

# CURRICULUM VITAE ET STUDIORUM (Andrea Sorbi)

## 1 Address

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## 2 Educational and Professional Record

1979 *Laurea in Matematica* (cum laude; University of Siena, Italy)

1987 *Ph.D. in Mathematics* (CUNY, New York, 1987)

1984-present Researcher (1984-1991), Associate Professor (1991-2001), Full Professor (2001-present)  
(University of Siena) 1997 Visiting Associate Professor (Department of Mathematics, University of Wisconsin, Madison, USA).

1989-90 Visiting Assistant Professor, Department of Computer Science, Queens College, New York

Fall 1997 Visiting Associate Professor, Department of Mathematics, University of Wisconsin, Madison

2001-present Director of the Graduate School LOMIT (*Mathematical Logic and Theoretical Computer Science* of the University of Siena

2002-2005 Director of Undergraduate Studies in Mathematics, at the University of Siena

2007- Director of Undergraduate Studies in Mathematics, at the University of Siena

October 2007 Visiting scholar at the Faculty of Sciences of the Al Farabi Kazakhstan National University

## 3 Grants and research projects

1979-80 *Consiglio Nazionale delle Ricerche*: fellowship

1983-85 *Consiglio Nazionale delle Ricerche*: fellowship

1985-1986 *Alfred P. Sloan Foundation*: PhD fellowship

1992-1996 BC-MURST Research Project grant no. ROM/889/92/81 (Leeds-Siena) *Computability Relative to Imperfect Data Bases*

1994-1997 Coordinator of the European network *Complexity, Logic and Recursion Theory* (COLORET), EC Human Capital and Mobility, Contract n. ERBCHRXCT930415 (Siena, Amsterdam, Barcelona, Heidelberg, Leeds, Turin)

1995-1997 Coordinator of the European PECO (cooperation with Eastern European countries and countries from the former Soviet Union) action: Supplementary Agreement n. ERB-CIPDCT940615 to the COLORET contract (Siena, Praga, Kazan, Novosibirsk)

- 01/01/2000-31/12/2002 Participating in the INTAS-RFBR project *Computability and Models* (coordinated by Barry Cooper in Leeds), n. 97-2139
- 01/07/01-30/06/2004 Coordinator of the INTAS project 00499 *Computability in Hierarchies and Topological Spaces* (Siena, Siegen, Novosibirsk, Almaty)
- 01/06/2002-30/11/2002 Scientific supervisor of an Outreach-Nato Fellowship (joint research with Prof. Roland Omanadze, Tbilisi, Georgia)
- 01/08/2002-31/07/2006 Participant in the International Joint Project *New Directions in the Theory and Applications of Models of Computation*, No.60310213, coordinated by Angsheng Li (Beijing, Institute of Software)
- 01/03/2003-28/02/2005 Scientific supervisor of a Marie Curie IntraEuropean Individual Fellowship (Contract n. HPMF-CT-2002-01828)
- 01/12/2005-30/11/2007 Scientific supervisor of a Marie Curie IntraEuropean Individual Fellowship (Contract n. MEIF-CT-2005-023657)
- 02/11/2006-1/11/2008 Scientific supervisor of a Marie Curie International Individual Fellowship (Contract n. MIFI-CT-2006-021702)
- April-June 2006 INTAS Young Scientist Supervisor; Contract. No. INTAS YSF 04-83-3310
- June-October 2007 INTAS Young Scientist Supervisor; Contract. No. INTAS YSF 05-109-4919
- 2008-2010 Italian coordinator of the Executive Programme of Scientific and Technological Cooperation between the Italian Republic and Republic of South Africa *Borel Complexity in Computable Analysis* (between the University of Siena and the University of Cape Town)

## 4 Recent meetings and conferences

- Oberwolfach 28/01/1996-03/02/1996 **Rekursionstheorie**, *invited*
- Barcelona 25-29/03/1996 **3<sup>rd</sup> COLORET workshop**: conference *Recent results on the enumeration degrees of the  $\Sigma_2^0$  sets*, *invited*
- Beijing 20-24/05/1996 **The 6<sup>th</sup> Asian Logic Colloquium**: talk *Cupping and noncupping in the  $\Sigma_2^0$  enumeration degrees*
- Genova 24-26/10/1996 **XVI Incontro di Logica Matematica**: talk *Calcolabilità relativa di funzioni parziali: alcuni risultati sulla struttura locale*
- Leeds 7-13/7/1997 **Logic Colloquium 97**: talk *Branching in the enumeration degrees of the  $\Sigma_2^0$  sets*
- Kazan 14-19/7/1997 **Workshop in Recursion Theory and Complexity**: talk *Density in the  $\Delta_2^0$  e-degrees*, *invited*
- Madison (University of Wisconsin) 2/09/1997 **Southern Wisconsin Logic Colloquium**: conference *Enumeration reducibility*
- Milwaukee 24-25/10/1997 **Meeting of the American Mathematical Society, Special Session in Computability Theory**: talk *Hypersimplicity and the enumeration degrees below  $\mathbf{0}'_e$* , *invited*

- Ithaca (Cornell University) 6/11/1997: conference *The problem of embedding finite lattices into the  $\Sigma_2^0$  enumeration degrees*
- Chicago (The University of Chicago ) 21/11/1997: conference *The problem of embedding finite lattices into the  $\Sigma_2^0$  enumeration degrees*
- Siena 27-30/4/98 **XVIII Incontro di Logica Matematica**, conference *Embeddings and extensions of embeddings in the  $\Sigma_2^0$  enumeration degrees*
- Boulder (Colorado),13-17 June 1999, **AMS Summer Research Conference on Computability Theory and Applications**, *invited*
- Novosibirsk (Russia), August 1999, Mal'tsev Meeting (invited talk).
- Oberwolfach (Germany), January 2001, **Computability Theory** (invited)
- Heidelberg (Germany), June 2003, Workshop on **Computability and Logic** (invited)
- Beijing (China), May 2004, Workshop **Computability Theory and Its Applications** (invited talk)
- Novosibirsk (Russia), September 2001, **International Workshop on Computability Theory: PROGRAM COMMITTEE** member, invited talk
- Almaty (Kazakhstan), June 2002, **Computability and Models: PROGRAM COMMITTEE** member
- Münster (Germany); August 2002, **Logic Colloquium 2002**: coorganizer of the Special Session in Computability Theory
- Turin (Italy), July 2004, **Logic Colloquium 2004**: PROGRAM COMMITTEE member
- Kunming (China) May 2005, **Computation and Logic 05** (invited speaker)
- Amsterdam (Holland), June 2005, **CiE2005-New Paradigms of Computation: PROGRAM COMMITTEE** member
- Singapore, July-August 2005, **Computational Prospects on Infinity** (invited speaker)
- Bristol (UK), September 2005, **British Logic Colloquium 2005** (invited speaker)
- Beijing (China), May 15-20 2006, **TAMC 2006- Theory and Applications of Models of Computation: PROGRAM COMMITTEE** member
- Swansea (UK), June 30-July 5 2006, **CiE2006-Logical Approaches to Computational Barriers** PROGRAM COMMITTEE member
- Siena (Italy), June 18-23, **CiE2007-Computation and Logic in the Real World**, Chair of the Organizing Committee
- Athens (Greece), June 15-July 20 2008, **CiE2008-Logic and Theory of Algorithms** PROGRAM COMMITTEE member

## 5 Research

Computability theory: Enumeration Reducibility and Enumeration Degrees; Theory of Numberings. Inductive inference. Formal Languages.

## 6 Affiliations

- American Mathematical Society (AMS)
- Association for Symbolic Logic (ASL)
- Unione Matematica Italiana (UMI)
- Associazione Italiana di Logica e Applicazioni (AILA)

### PUBLICATIONS

1. *Numerazioni positive, r.e. classi e formule*, **Bollettino UMI**, (6), 1-B, (1982), pp. 403–411
2.  $\Sigma_n^0$  *equivalence relations*, **Studia Logica**, **XLI**, 4, (1982), pp. 351–358
3. *Classifying positive equivalence relations*, (with C. Bernardi), **The Journal of Symbolic Logic**, **48**, 3, (1983), pp. 529–538
4. *Universal recursion theoretic properties of r.e. preordered structures* (with F. Montagna), **The Journal of Symbolic Logic**, **50**, 2, (1985), pp. 397–406
5. *The Fine Structure of the Medvedev Lattice and the Partial Degrees* (PhD Thesis , 1987) , 226 pages
6. *Creativeness and completeness in recursion categories of partial recursive operators* (with F. Montagna), **The Journal of Symbolic Logic**, **54**, 3, (1989), pp. 1023–1041
7. *On quasi-minimal e-degrees and total e-degrees*, **Proceedings of the American Mathematical Society**, **102**, 4, (1988), pp. 1005–1008
8. *Some remarks on the algebraic structure of the Medvedev lattice*, **The Journal of Symbolic Logic**, **55**, 2, (1990), pp. 831–853
9. *On some filters and ideals of the Medvedev lattice*, **Archive for Mathematical Logic**, **30**, (1990), pp. 29–48
10. *Embedding Brouwer algebras in the Medvedev lattice*, **Notre Dame Journal of Formal Logic**, **32**, 2, (1991), pp. 266–275
11. *Some quotient lattices of the Medvedev lattice*, **Zeitschrift für Mathematische Logik und Grundlagen der Mathematik**, **37**, (1991), pp. 167–182
12. *Comparing  $\Pi_2^0$  sets of the Baire space by means of general recursive operators*, **Fundamenta Mathematicae**, **138**, (1991), pp. 1–12
13. *Reducibilities in some recursion categories of partial recursive operators* (with C. Bianchini), **Zeitschrift für Mathematische Logik und Grundlagen der Mathematik**, **38**, (1992), pp. 349–359
14. *A note on relative efficiency of axiom systems* (with F. Montagna, S. Fontani), **Mathematical Logic Quarterly**, **40**, (1994), pp. 261–272
15. *Enumeration degrees and Turing degrees*, Dipartimento di Matematica di Siena, Rapporto Matematico n. 273 (1994) (text of conference delivered at 1<sup>st</sup> COLORET WORKSHOP (Amsterdam, 22-24/6/1994))

16. *A note on closed degrees of difficulty of the Medvedev lattice* (with C. Bianchini), **Mathematical Logic Quarterly**, **42**, (1996), pp. 127-133
17. *The Medvedev lattice of degrees of difficulty*, in *Computability, Enumerability, Unsolvability - Directions in Recursion theory* (eds. S.B. Cooper, T.A. Slaman and S.S. Wainer), **Cambridge University Press, London Mathematical Society Lecture Notes Series**, (1996), pp. 289-312
18. *Noncappable enumeration degrees below  $\mathbf{0}'_e$*  (with S.B. Cooper), **The Journal of Symbolic Logic**, **61**, **4**, (1996), pp. 1347-1363
19. *Logic and probabilistic systems* (with F. Montagna, G. Simi), **Archive for Mathematical Logic**, **35**, 1996, pp. 225-261
20. *Cupping and noncupping in the enumeration degrees of  $\Sigma_2^0$  sets* (with S.B. Cooper e X. Yi), **Annals of Pure and Applied Mathematical Logic**, **82**, (1997), pp. 317-342
21. *The Enumeration degrees of the  $\Sigma_2^0$  sets*, in *Complexity, Logic and Recursion Theory* (ed. A. Sorbi), (1997), Marcel Dekker, New York, (Lecture Notes in Pure and Applied Mathematics), pp. 303-330
22. *Generalized computable numerations and non-trivial Rogers semilattices*, (with S.S.Goncharov), **Algebra and Logic**, **36**, **6**, (1997), pp. 359-369
23. *Quasi-minimal enumeration degrees and minimal Turing degrees*, (with T. A. Slaman), **Annali di matematica pura ed applicata**, **174**, (1998), pp. 97-120
24. *Sets of generators and automorphism bases for the enumeration degrees*, **Annals of Pure and Applied Logic**, **94**, **3**, (1998), pp. 263-272
25. *Branching in the enumeration degrees of the  $\Sigma_2^0$  sets*, (with A. Nies), **Israel Journal of Mathematics**, **110**,**1** (1999), pp. 29-59
26. *Relative splitting of  $\mathbf{0}'_e$  in the  $\Delta_2^0$  enumeration degrees*, (with M. Arslanov), in **Logic Colloquium '98**, (eds. S. Buss and P. Pudlak), (1999), Springer-Verlag, New York, pp. 26-39
27. *Jumps of  $\Sigma_2^0$  high  $e$ -degrees and properly  $\Sigma_2^0$   $e$ -degrees*, (with R. Shore), in **Recursion Theory and Complexity**, (eds. M. Arslanov and S. Lempp), (1999), Walter de Gruyter, Berlin, pp. 157-172
28. *The distribution of properly  $\Sigma_2^0$   $e$ -degrees*, (with R. Coles and S. Bereznyuk), **The Journal of Symbolic Logic**, **65**, (2000), pp. 19-32
29. *Structural properties and enumeration reducibility*, (with A. Nies), **The Journal of Symbolic Logic**, **65**, (2000), pp. 285-292
30. *Open problems in the enumeration degrees*, in **Computability Theory and Its Applications**, Contemporary Mathematics vol. 257, (eds. Peter A. Cholak, Steffen Lempp, Manuel Lerman, Richard A. Shore), (2000) American Mathematical Society, Providence, pp. 309-320
31. *Density results in the  $\Delta_2^0$   $e$ -degrees*, (with M. Arslanov, I. Kalimullin), **Archive for Mathematical Logic**, **40**, (2001), pp. 597-614
32. *Embeddings into the enumeration degrees*, in **Proceedings of the International Conference "Logic and Applications"**, honouring Yu. L. Ershov on his 60-th birthday; and of the **International Conference on Mathematical Logic**, honouring A. L. Malt'sev on his 90-th birthday anniversary and the 275-th anniversary of the

- Russian Academy of Sciences**, (ed. Sergey Goncharov) (2002), Novosibirsk State University, Novosibirsk, pp. 144–164
33. *Embedding finite lattices into the  $\Sigma_2^0$  enumeration degrees*, (with S. Lempp), (2002), **The Journal of Symbolic Logic**, **67**, **1**, (2002), pp. 69–90
  34. *There exists a maximal 3-c.e. enumeration degree*, (con B. S. Cooper, A. Li, Y. Yang), **Israel Journal of Mathematics**, **137** (2003), pp. 285–320
  35. *On learning to coordinate: random bits help, insightful normal forms, competency isomorphisms*, (con J. Case, S. Jain, F. Montagna, G. Simi), in **Learning Theory and Kernel Machines**, Lecture Notes in Computer Science: Springer-Verlag, 2777, (2003), pp. 699–713
  36. *Completeness and universality of arithmetical numberings*, (with S. Badaev, S. Goncharov), in **Computability and Models Perspectives East and West** (eds. S. Barry Cooper, Sergey Goncharov) (2003), Kluwer, Dordrecht, pp. 11–44
  37. *Algebraic properties of Rogers semilattices of arithmetical numberings*, (with S. Badaev, S. Goncharov, S. Podzorov), in **Computability and Models Perspectives East and West** (eds. S. Barry Cooper, Sergey Goncharov) (2003), Kluwer, Dordrecht, pp. 45–77
  38. *Isomorphism types and theories of Rogers semilattices of arithmetical numberings*, (with S. Badaev, S. Goncharov), in **Computability and Models Perspectives East and West** (eds. S. Barry Cooper, Sergey Goncharov) (2003), Kluwer, Dordrecht, pp. 79–91
  39. *Elementary properties of Rogers semilattices of arithmetical numberings*, (con S. Badaev, S. Goncharov), **Proceedings of the 7-th and 8-th Asian Logic Conferences**, (R. Downey, D. Ding, S.H. Tung, Y. H. Qiu, M. Yasugi; associated editor G. Wu) (2003), World Scientific, Singapore, pp. 1–10
  40. *Elementary Theories for Rogers Semilattices*, (with S. Badaev, S. Goncharov), **Algebra and Logic**, **44**, **3**, (2005), pp. 143–147.
  41. *Bounding and nonbounding minimal pairs in the enumeration degrees*, (with S. B. Cooper, A. Li, Y. Yang), **The Journal of Symbolic Logic**, **70** (**3**), (2005), pp. 741–766
  42. *On learning to coordinate: random bits help, insightful normal forms, competency isomorphisms*, (with J. Case, S. Jain, F. Montagna, G. Simi), **Journal of Computer and System Sciences**, **71** (**3**), (2005) pp. 308–332
  43. *Some remarks on tiling recognizable languages*, (with F. De Carli, A. Frosini, S. Rinaldi), **PU.M.A.**, **16**, (2005), pp. 69–80
  44. *On extensions of embeddings into the enumeration degrees of the  $\Sigma_2^0$  sets* (with S. Lempp, T. A. Slaman), **Journal of Mathematical Logic**, **5**, (2005), pp. 247–298
  45. *On elementary theories and isomorphism types of Rogers semilattices*, (with S. Badaev, S. Goncharov), in **Theory of models in Kazakhstan**, ed. 2006), ed. M.M. Erimbetov, pp. 277–301, Publisher: Eco Study, Almaty
  46. *Isomorphism types of Rogers semilattices for families from different levels of the arithmetical hierarchy*, (with S. Badaev, S. Goncharov), **Algebra and Logic**, **45**, (2006), pp. 361–370.
  47. *Strong enumeration reducibilities*, (with R. Omanadze), **Archive for Mathematical Logic**, **45**, **7**, (2006), pp. 869–912

48. *Properly  $\Sigma_2^0$  enumeration degrees and the high/low hierarchy*, (with M. Giorgi, Y. Yang), **The Journal of Symbolic Logic**, **71**, (2006), pp. 1125–1144
49. *Bounding nonsplitting enumeration degrees*, (with T. Kent), **The Journal of Symbolic Logic**, **72**, 4 (2007), pp. 1405–1417
50. *Undecidability of local structures of  $s$ -degrees and  $Q$ -degrees*, (with M. L. Affatato and T. Kent), to appear in the **Tbilisi Mathematical Journal**, **1**, (2008), pp. 15-32
51. *Branching in the enumeration degrees: A new perspective*, (with M. L. Affatato and T. Kent), to appear in the **Archive for Mathematical Logic**
52. *Intermediate Logics and Factors of the Medvedev Lattice*, (with S. Terwijn), to appear in the **Annals of Pure and Applied Mathematical Logic**
53. *A characterization of  $\Delta_2^0$  hyperhyperimmune sets*, (with R. Omanadze), to appear in the **The Journal of Symbolic Logic**
54. *Some remarks on completion of numberings*, (with S. Badaev and S. Goncharov), submitted for publication
55. *Lattices of two-dimensional local languages*, (with F. De Carli, A. Frosini, S. Rinaldi), Technical Report of the Department of Mathematics and Computer Science of the University of Siena, submitted for publication

#### EDITORIAL WORK

- Editor of the volume *Complexity, Logic and Recursion Theory* Marcel Dekker Inc, New York, (Lecture Notes in Pure and Applied Mathematics), 1997
- Coeditor (with B. Cooper and B. Löwe) of the volume *New Computational Paradigms: A Logical Perspective on Changing Conceptions of What is Computable*, Springer-Verlag
- Coeditor (with B. Cooper and B. Löwe) of the volume *Computation and Logic in the Real World*, Lecture Notes in Computer Science, Vol. 4497, Springer-Verlag, 2007
- Coeditor (with B. Cooper, T. Kent, and B. Löwe) of the volume *Computation and Logic in the Real World*, Technical Report n. 487, Department of Mathematics and Computer Science “Roberto Magari”, University of Siena. June 2007
- Coeditor (with R. Dillhage, T. Grubba, K. Weihrauch, N. Zhong) of **CCA 2007 – Fourth International Conference in Computability and Complexity in Analysis**, Informatik Berichte 338-6/2007, FernUniversität in Hagen
- Coeditor (with B. Cooper and B. Löwe) of special issue of **Journal of Logic and Computation** arising from the 2007 Computability in Europe conference CiE 2007: Logic and Computation in the Real World, held in Siena in June 2007
- Coeditor (with B. Cooper and E. Mayordomo) of special issue of **Journal of Computing Systems** arising from the 2007 Computability in Europe conference CiE 2007: Logic and Computation in the Real World, held in Siena in June 2007
- Coeditor (with P. Bonizzoni, B. Cooper and B. Löwe) of special issue of **Theoretical Computer Science-C** arising from the 2007 Computability in Europe conference CiE 2007: Logic and Computation in the Real World, held in Siena in June 2007

- Coeditor (with S. Buss, B. Cooper and B. Löwe) of special issue of **Annals of Pure and Applied Mathematical Logic** arising from the 2007 Computability in Europe conference CiE 2007: Logic and Computation in the Real World, held in Siena in June 2007
- *Computation and Logic in the Real World*, (with S.B. Cooper), Imperial College Press

### **BOOKS IN PREPARATION**

- *Computing with Incomplete Information: The Mathematics of Enumeration and Positive Reducibilities* (with S.B. Cooper) World Scientific Publishing S. B.