sets and binary relations, invited course (3 lectures) *34th Winter School in Abstract Analysis 2006*, Lhota nad Rohanovem (Czech Rep.), January 14–21, 2006.
- The reverse mathematics of Fraïssé’s conjecture for finite Hausdorff rank, invited talk, special session on Computability Theory and Computable Mathematics, *2008 ASL Annual Meeting*, Irvine (USA), March 27–30, 2008.
- Veblen functions, Turing jumps, and reverse mathematics, plenary talk, *7th Panhellenic Logic Symposium*, Patras (Greece), July 15–19, 2009.

- The reverse mathematics of the maximal linear extension theorem for WPOs, invited talk, *Workshop on Computability Theory 2010*, Paris (France), July 23–24, 2010.
- Well partial orders and better partial orders in reverse mathematics, invited talk, *Reverse Mathematics Workshop*, Chicago (USA), September 16–18, 2011.
- Partial orders and reverse mathematics, invited seminar, *Buenos Aires Semester in CCR Computability, Complexity and Randomness*, Buenos Aires (Argentina), January 30, 2013.
- The complexity of isometric embeddability between ultrametric Polish spaces with fixed set of distances, *ESI 2013 Set Theory Programme, Descriptive Set Theory Workshop*, Vienna (Austria), September 30–October 4, 2013.
- Some Recent Advances in the Reverse Mathematics of Partial Orders, invited talk, *Workshop on Computability Theory 2015*, Bucharest (Romania), June 27–28, 2015.
- From Well-Quasi-Orders to Noetherian Spaces: the Reverse Mathematics Viewpoint, plenary talk, *Computability Theory and Foundations of Mathematics 2015*, Tokyo (Japan), September 7–11, 2015.
- Wqo and bqo theory in reverse mathematics, invited talk, workshop *Well Quasi-Orders in Computer Science*, Schloss Dagstuhl — Leibniz Center for Informatics (Germany), January 17–22, 2016.
- A peek at the higher levels of the Weihrauch hierarchy, invited talk, workshop *Computability Theory*, Schloss Dagstuhl — Leibniz Center for Informatics (Germany), February 19–24, 2017.
- Strongly surjective linear orders: when embeddability and epimorphism agree, invited talk, *Descriptive set theory conference*, Bernoulli Center, Lausanne (Switzerland), June 18–22, 2018.
- Looking for  $\text{ATR}_0$  in the Weihrauch lattice, plenary talk, *Sailing Routes in the World of Computation, CiE 2018*, Kiel (Germany), July 30–August 3, 2018.
- Reorientations of directed graphs, invited talk, *Workshop on Computability Theory 2019*, Leeds (United Kingdom), July 22–23, 2019.
- The open and clopen Ramsey theory in the Weihrauch lattice, invited talk, workshop *Reverse Mathematics and Combinatorial Principles*, Casa Matemática Oaxaca (Mexico), September 15–20, 2019.
- The Weihrauch lattice around  $\text{ATR}_0$  and  $\Pi_1^1\text{-CA}_0$ , plenary talk, *Seventeenth International Conference on Computability and Complexity in Analysis, CCA 2020*, online, September 9–11, 2020.
- Classifying theorems: the approach of Weihrauch reducibility, *World Logic Day 2022, Sobolev Institute of Mathematics (Russia) and Nazarbayev University (Kazakhstan)*, online, January 17, 2022.

Last updated: February 21, 2024