

# Curriculum vitae      Martin Raussen

## Personal data

Name                    Martin Raussen  
Position                Associate Professor, Ph.D, Aalborg University  
Day of Birth            25 May, 1954  
Place of Birth         Trier, Germany  
Citizenship            German  
Marital Status        Married to Anne Lorentzen  
Children                Three grown-up daughters  
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## Education

1981    Ph.D (Dr. rer. nat.) in mathematics from Georg-August Universität Göttingen, Germany  
1975    Master degree (Diplom) in mathematics (minor Computer Science) from Universität des Saarlandes, Saarbrücken, Germany  
1971    High school certificate (Zeugnis der Reife) from Max-Planck Gymnasium Trier, Germany

## Language skills

Professional level    German, Danish, English, French  
Elementary level     Spanish and a little Russian.

## Employment

1998 –                Associate Professor, Department of Mathematical Sciences, Aalborg University  
1984 – 1998        Associate Professor, Department of Electronic Systems, Aalborg University  
1983 – 1984        Postdoc, Department of Mathematical Sciences, Aarhus University  
1983                Assistant Professor, Department of Mathematics, Technical University of Denmark  
1977 – 1984        Research Assistant, Department of Mathematics, Georg-August Universität Göttingen, Germany

## Visiting Positions

2008	Commissariat à l'énergie atomique, LIST, Saclay, France
2002	Ecole Polytechnique, Massy-Palaiseau, France
2000	Brown University, Providence, RI, USA
1994 and 2006	Institut Mittag-Leffler, Djursholm, Sweden
1991	Georg-August Universität Göttingen, Germany
1982	Universidad Autonoma de Mexico
1979 – 80	Graduate Student, Université Paris XI, Orsay, France

## Research

With a point of departure within pure Algebraic and Differential Topology, I have in recent years contributed to new and emerging applications of Algebraic Topology in Computer Science. One of the models for concurrency in theoretical Computer Science, the so-called Higher Dimensional Automata (HDA) are of a combinatorial/topological nature. From a basic research point of view, the new phenomenon to take consider is a restricted directed path space. The investigations carried out in this direction, started by Lisbeth Fajstrup (Aalborg), Eric Goubault (Paris) and myself have led to a research area called “Directed Algebraic Topology”. In a recent paper, I have shown how to model the space of directed paths (executions) in such a model as a simplicial complex. My partners in France and in Poland have built up/modified software packages that allow to compute essential invariants for these path or trace spaces.

## Publications

See attachment.

## Important reseach collaborators

Lisbeth Fajstrup	Aalborg University, Denmark
Èric Goubault	CEA, Saclay and Ècole Polytechnique, France
Emmanuel Haucourt	CEA, Saclay, France
Maurice Herlihy	Brown University, Providence, RI, USA
Marian Mrozek	Jagellonian University, Krakow, Poland

### Participation in Research Projects

- 2012 – 14 Topology in Interaction, application to FNU project pending; collaboration between researchers from AAU, AU and KU; principal investigator MR
- 2011 – 15 ESF Research Network Applied and Computational Algebraic Topology; MR elected to chairman of the steering committee at its meeting in Zurich in July 2011
- 2011 COMETS (collaboration project with LIST/CEA, France); supported by French Minister of Foreign Affairs; MR principal investigator on the Danish side
- 2008 – 11 Symmetry and Moduli Problems in Topology, FNU
- 2005 – 07 Topology and Quantization of Moduli Spaces, FNU
- 2002 – 04 Moduli Spaces in Topology and Geometry, SNF/FNU

### Organization of Conferences and Workshops

Since 1999, I have been one of the main organizers of a series of nine workshops and conferences (between one and five days) under the title GETCO (Geometric and Topological Methodes in Computer Science); the last one took place in Aalborg 2010.

I was a member of the organizing committee of the conference Algebraic Topological Methods in Computer Science 2008.

### Recent invited talks

- 2012 Schloss Dagstuhl, Germany; Banach Center, Bedlewo, Poland
- 2011 Cergy-Pontoise, France; ETH Zürich, Switzerland; Fields Inst. Toronto, Canada
- 2010 Aalborg, Denmark; Münster, Germany
- 2009 Trondheim, Norway
- 2008 MFO Oberwolfach, Germany; Paris, France; Baia Mara (Romania); UA Madrid, Spain; Bremen, Germany
- 2007 Neuchâtel, Switzerland; DMV-GDM Berlin, Germany; AMS-PTM Warszawa, Poland, Göttingen, Germany
- 2006 Schloss Dagstuhl, Germany; MSRI Berkeley, CA, USA

### Teaching Experience

Since my appointment as associate professor at Aalborg University in 1984, I have taught a lot of different courses and also worked as supervisor for many students on a wide variety of mathematical topics, from 1st year students to Ph.D-students. This includes teaching students of mathematics, mathematical economics, computer science, different branches of engineering science, land surveyors, and several courses for Ph.D students at the Aalborg University Doctoral School of Engineering and Science.

Aalborg University has specialized in project based learning: I have suggested and developed a whole range of topics within several mathematical areas that student groups have worked on under my supervision or that of colleagues.

I have acted as an external examiner for more than 20 years at Aarhus University, University of Copenhagen, the Technical University and at Roskilde University.

### **Ph.D-students and assistant professors.**

The following Ph.D.-students were supervised by me:

2002 – 2005 Rafael Wisniewski now at Dept. Electronic Systems, Aalborg University

2002 – 2005 Ulrich Fahrenberg now at INRIA Rennes, France

2004 – 2007 John-Josef Leth now at Dept. Electronic Systems, Aalborg University

Moreover, I have been supervisor for many assistant professors at Aalborg University during their mandatory educational activity (adjunktpdagogikum).

### **Teaching material**

From 1999 to 2001, I participated in a joint effort (VIDIGEO - visual interactive differential geometry) with the aim to produce interactive material for the teaching of elementary differential geometry; partially supported by a grant from Dansk Naturvidenskabsformidling. The result is a set of notes Elementary Differential Geometry: Curves and Surfaces and in particular an interactive Java based geometric laboratory which is still used by several colleagues in Denmark and abroad.

### **Internationalization**

During recent years, I have worked as ERASMUS coordinator at the Department of Mathematical Sciences, Aalborg University. This involves elaboration of written and net based material presenting mathematical education at Aalborg, contact to and evaluation of prerequisites of international students in their home countries, and contact to international students during their stay at the department.

### **Administrative and leadership experience**

#### **outside academia**

2004 – Board of amateur choir MOFI, Aalborg, Deputy Chairman.

2000 – 2004 Chairman, private school Klostermarkskolen, Aalborg

1998 – 2004 Member of the board of Klostermarkskolen, Aalborg

**within academia**

- 2011 – Vice president of the European Mathematical Society (EMS)
- 2009 – Member of the Executive Committee of the EMS
- 2008 – Associate Editor of the Newsletter of the European Mathematical Society
- 2005 – Member of the board of the Department of Mathematical Sciences,  
Aalborg University
- 2003 – 2008 Chief Editor of the Newsletter of the European Mathematical Society
- 2002 – 2003 Chief Editor Matilde, Newsletter of the Danish Mathematical Society
- 1999 – 2003 Editor of Matilde
- 1993 – 1996 Vice Head of the Department of Mathematics and Computer Science  
(as a section of the Institute of Electronic Systems), Aalborg University
- 1992 – 1996 Member of the governing board of the Department of Mathematics and  
Computer Science
- 1992 and 1999 Editor of research evaluation report for the research group in mathematics  
and statistics at Aalborg University
- 1987 – 1990 Member of FLUNA (advisory board for the minister of education regarding  
higher education in science)
- 1985 – 1988& 1999 – 2005 Member of the study board for Mathematics, Physics and Computer Science,  
Aalborg University

**Public Outreach**

Since the beginning 1990s, I have given public lectures (at Folkeuniversitet and for High School students) on several aspects of mathematical modeling and reasoning, e.g., on “Symmetry in nature, arts and mathematics”.

At the department of mathematical sciences at Aalborg University, I have taken initiative to establish a regular seminar “Mathematical Pearls” with lectures on topics with a certain general and esthetical interest to all staff and to well-educated students. I have given such a talk myself – and done so also at Trondheim and at Cergy-Pontoise.

For many years, I have done editorial work for journals/newsletters for mathematicians on a general outreach level, in particular for Matilde, the newsletter of the Danish Mathematical Society and for the Newsletter of the European Mathematical Society EMS; for both journals as editor-in-chief during extended periods.

The Abel prize was established in 2002 by the Norwegian government as an international mathematical prize on the same level as the Nobel prizes. From the very beginning in 2003, I have, in collaboration with my colleague Christian Skau (NTNU Trondheim, Norway) prepared and run interviews with the laureates; nine so far. These interviews were broadcast by Norwegian TV<sup>1</sup> and later on edited and published in several journals, among them the Newsletter of the EMS and the Notices of the American Mathematical Society AMS.

In connection with my membership of the Executive Committee of the European Mathematical Society, I am a member of the society’s Meetings Committee and the contact person to

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<sup>1</sup>online at the Abel Prize homepage

the committee “Raising Public Awareness of Mathematics”. Moreover, as vice-president I have taken over the post of webmaster for the society.

## List of publications – Martin Raussen

### Mathematical Papers

### References

- [1] M. Raussen, *Execution Spaces for simple higher dimensional Automata*, Research report R-2010-14, Department of Mathematical Sciences, Aalborg University; accepted for publication in *Appl. Algebra Engrg. Comm. Comput.*
- [2] \_\_\_\_\_, *Simplicial models for trace spaces*, *Algebr. Geom. Topol.* **10** (2010), no.3, 1683–1714.
- [3] \_\_\_\_\_, *Trace spaces in a pre-cubical complex*, *Topology Appl.* **156** (2009), no. 9, 1718–1728.
- [4] \_\_\_\_\_, *Reparametrizations with given stop data*, *J. Homotopy Relat. Struct.* **4** (2009), no. 1, 1–5.
- [5] \_\_\_\_\_, *Invariants of directed spaces*, *Appl. Categ. Struct.* **15** (2007), no. 4, 355–386.
- [6] U. Fahrenberg and M. Raussen, *Reparametrizations of continuous paths*, *J. Homotopy Relat. Struct.* **2** (2007), no. 2, 93–117.
- [7] R. Wisniewski and M. Raussen, *Geometric analysis of nondeterminacy in dynamical systems*, *Acta Inf.* **43** (2007), no. 7, 501–519.
- [8] L. Fajstrup, M. Raussen, and E. Goubault, *Algebraic topology and concurrency*, *Theor. Comput. Sci.* **357** (2006), no. 1-3, 241–278.
- [9] M. Raussen, *Deadlocks and dihomotopy in mutual exclusion models*, *Theor. Comput. Sci.* **365** (2006), no. 3, 247–257.
- [10] L. Fajstrup, M. Raussen, E. Goubault, and E. Haucourt, *Components of the fundamental category*, *Appl. Categ. Struct.* **12** (2004), no. 1, 81–108.
- [11] M. Raussen, *A second look at normal curvature*, *Normat* **51** (2003), no. 2, 59–62.
- [12] \_\_\_\_\_, *State spaces and dipaths up to dihomotopy*, *Homology Homotopy Appl.* **5** (2003), no. 2, 257–280.

- [13] ———, *Symmetries on manifolds, deformations and rational homotopy: A survey*, Bak, Anthony (ed.) et al., Current trends in transformation groups. Dedicated to the memory of Professor Katsuo Kawakubo. Dordrecht: Kluwer Academic Publishers. K-Monogr. Math. 7, 167-179 (2002), 2002.
- [14] E. Goubault and M. Raussen, *Dihomotopy as a tool in state space analysis*, Rajsbaum, Sergio (ed.), LATIN 2002: Theoretical informatics. 5th Latin American symposium, Cancun, Mexico, April 3–6, 2002. Proceedings. Berlin: Springer. Lect. Notes Comput. Sci. 2286, 16-37 (2002), 2002.
- [15] M. Raussen, *On the classification of dipaths in geometric models for concurrency*, Math. Struct. Comput. Sci. **10** (2000), no. 4, 427–457.
- [16] ———, *Cyclic group actions on manifolds from deformations of rational homotopy types*, Math. Ann. **312** (1998), no. 4, 737–760.
- [17] L. Fajstrup, E. Goubault, and M. Raussen, *Detecting deadlocks in concurrent systems*, CONCUR'98: concurrency theory (Nice), Lecture Notes in Comput. Sci., vol. 1466, Springer, Berlin, 1998, pp. 332–347. MR MR1683333
- [18] E. Laitinen and M. Raussen, *Homotopy types of locally linear representation forms*, Manuscr. Math. **88** (1995), no. 1, 33–52.
- [19] M. Raussen, *Circle actions on rational homology manifolds and deformations of rational homotopy types*, Trans. Am. Math. Soc. **347** (1995), no. 1, 137–153.
- [20] ———, *Rational cohomology and homotopy of spaces with circle action*, Algebraic topology, Proc. Conf., S. Feliu de Guíxols/Spain 1990, Lect. Notes Math. 1509, 313-325 (1992).
- [21] I. Madsen and M. Raussen, *Locally linear representation forms*, Osaka J. Math. **27** (1990), no. 3, 567–591.
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- [23] P. Löffler and M. Raussen, *Symmetrien von Mannigfaltigkeiten und rationale Homotopie-theorie*, Math. Ann. **271** (1985), 549–576.
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- [25] M. Raussen, *Non-orthogonalizable vector fields on spheres*, Proc. Edinb. Math. Soc., II. Ser. **27** (1984), 275–281.
- [26] M. Raussen and R. Wiegmann, *Liftings, homotopy liftings and localization applied to vector field and immersion theory*, Osnabrücker Schriften zur Mathematik. Reihe M: Mathematische Manuskripte [Osnabrück Publications in Mathematics. Series M: Mathematical Manuscripts], vol. 6, Universität Osnabrück Fachbereich Mathematik, Osnabrück, 1984.

- [27] M. Raussen, *Some invariants for vector field problems*, Topology, Proc. spec. Semin., Vol. 4, México 1982, 163-185 (1982).
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- [32] M. Raussen, *Hurewicz isomorphism and Whitehead theorems in pro-categories*, Arch. Math. **30** (1978), 153–164.

## Preprints

## References

- [1] M. Raussen, *Simplicial models for trace spaces II: General Higher Dimensional Automata*, Research report R-2011-11, Department of Mathematical Sciences, Aalborg University; submitted.
- [2] L. Fajstrup, E. Goubault, E. Haucourt, A. Lang, S. Mimram, M. Raussen, *Trace Spaces: an Efficient New Technique for State-Space Reduction*, submitted.

## Interviews and articles in journals of mathematical societies

## References

- [1] M. Raussen and Chr. Skau, *Interview with Abel laureate John Milnor*, Eur. Math. Soc. Newsl. (2011), no. 81, 31–40.
- [2] ———, *Interview with Abel laureate John Tate*, Eur. Math. Soc. Newsl. (2010), no. 77, 41–48. Reprinted in Notices Am. Math. Soc. **58** (2011), no. 3, 444 – 452.
- [3] ———, *Interview with Abel laureate Mikhail Gromov*, Eur. Math. Soc. Newsl. (2009), no. 73, 19–30. Reprinted in Notices Am. Math. Soc. **57** (2010), no. 3, 391 – 403.



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- [4] Martin Raussen, *Interview with Jacques Dixmier*, Eur. Math. Soc. Newsl. (2009), no. 72, 34–41.
- [5] \_\_\_\_\_, *Invitation to topological robotics [book review]*, Eur. Math. Soc. Newsl. (2009), no. 72, 46–47.
- [6] M. Raussen and Chr. Skau, *Interview with the winners of the Abel Prize 2008: John G. Thompson and Jacques Tits*, Eur. Math. Soc. Newsl. **69** (2008), 31–38. Reprinted in Notices Am. Math. Soc. **56** (2009), no. 4, 471 – 478.
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- [9] U. Persson and M. Raussen, *Two mathematicians forced to resign at Uppsala University, Sweden*, Eur. Math. Soc. Newsl. **64** (2007), 15.
- [10] M. Raussen and Chr. Skau, *Interview with Abel Prize recipient Lennart Carleson*, Eur. Math. Soc. Newsl. **61** (2006), 31–36. Reprinted in Notices Am. Math. Soc. **54** (2007), no. 2, 223–229 and Mitt. Dtsch. Math.-Ver. **14** (2006), no.4, 206–212.
- [11] \_\_\_\_\_ *Interview with Peter D. Lax*, Eur. Math. Soc. Newsl. **57** (2005), 24–31. Reprinted in Notices Am. Math. Soc. **53** (2006), no. 2, 223–229.
- [12] \_\_\_\_\_, *Interview with Michael Atiyah and Isadore Singer*, Eur. Math. Soc. Newsl. **53** (2004), 24–30. Reprinted in Notices Am. Math. Soc. **52** (2005), no. 2, 225–233 and Mitt. Dtsch. Math. Ver. **12** (2004), no. 4, 272–281.
- [13] \_\_\_\_\_, *Interview with Jean-Pierre Serre*, Eur. Math. Soc. Newsl. **49** (2003), 18–20. Reprinted in Notices Am. Math. Soc. **51** (2004), no. 2, 210–214 and Nieuw Arch. Wisk (5) **5** (2004) no. 1, 38–41.

Moreover interviews with Danish mathematicians Ebbe Thue Poulsen, Bent Fuglede, Tobias Colding and Ib Madsen in the journal Matilde of the Danish Mathematical Society.