

# CURRICULUM VITAE

## Jouko Antero Väänänen

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### Personal data

- Born 3 September 1950 in Rovaniemi, Finland, citizen of Finland, Married

### Research topics

- Set theory, foundations of mathematics, logic in computer science, semantics of natural language
- Emphasis on generalized quantifiers, infinitary languages, model theory, games

### Degrees

- University of Manchester, England, Doctor of Philosophy, 15 December 1977, Mathematics, Supervisor: Peter Aczel
- University of Helsinki, Finland, Master of Science, 2 February 1973, Mathematics

### Positions

- University of Helsinki, Department of Mathematics and Statistics
  - Chairman of the department 1999-2000, 2004-2006
  - Vice-Chair, 2010-
  - Professor, Foundations of Mathematics 1998-
  - Associate professor, Foundations of Mathematics 1983-1998
  - Assistant 1978-1983
  - Teaching assistant 1971- 1973
- University of Amsterdam, Institute for Logic, Language and Computation
  - Professor, Foundations of Mathematics 2006-
- Academy of Finland
  - Senior scientist 88-89,90,91-92,92-93,96-97,00-01
  - Younger researcher 1981-1983

## Positions of trust

- Member of the Senate (Konsistori) (the highest decision making body of the university, chaired by the rector and consisting of 5 professors, 4 members of other staff, 4 students, and one outside member), 2004-2006
- Vice-dean, Faculty of Science, 2008-2009
- Member of the Board of the Faculty of Science 2001-2006, deputy member 2008-2009
- Chairman of the Department of Mathematics and Statistics 2004-2006. Vice-chairman 2010-
- Treasurer, European Mathematical Society, 2007-
- Chairman, Association for Symbolic Logic Committee for Logic in Europe, 2007-2009

## Major research grants

- Research grant since 1988
- Research grant of Academy of Finland, University of Helsinki and NSF, 1992-1994
- Research grant of Academy of Finland, University of Helsinki, 1995-1997
- Research grant of Academy of Finland, 1998-2003
- Research grant of University of Helsinki, 2000-2002
- Research grant of Academy of Finland 2005-2011
- ESF Eurocores LogiCCC grant LINT 2008-2011
- ESF Research Networking Programme INFITY 2009-2014

## Invited talks 2008-2009

- Young Set Theorist Workshop, January 2008, Bonn, Germany
- Departmental Colloquium, Utrecht, January, 2008
- Department of Mathematics, February 2008, Leeds University, UK
- Advances in Set-Theoretic Topology, Erice, Italy, June, 2008
- MATHLOGAPS Training Workshop, Manchester, July, 2008
- ESSLLI 2008, Hamburg, August, 2008
- Games 2008 Workshop, Warsaw, September, 2008
- Luminy Set Theory Workshop, Marseilles, September, 2008
- Mathematical Methods in Philosophy, Bristol, September, 2008
- ESF LogiCCC Kick-off Workshop, Prague, October, 2008.
- Helsinki University of Technology-TKK, Helsinki, November, 2008
- AMS/ASL joint mathematics meeting, Washington DC, January, 2009, Special ASL Lecture.
- LINT workshop, Amsterdam, January 2009
- From Plato to predicativity - Seminar on the Philosophy of Mathematics, Amsterdam, March 2009
- Summamutikkaklubi, Helsinki, March 2009
- DESDA symposium on mathematics and philosophy, Nijmegen, May 2009.
- Mathematical Logic in the Netherlands, Nijmegen, May 2009
- Philosophy and Foundations of Mathematics (Martin-Löf Retirement Colloquium), May 2009
- Logic Colloquium 2009, Sofia, plenary speaker.
- LORI II, Chongqing, China, October 2009

- GASICS, Aachen, October, 2009
- LINT Workshop, Stockholm, invited talk, 7.11.2009.
- Mittag-Leffler Institute, invited talk, 10.12.2009
- Dagstuhl seminar “Circuits, Logic, and Games”, tutorial on Dependence Logic, 7-12.2.2010.
- Göttingen, Lichtenberg-Kolleg, Symposium on “Logic and Set Theory: Philosophical and Mathematical Perspectives”, invited lecture, 3.2.2010.
- Kumpula-Kolloquium, Helsinki, invited popular lecture, 2.3.2010
- Amsterdam workshop in set theory, June 1- 2, 2010

## Selected recent memberships

- Member of the Executive Committee of the European Mathematical Society 2007-
- Member of the Executive Committee, Association for Symbolic Logic, 2007-2009
- Member of the Council of the Association for Symbolic Logic 1999-2001
- Member of the Committee of Logic in Europe of the Association for Symbolic Logic 2004-2009, Chair 2007-2009
- Chair of the Second European Set Theory Workshop, Bedlewo, 2009
- Chairman of the Organizing Committee for the European Summer Meeting of the Association for Symbolic Logic (Logic Colloquium) 2003
- Member of the Program Committee for the European Summer Meeting of the Association for Symbolic Logic (Logic Colloquium) 1990, 2003, 2006, plenary speaker 2001, 2009
- Chairman of the Nomination Committee of the Association for Symbolic Logic 2004
- Chairman of the Board of the Rolf Nevanlinna Research Foundation 2003-2005

## Ph.D. students

Maaret Karttunen 1984, Lauri Hella 1988, Heikki Tuuri 1990, Taneli Huuskonen 1991, Kerkko Luosto 1992, Jyrki Akkanen 1995, Juha Nurmonen 1996, Aapo Halko 1996, Risto Kaila 2001, Alex Hellsten 2003, Juha Kontinen 2004, Marta García-Matos 2005, Matti Pauna 2007, Ryan Bissell-Siders 2008, Ville Nurmi 2009, Jarmo Kontinen 2010.

## Major visits

(3 months or more)

- Department of Mathematics, University of California at Los Angeles, 1988-1989, 1 year, visiting scholar, hosted by Yiannis Moschovakis.
- Department of Mathematics, Simon Fraser University, Vancouver, 1990, 4 months, visiting professor, hosted by Alan Mekler.
- Computer and Information Sciences, University of California at Santa Cruz, 1991-1992, 6 months, research associate, hosted by Phokion Kolaitis.
- Department of Mathematics, Stanford University, 1991-1992, 6 months, visiting scholar, hosted by Solomon Feferman.
- Department of Mathematics, Simon Fraser University, Vancouver, 1992-1993, 8 months, visiting professor, hosted by Alistair Lachlan.
- Department of Mathematics, University of Freiburg, 1995, 3 months, hosted by Heinz-Dieter Ebbinghaus.
- Department of Mathematics, Florida State University, Tallahassee, 1996-1997, 5 months, visiting professor, hosted by Mika Seppälä.

- L'Equipe de Logique Mathématique, Paris VII, 1997, 3 months, hosted by Boban Velickovic.
- Mittag-Leffler Institute of the Royal Swedish Academy of Science, Stockholm, Sweden, 2000-2001, 9 months, scientific director (with Per Martin-Löf, Dag Norman and Viggo Stoltenberg-Hansen) of the Special Year of Logic.
- Mittag-Leffler Institute of the Royal Swedish Academy of Science, Stockholm, Sweden, 2009, 4 months, scientific director (with Hugh Woodin, Dag Norman and Erik Palmgren) of the Special Semester of Set Theory and Set Theoretic Model Theory.

## Short visits 2006-2010

(1 to 4 months)

- Princeton University Philosophy Department, July-August 2004, July 2006, hosted by John Burgess.
- Isaac Newton Institute for Mathematical Sciences Program on Logic and Algorithms, Cambridge, UK, April 2006

## Honors

- Elected to the Finnish Academy of Science and Letters, 2002
- Teaching Technology Award of the University of Helsinki 1999
- August Ramsay Award of the University of Helsinki 1982
- Ernst Lindelöf Award of the Finnish Mathematical Society 1973
- Pro Gradu Award of the Faculty of Science, University of Helsinki, 1973

## Editorial board member

- Notre Dame Journal of Formal Logic
- Logica Universalis

# List of publications

## Jouko Väänänen

Those marked with \* are published in unrefereed forums.

### Model theory

1. \*Äärettömät formaalikieliet ja abstraktit logiikat. In S. Miettinen, Logiikan perusteet II, pages 126-164, Oy Gaudeamus Ab, Helsinki, 1974.
2. \*Remarks on free quantifier variables, In J.Hintikka, I.Niiniluoto and E.Saarinen, editors, Essays on mathematical and philosophical logic pages 267-272, Reidel, 1978.
3. \*On the Hanf numbers of unbounded logics. In F.Jensen, B.Mayoh and K.Moller, editors, Proceedings from 5th Scandinavian Logic Symposium, pages 309-328, Aalborg University Press, 1979.
4. On the axiomatisability of the notion of an automorphism of a finite order, with Dionysis Anapolitanos. Zeitschrift für Mathematischen Logik und Grundlagen der Mathematik 26(5):433-437, 1980.
5. A quantifier for isomorphism, Zeitschrift für Mathematischen Logik und Grundlagen der Mathematik 26 (1980), pages 123-130.
6. Boolean valued models and generalized quantifiers, Annals of Mathematical Logic, 79(1980), pages 193-225.
7. The Hanf number of  $L_{\omega_1\omega_1}$ . Proceedings of American Mathematical Society 79:294-297, 1980.
8. Decidability of some logics with free quantifier variables, with Dionysis Anapolitanos. Zeitschrift für Mathematischen Logik und Grundlagen der Mathematik 27:17-22, 1981.
9. On orderings of the family of all logics, with Michal Krynicki. Archiv für Mathematischen Logik 22:141-158, 1982.
10. \*Craig's theorem and syntax of abstract logics. Bulletin of the section of logic 11(1/2):82-83, Polish Academy of Sciences, 1982.
11.  $\Delta$ -extensions and Hanf numbers. Fundamenta Mathematicae, 115:43-55, 1983.
12. Vector spaces and binary quantifiers, with Michal Krynicki and Alistair Lachlan. Notre Dame Journal of Formal Logic 25(1):72-78, 1984.
13. \*A hierarchy theorem for Lindström quantifiers, In M. Furberg et al, editors, Logic and abstraction, pages 317-323, Acta Philosophica Gotheburgensia 1, 1986.
14. Henkin and function quantifiers, with Michal Krynicki. Annals of Pure and Applied Logic 43:273-292, 1989.
15. On Scott and Karp trees of uncountable model, with Tapani Hyttinen. Journal of Symbolic Logic 55(3):897-908, 1990.
16. The Härtig-quantifier. A survey, with Heinrich Herre, Michal Krynicki and Anatoli Pinus. 33 pages, Journal of Symbolic Logic 56(4), 1991.
17. On the number of automorphisms of uncountable models, with Saharon Shelah and Heikki Tuuri, Journal of Symbolic Logic 58(1993), 1402-1418.
18. Stationary sets and infinitary logic, with Saharon Shelah, Journal of Symbolic Logic. 65:1311-1320, 2000.
19. Barwise: Abstract model theory and generalized quantifiers, Bulletin of Symbolic Logic, vol. 10:1, 2004, 37-53.
20. A note on extensions of infinitary logic, with Saharon Shelah, Archive for Mathematical Logic. 44:1, 63-69, 2005.

21. Abstract Model Theory as a Framework for Universal Logic, with Marta Garcia-Matos, *Logica Universalis* (J.-Y. Beziau, ed.), Birkhäuser, 2005, 19-33.
22. Recursive logic frames, with Saharon Shelah, *Archive for Mathematical Logic*. 52, No. 2 (2006).
23. On Applications of regular filters and square principles in model theory, in *Model Theory*, with J. Kennedy, In: *Set Theory: Recent Trends and Applications* (A. Andretta ed.), *Quaderni di Matematica*, vol 17, 2007, 111-136.
24. The Craig Interpolation Theorem in abstract model theory, *Synthese* (2008) 164:401-42.
25. \*In Memoriam: Per Lindström, with D. Westerståhl. *Theoria-a Swedish Journal of Philosophy*, 2010. 76(2): p. 100-107.

### **Set theory, higher order logic**

26. \*Applications of set theory to generalized quantifiers. Ph.D. thesis, University of Manchester, 1977.
27. \*Remarks on generalized quantifiers and second-order logics. In *Set theory and hierarchy theory*, *Prace Naukowe Instytutu Matematyki Politechniki Wrocławskiej*, Wrocław, vol. 14 (1977), pages 117-123.
28. Two axioms of set theory with applications to logic. *Ann. Acad. Sci. Fenn. Ser. A I. Math. Diss.* 20:1-19, 1978.
29. \*Abstract logic and set theory, I: Definability. In M.Boffa, D.van Dalen and K.McAloon, editors, *Logic Colloquium '78*, pages 391-421, North-Holland, 1979.
30. Abstract logic and set theory, II: Large cardinals, *Journal of Symbolic Logic* 47 (1982), pages 335-345.
31. \*Generalized quantifiers in models of set theory. In G. Metakides, editor, *Patras Logic Symposium*, pages 359-371, North-Holland, 1982.
32. Set theoretic definability of logics. In J.Barwise and S.Feferman, editors, *Model Theoretic Logics*, pages 599-643, Springer, 1985.
33. Reflection principles for the continuum, with J. Stavi, *Logic and Algebra*, ed. Yi Zhang, pp. 59-84, *Contemporary Mathematics*, Vol 302, AMS, 2002.
34. On Ordinals accessible by Infinitary Languages, with Saharon Shelah and Pauli Väisänen, *Fundamenta Mathematicae* 186, 193-214, 2005.
35. Regular Ultrafilters and Finite Square Principles, with J. Kennedy and S. Shelah, *Journal of Symbolic Logic*, 73(2), 2008, 817-823.

### **Games**

36. Partially ordered connectives, with Gabriel Sandu. *Zeitschrift für Mathematische Logik und Grundlagen der Mathematik*, 38:361-372, 1992.
37. Game-theoretic inductive definability, with Juha Oikkonen, *Annals of Pure and Applied Logic* 65(1993), 265-306.
38. The Ehrenfeucht-Fraïssé game of length  $\omega_1$ , with Alan Mekler and Saharon Shelah, *Transactions of the American Mathematical Society* 339(1993), 567-580.
39. \*Games and trees in infinitary logic: A Survey. In M. Krynicki, M. Mostowski and L. Szczerba, editors, *Quantifiers*, Kluwer Academic Publishers, 1995, 105-138.
40. Reflection of long game formulas, with Heikki Heikkilä, *Mathematical Logic Quarterly* 40:381-392, 1994.
41. Trees and Ehrenfeucht-Fraïssé games, with Stevo Todorčević, *Annals of Pure and Applied Logic*, 100, 69-97, 1999.
42. On the semantics of informational independence, *Logic Journal of the Interest Group in Pure and Applied Logics* 10:3, 337-350, 2002.
43. More on the Ehrenfeucht-Fraïssé game of length  $\omega_1$ , with T. Hyttinen and S. Shelah, *Fund. Math.* 175 (2002), no. 1, 79-96.

44. Games played on partial isomorphisms, with B. Velickovic, *Archive for Mathematical Logic*, 43:1, 19-30, 2004.
45. Finite information logic, with R. Parikh, *Annals of Pure and Applied Logic*, 134, 83-93, 2005.
46. A remark on non-determinacy in IF logic, *Acta Philosophica Fennica*, 78 (2006) 71-77.
47. On Infinite Ehrenfeucht-Fraïssé Games, in: *Infinite Games, Foundations of the Formal Sciences V*, Stefan Bold, Benedikt Löwe, Thoralf Räscher, Johan van Benthem (eds.), College Publications at King's College (Studies in Logic), to appear.
48. Team logic, in: *Interactive Logic*, Johan van Benthem, Benedikt Löwe, Dov Gabbay (eds.), *Texts in Logic and Games*, vol 1. Amsterdam University Press, 2007, 281-302.
49. Modal dependence logic, in: *New Perspectives on Games and Interaction*, Krzysztof Apt, Robert van Rooij (eds.) *Texts in Logic and Games*, vol 5 Amsterdam University Press, 2008, 237-254.
50. Dependence of Variables Construed as an Atomic Formula, with W. Hodges. Accepted to *Annals of Pure and Applied Logic*, 2010. 161(6): p. 817-828.
51. On definability in dependence logic, with J. Kontinen. *Journal of Logic, Languages and Information* 18(3) (2009), 317 - 332.
52. From IF to BI, with S. Abramsky. *Synthese*. Volume 167, Number 2. March, 2009.
53. A note on negation in dependence logic, with J. Kontinen. *Notre Dame J. Formal Logic*, (to appear).

### **Finite model theory, computer science, semantics of natural language**

54. Generalized quantifiers and pebble games on finite structures, with Phokion Kolaitis in: *Proceedings of the 7th IEEE Symposium on Logic in Computer Science*, 1992.
55. Generalized quantifiers and pebble games on finite structures, with Phokion Kolaitis, *Annals of Pure and Applied Logic* 74(1995), 23-75,
56. Combinatorics and Quantifiers, with Jaroslav Nesetril, *Commentat. Math. Univ. Carol.* 37(3), 1996.
57. The Hierarchy Theorem for generalized quantifiers, with Lauri Hella and Kerkko Luosto, *Journal of Symbolic Logic* 61(1996), 802-817.
58. \*Finite Model Theory. In: C. Gefwert, P. Orponen and J. Seppänen, editors, *Logic, Mathematics and the Computer*, Publications of the Finnish Artificial Intelligence Society Number 14 (1996), 89-91.
59. Unary quantifiers on finite models, *Journal of Logic, Language and Information*. 6:275-304, 1997.
60. \*Generalized quantifiers. *Bulletin of the European Association for Theoretical Computer Science*. June 1997.
61. Definability of polyadic lifts of generalized quantifiers, with Lauri Hella and Dag Westerståhl, *Journal of Logic, Language and Information*. 6:305-335, 1997.
62. Quantifiers and congruence closure, with Jörg Flum and Matthias Schielen, *Studia Logica*, 62:3,315-340, 1999.
63. \*Semantics of mathematics on the web, with Mika Seppälä. *Semantic Web Kick-Off in Finland*, pages 265-273, Helsinki Institute for Information Technology Publications 2002-01.
64. On the expressive power of monotone natural language quantifiers over finite models, with Dag Westerståhl, *Journal of Philosophical Logic*, vol. 31 (2002), no. 4, 327-358.
65. Pseudo-finite model theory, *Matemática Contemporânea*, vol. 24, 2003, 169-183.

66. Lindström theorems for fragments of first order logic, with Balder ten Cate and Johan van Benthem, Proceedings of LICS 2007, pp 280-292. Journal version: Logical Methods in Computer Science 5(3) (2009) 1 - 27.

## Topology

67. Some remarks on pseudocompact spaces. Ann. Acad. Sci. Fenn. Ser. A I Math 559 (1973) 11 p.
68. A Cantor-Bendixson theorem for the space  $\omega_1 \omega_1$ . Fundamenta Mathematicae, 37:187-199, 1991.
69. Trees and  $\Pi_1$ -subsets of  $\omega_1 \omega_1$ , with Alan Mekler, Journal of Symbolic Logic 58(1993), 1052-1070.
70. A family of trees with no uncountable branches, with M. Dzamonja, Topology Proceedings, 28(1), 113-132, 2004.

## Philosophy

71. Second order logic and foundations of mathematics, Bulletin of Symbolic Logic 7 (2001), no. 4, 504-520.
72. Entry on Jaakko Hintikka in Borchert, Donald, ed. Encyclopedia of Philosophy, 2nd edition. Detroit: Macmillan Reference USA, 2006, 172-174.

## Popular articles

73. \*Uusi epätäydellisyys aritmetiikassa. Archimedes 31:30-37, 1979.
74. \*Äärettömyyden käsite Georg Cantorilla. In J. Oikkonen, editor, Katsauksia Matematiikan Historiaan, pages 88-101, Oy Gaudeamus Ab, Helsinki, 1982.
75. \*Herakles ja Hirviö, Archimedes 35:39-45, 1983.
76. \*Matemaattiset oliot. In L. Haaparanta, editor, Olio, Reports of the Department of Philosophy 3:142-146, University of Helsinki, 1984.
77. Wittgenstein och matematikens filosofi, Nordisk Matematisk Tidskrift 35(3):98-100, 1987.
78. \*Kummallisia olioita, with H. Salminen, Tiede 2000, 2/1993, s. 44-45.
79. \*Matkalla kohti ääretöntä, with H. Salminen, Tiede 2000, 3/1993, s. 58-59.
80. \*Umpikuja - tie uuteen, with H. Salminen, Tiede 2000, 4/1993, s. 48-49.
81. \*Kuka ratkaisee matematiikan mysteerin, with H. Salminen, Tiede 2000, 5/1993, s. 60-61.
82. \*Kunnon ongelmassa herkkua monelle, with H. Salminen, Tiede 2000, 6/1993, s. 48-49.
83. \*Kuka laskisi kolmion kulmien summan, with H. Salminen, Tiede 2000, 8/1993, s. 56-57.
84. \*Fermat'n suuri lause todistettu, with H. Salminen, Helsingin Sanomat, 3.7.1993.
85. \*Logiikka on ajattelun matematiikkaa, with H. Salminen, Tiede 2000, 1/1994, s. 56-59.
86. \*Laattoja pitkin äärettömään, with H. Salminen, Tiede 2000, 8/1994, s. 54-57.
87. \*Tietotokone kompastuu matematiikan rajoihin, with H. Salminen, Tiede 2000, 2/1995, s. 38-40.
88. \*Kultainen leikkaus - harmonian avain, with H. Salminen, Tiede 2000, 4/1995, s. 66-68.
89. \*Matematiikka, kiehtova tiede, with H. Salminen, Mitä Missä Milloin 95, 1994, s. 363-367.
90. \*Logiikka - kielen matematiikka, with H. Salminen, Mitä Missä Milloin 96, 1995.
91. \*Roomalaisten numeroiden nousu ja tuho, Mitä Missä Milloin 2000, 1999, 330-334.
92. \*Onko matemaattinen totuus suhteellista vai absoluuttista. In J. Rydman, editor, Suhteellista? Pages 266-283, Yliopistopaino, Helsinki, 2005.



93. \*How complicated can structures be? *Nieuw Archief voor Wiskunde*. June 2008, 117-121.
94. \*Mathematics for Everyday Life, Special issue of *ERCIM News*, with Introduction, edited with Ulrich Trottenberg. 73 (2008 *ERCIM News*).
95. \*How I became a logician, in *Miten meistä tuli filosofian tohtoreita*. (to appear), Suomen Filosofinen Yhdistys.

## **Books**

96. *Matemaattinen logiikka*, Oy Gaudeamus Ab, Helsinki, 1987, second edition 1988, 144p.
97. *Johdatus logiikkaan*, with H. Salminen, Oy Gaudeamus Ab, Helsinki 1992, 159 pages.
98. *Logic Colloquium '90* (editor, with J. Oikkonen), *Lecture Notes in Logic*, vol. 2, Springer-Verlag, 1993.
99. *Matematiikan Taito 12: Numeeriset Menetelmät*, with H. Salminen, Weilin+Göös, 1996, 94 pages, second edition 1997.
100. Generalized Quantifiers and Computation, Jouko Väänänen, editor, *Lecture Notes in Computer Science*, vol. 1754, Springer, 1999.
101. *Logic Colloquium '03* (editor, with V. Stoltenberg-Hansen), *Lecture Notes in Logic*, vol. 24, Association for Symbolic Logic, 2006.
102. *Dependence Logic*, Cambridge University Press, London Mathematical Society Student Texts 70, 225 pages, 2007.
103. *Logic Colloquium 2006* (editor, with S. Barry Cooper, Herman Geuvers, and Anand Pillay). *Proceedings of the Annual European Summer Meeting of the Association for Symbolic Logic. Lecture Notes in Logic*. Cambridge University Press, 2009.

## **Edited journal issues**

104. *Annals of Pure and Applied Logic* Volume 156, Issue 1, (2008). *Logic Colloquium 2006*. Edited by S.B. Cooper, H. Geuvers, A. Pillay and J. Väänänen.

## **Abstracts**

105. \*Higher order logic and set theory. *Notices Amer. Math. Soc.* 25.1(1978), A-15.