

# Curriculum Vitae

Oliver Kullmann

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## Contents

<b>1</b>	<b>Personal information</b>	<b>II</b>
1.1	Current affiliation . . . . .	II
1.2	Personal data . . . . .	II
1.3	Education . . . . .	II
<b>2</b>	<b>Career related information</b>	<b>III</b>
2.1	Academic employment . . . . .	III
2.2	Teaching record . . . . .	IV
<b>3</b>	<b>Publications</b>	<b>IV</b>
3.1	List of publications in journals and books . . . . .	IV
3.2	List of publications in conference proceedings . . . . .	VI
3.3	List of publications in electronical series . . . . .	VIII
3.4	List of publications in workshop proceedings (not published elsewhere) . . . . .	VIII
3.5	Published abstracts . . . . .	X
3.6	Manuscripts, reports . . . . .	X
3.7	Theses . . . . .	XIV
<b>4</b>	<b>Talks given at conferences and other institutions</b>	<b>XIV</b>
4.1	Talks at conferences . . . . .	XIV
4.2	Invited talks . . . . .	XV
4.3	Talks at workshops and colloquia . . . . .	XVII
4.4	Talks at other institutions . . . . .	XX
4.5	Workshop participations . . . . .	XXI

<b>5</b>	<b>Software Projects</b>	<b>XXII</b>
5.1	Before the OKlibrary . . . . .	XXII
5.1.1	OKsolver . . . . .	XXII
5.1.2	OKgenerator . . . . .	XXII
5.2	The OKlibrary . . . . .	XXII
<b>6</b>	<b>Professional activities</b>	<b>XXIII</b>
6.1	Conference and Workshop Chairs . . . . .	XXIII
6.2	Editor . . . . .	XXIV
<b>7</b>	<b>Grants</b>	<b>XXIV</b>

## 1 Personal information

### 1.1 Current affiliation

Swansea University  
 Computer Science Department  
 Singleton Park, Faraday Building  
 Swansea SA2 8PP  
 United Kingdom  
 e-mail: O.Kullmann@Swansea.ac.uk  
 WWW: <http://cs.swan.ac.uk/~csoliver>  
 Papers: <http://www.cs.swan.ac.uk/~csoliver/papers.html>

### 1.2 Personal data

Born 1965 in Essen (Germany). Nationality German.

### 1.3 Education

**22.6.1984** Abitur (Graduation) from Gymnasiale Oberstufe (High School) in Schwalbach am Taunus

**1984-92** Study of mathematics and computer science at the University of Frankfurt  
 (“Johann Wolfgang Goethe-Universität”; including seminars in philosophy, political sciences, economics, sociology, psychology, linguistics, history of arts, philology (especially theory of film), dramatics and musicology)

**23.10.1992** Diploma examination in Mathematics (and Computer Science) at the University of Frankfurt. Adviser of the “Diplomarbeit” (diploma thesis) Prof. Dr. H. Luckhardt

**11.8.1997** Ph.D. in Mathematics at the University of Frankfurt (Thesis advisor: Prof. Dr. H. Luckhardt)

## **2 Career related information**

### **2.1 Academic employment**

**1987-93** “Wissenschaftliche Hilfskraft” (student instructor) at the Department of Mathematics, University of Frankfurt

**1.7.1993-30.6.1998** “Wissenschaftlicher Mitarbeiter” (assistant) at the Department of Mathematics, University of Frankfurt, in the group of Prof. C.P. Schnorr

**July 1997 - October 1997** Visiting researcher at the CWI in Amsterdam in the group of Prof. Jan Friso Groote

**September - November 1998** Visiting researcher at the Technical University of Delft in the Operations Research group

**1.2.1999-30.6.2001** Postdoctoral Fellow at the University of Toronto, Department of Computer Science, in the group of Stephen A. Cook (supported by the Natural Science and Engineering Research Council of Canada (NSERC) and by the Communication and Information Technology Ontario (CITO))

**Starting March 2001** Lecturer at the University of Wales Swansea, Computer Science Department

**August 2001** Visiting researcher at the Institute of Discrete Mathematics in Vienna (invited by Prof. Herbert Fleischner)

**July 2003** Visiting researcher at the Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy, participating in the Thematic Institute of the Complex Systems Network of Excellence (EXYSTENCE): “Algorithms and challenges in hard combinatorial problems and in optimization under ‘uncertainty’”

**January 2007** Visiting researcher at the Computer Science Department of the University of Kentucky.

**April/May 2008** Visiting researcher at the Sun Yat-Sen University, Guangzhou, China.

**October 2008** Promoted to Senior Lecturer (Swansea University).

**April/May 2011** Visiting researcher at the Sun Yat-Sen University, Guangzhou, China.

**January/February 2012** Visiting researcher at Sapienza University, Rome, Italy.

**March/April 2013** Visiting researcher at the Sun Yat-Sen University, Guangzhou, China.

**June 2014** Visiting researcher at the Sun Yat-Sen University, Guangzhou, China.

**April 2015** Visiting researcher at the Sun Yat-Sen University, Guangzhou, China.

## 2.2 Teaching record

In Swansea, I designed and implemented modules on programming, constraint satisfaction, algorithms and complexity, and design patterns and generic programming. Numerous BSc/MEng/MSc/MRes final year projects have been successfully completed.

## 3 Publications

The [www-items](#) are clickable, and lead to the relevant part of my research web-page.

### 3.1 List of publications in journals and books

1. *Worst-case Analysis, 3-SAT Decision and Lower Bounds: Approaches for Improved SAT Algorithms*. Satisfiability Problem: Theory and Applications, DIMACS Series in Discrete Mathematics and Theoretical Computer Science, volume 35 (1997), pp. 261-313. Editors: Dingzhu Du, Jun Gu and Panos M. Pardalos. [21] [www](#)

2. *New methods for 3-SAT decision and worst-case analysis*. Theoretical Computer Science, volume 223 (no. 1-2), pages 1 - 72, 1999. [22] [www](#)
3. *On a generalization of extended resolution*. Discrete Applied Mathematics, volume 96-97 (no. 1-3), pages 149 - 176, 1999. [23] [www](#)
4. *Investigations on autark assignments*. Discrete Applied Mathematics, volume 107, pages 99 - 137, 2000.
5. *Polynomial-Time Recognition of Minimal Unsatisfiable Formulas with Fixed Clause-Variable Difference*. Joint work with Herbert Fleischner and Stefan Szeider, Theoretical Computer Science, volume 289 (no. 1), 2002, pages 503-516.
6. *Lean clause-sets: Generalizations of minimally unsatisfiable clause-sets*. Discrete Applied Mathematics, volume 130, pages 209-249, 2003.
7. *Upper and lower bounds on the complexity of generalized resolution and constraint satisfaction problems*. Annals of Mathematics and Artificial Intelligence, volume 40, number 3-4, pages 303-352, 2004.
8. *The SAT 2005 solver competition on random instances*, Journal on Satisfiability, Boolean Modeling and Computation, volume 2, pages 61-102, 2006.
9. *Present and future of practical SAT solving*, Lecture Notes in Computer Science (LNCS) 5250, 2008, pages 283-319; in *Complexity of Constraints: An Overview of Current Research Themes*, editors Nadia Creignou, Phokion Kolaitis and Heribert Vollmer.
10. *Fundamentals of Branching Heuristics*, chapter 7 of *Handbook of Satisfiability*, IOS Press 2009; pages 205-244, editors Armin Biere, Marijn Heule, Hans van Maaren and Toby Walsh. [28] [www](#)
11. *Minimal Unsatisfiability and Autarkies*, joint work with Hans Kleine Büning, chapter 11 of *Handbook of Satisfiability*, IOS Press 2009; pages 339-401, editors Armin Biere, Marijn Heule, Hans van Maaren and Toby Walsh. [20] [www](#)
12. *The OKlibrary: Introducing a “Holistic” Research Platform for (Generalised) SAT Solving*, Studies in Logic, volume 2(1), pages 20-53, 2009. [27] [www](#)

13. *Constraint satisfaction problems in clausal form I: Autarkies and deficiency*, Fundamenta Informaticae, 2011, volume 109, number 1, pages 27-81. [31] [www](#)
14. *Constraint satisfaction problems in clausal form II: Minimal unsatisfiability and conflict structure*, Fundamenta Informaticae, 2011, volume 109, number 1, pages 83-119. [32] [www](#)
15. *On Davis-Putnam reductions for minimally unsatisfiable clause-sets*, joint work with Xishun Zhao, Theoretical Computer Science, 2013, volume 492, pages 70-87. [38] [www](#)
16. *Generalising unit-refutation completeness and SLUR via nested input resolution*, joint work with Matthew Gwynne, Journal of Automated Reasoning, 2014, volume 52, pages 31-65. [17] [www](#)
17. *On the van der Waerden numbers  $w(2; 3, t)$* , joint work with Tanbir Ahmed and Hunter Snevily, Discrete Applied Mathematics, 2014, volume 174, pages 27-51. [1] [www](#)

### 3.2 List of publications in conference proceedings

1. *An application of matroid theory to the SAT problem*. Fifteenth Annual IEEE Conference of Computational Complexity, July 4 - 7, 2000, pages 116 - 124.
2. *The Combinatorics of Conflicts between Clauses*. In Theory and Applications of Satisfiability Testing 2003, Lecture Notes in Computer Science (Springer), volume 2919, pages 426-440. [26] [www](#)
3. *Polynomial Time SAT Decision, Hypergraph Transversals and the Hermitian Rank*; joint work with Nicola Galesi. In Theory and Applications of Satisfiability Testing 2004, Lecture Notes in Computer Science (Springer), volume 3542, pages 89-104. [8] [www](#)  
This is a somewhat shortened version of [7].
4. *Categorisation of clauses in conjunctive normal forms: Minimally unsatisfiable sub-clause-sets and the lean kernel*, joint work with Inês Lynce and João Marques-Silva. In Theory and Applications of Satisfiability Testing 2006 — SAT 2006, Lecture Notes in Computer Science (Springer), volume 4121, pages 22 - 35.

5. *Polynomial Time SAT Decision for Complementation-Invariant Clause-Sets, and Sign-non-Singular Matrices*. In Theory and Applications of Satisfiability Testing 2007 — SAT 2007, Lecture Notes in Computer Science (Springer), volume 4501, pages 314 - 327.
6. *Green-Tao numbers and SAT*. In Theory and Applications of Satisfiability Testing - SAT 2010, Lecture Notes in Computer Science (Springer), volume 6175, pages 352 - 362.
7. *The Seventh QBF Solvers Evaluation (QBF EVAL'10)*, joint work with Claudia Peschiera, Luca Pulina, Armando Tacchella, Uwe Bubeck and Inês Lynce. In Theory and Applications of Satisfiability Testing - SAT 2010, Lecture Notes in Computer Science (Springer), volume 6175, pages 237 - 250.
8. *On variables with few occurrences in conjunctive normal forms*, joint work with Xishun Zhao. In Theory and Applications of Satisfiability Testing - SAT 2011, Lecture Notes in Computer Science (Springer), volume 6695, pages 33 - 46.
9. *Cube and Conquer: Guiding CDCL SAT Solvers by Lookaheads*, joint work with Marijn J.H. Heule, Siert Wieringa and Armin Biere. In Hardware and Software: Verification and Testing - 7th International Haifa Verification Conference, HVC 2011, Lecture Notes in Computer Science (Springer), volume 7261, pages 50 - 65. Won the *Best Paper Award*. [19] [www](#)
10. *On Davis-Putnam reductions for minimally unsatisfiable clause-sets*, joint work with Xishun Zhao. In Theory and Applications of Satisfiability Testing - SAT 2012, Lecture Notes in Computer Science (Springer), volume 7317, pages 270 - 283. [36] [www](#)
11. *Generalising and unifying SLUR and unit-refutation completeness*, joint work with Matthew Gwynne. In SOFSEM 2013: Theory and Practice of Computer Science, Lecture Notes in Computer Science (Springer), volume 7741, pages 220 - 232. Won the *Best Paper Award*. [11] [www](#)
12. *On SAT representations of XOR constraints*, joint work with Matthew Gwynne. In LATA 2014: 8th International Conference on Language and Automata Theory and Applications, Lectures Notes in Computer Science (Springer), volume 8370, pages 409-420. [18] [www](#)

13. *Unified characterisations of resolution hardness measures*, joint work with Olaf Beyersdorff. In SAT 2014: 17th International Conference on Theory and Applications of Satisfiability Testing, Lectures Notes in Computer Science, volume 8561, pages 170-187. [4] www
14. *Computing maximal autarkies with few and simple oracle queries*, joint work with João Marques-Silva. In SAT 2015: 18th International Conference on Theory and Applications of Satisfiability Testing, Lectures Notes in Computer Science, volume 9340, pages 138-155. [33] www

### 3.3 List of publications in electronical series

1. *Investigating a general hierarchy of polynomially decidable classes of CNF's based on short tree-like resolution proofs*. Electronical Colloquium on Computational Complexity (ECCC) TR99-041, 86 pages, October 1999.
2. *An application of matroid theory to the SAT problem*. Electronical Colloquium on Computational Complexity (ECCC) TR00-018, 20 pages, March 2000.
3. *On the use of autarkies for satisfiability decision*. LICS 2001 Workshop on Theory and Applications of Satisfiability Testing (SAT 2001). Electronic Notes in Discrete Mathematics (ENDM), volume 9, June 2001, 22 pages.
4. *Constraint satisfaction problems in clausal form: Autarkies and minimal unsatisfiability*. Electronical Colloquium on Computational Complexity (ECCC) TR 07-055, 69 pages, June 2007.

### 3.4 List of publications in workshop proceedings (not published elsewhere)

1. *A note on a generalization of Extended Resolution*. Workshop on the Satisfiability Problem, Siena 1996, Report No. 96-230, Universität zu Köln, pages 73-95. Editors: John Franco, Giorgio Gallo, Hans Kleine Büning, Ewald Speckenmeyer and Cosimo Spera.
2. *Heuristics for SAT algorithms: A systematic study*, 8 pages. Extended abstract for the Second workshop on the satisfiability problem, May 10 - 14, 1998, Eringerfeld, Germany. Editors: John Franco, Hans Kleine Büning and Ewald Speckenmeyer.



3. *An improved version of width restricted resolution*, 11 pages. Electronic Proceedings of Sixth International Symposium on Artificial Intelligence and Mathematics, January 2001. [24] [www](#)
4. *Towards an adaptive density based branching rule for SAT solvers, using a database for mixed random conjunctive normal forms built upon the Advanced Encryption Standard (AES)*. Fifth International Symposium on Theory and Applications of Satisfiability Testing, Cincinnati, May 2002, pages 190-200.
5. *Conflict matrices and multi-hitting clause-sets*. Proceedings of Guangzhou Symposium on Satisfiability and its Applications, Guangzhou, September 2004, pages 43-49.
6. *How to generalise conjunctive normal forms*. Conference report on 4th International Workshop on Proof, Computation, Complexity (PCC'05), Lisboa, July 2005, pages 14-17.
7. *Sign-sensitive Graph Representations of CNFs: Conflict graphs and Resolution graphs*. Conference report on 5th International Workshop on Proof, Computation, Complexity (PCC'06), Ilmenau, July 2006, pages 30-32.
8. *Constraint satisfaction problems in clausal form: Autarkies, minimal unsatisfiability, and applications to hypergraph inequalities*. Dagstuhl Seminar Proceedings no. 06401, ISSN 1862-4405, Complexity of Constraints 2006, editors Nadia Creignou, Phokion Kolaitis and Heribert Vollmer.
9. *Towards a better understanding of SAT translations*, joint work with Matthew Gwynne. Workshop Logic and Computational Complexity (LCC'11), as part of LICS 2011; 10 pages. [10] [www](#)
10. *Towards a better understanding of hardness*, joint work with Matthew Gwynne. The Seventeenth International Conference on Principles and Practice of Constraint Programming (CP 2011): Doctoral Program Proceedings, September 2011, pages 37-42. [9] [www](#)
11. *SAT Interactions (Dagstuhl Seminar 12471)*, joint work with Nadia Creignou, Nicola Galesi and Heribert Vollmer, March 2013. [6] [www](#)

### 3.5 Published abstracts

1. *Methods for 3-SAT-decision in less than  $2^{0.59n}$  steps.* The Bulletin of Symbolic Logic 1(1), pp. 96-97 (1995).
2. *Algorithms and upper bounds for SAT-decision.* The Bulletin of Symbolic Logic 3(1), pp. 141 (1997).
3. *Some remarks on extended resolution.* The Bulletin of Symbolic Logic 3(2), pp. 267 (1997).
4. *Some new tools for SAT decision.* The Bulletin of Symbolic Logic 4(1), pp. 93-94 (1998).
5. *Restricted versions of extended resolution.* The Bulletin of Symbolic Logic 5(1), pp. 119 (1999).
6. *On polynomial time decidable hierarchies of SAT instances.* The Bulletin of Symbolic Logic 6(1), pp. 117-118 (2000).
7. *On minimally unsatisfiable conjunctive normal forms.* The Bulletin of Symbolic Logic, 7(1), pp. 128 (2001).
8. *On the use of autarkies for satisfiability decision.* Proceedings of the International School-Seminar on Discrete Mathematics and Mathematical Cybernetics, Dubna, May 31 – June 3, 2001; 3 pages.
9. *Resolution as the logic of applying partial assignments.* The Bulletin of Symbolic Logic, 8(1), pp. 145-146 (2002).
10. *The combinatorics of negation patterns.* The Bulletin of Symbolic Logic, 11(2), pp. 282 (2005).
11. *Generalised clause-sets and hypergraph colouring.* The Bulletin of Symbolic Logic, 12(2), pp. 338 (2006).
12. *Finding the error in propositional translations.* The Bulletin of Symbolic Logic, 13(2), pp. 277 (2007).

### 3.6 Manuscripts, reports

1. *Deciding propositional tautologies: Algorithms and their complexity.* Joint work with H. Luckhardt, 82 pages, 1997. Technical report.

2. *Heuristics for SAT algorithms: Searching for some foundations*. Manuscript, 25 pages, October 1998.
3. *Algorithms for SAT/TAUT decision based on various measures*, 71 pages, January 1999; joint work with H. Luckhardt, Technical report.
4. *SAT decision by adding colour to matching theory*. Preprint, 10 pages, August 2000.
5. *First report on an adaptive density based branching rule for DLL-like SAT solvers, using a database for mixed random conjunctive normal forms created using the Advanced Encryption Standard (AES)*, University of Wales Swansea, Computer Science Report Series, 2002, CSR 19-2002, 23 pages. Extended version of the contribution to SAT 2002.
6. *Investigating the behaviour of a SAT solver on random formulas*, University of Wales Swansea, Computer Science Report Series, 2002, CSR 23-2002, 119 pages.
7. *On the conflict matrix of clause-sets*, University of Wales Swansea, Computer Science Report Series, 2003, CSR 7-2003, 43 pages.
8. *Conjunctive normal forms with non-boolean variables, autarkies and hypergraph colouring*, University of Wales Swansea, Computer Science Report Series, 2005, CSR 5-2005, 38 pages.
9. *The SAT 2005 solver competition on random instances*, University of Wales Swansea, Computer Science Report Series, 2005, CSR 17-2005, 35 pages.
10. *Decomposing clause-sets: Integrating DLL algorithms, tree decompositions and hypergraph cuts for variable- and clause-based graph representations of CNF's*, joint work with Marijn Heule, University of Wales Swansea, Computer Science Report Series, 2006, CSR 2-2006, 35 pages.
11. *Categorisation of clauses in conjunctive normal forms: Minimally unsatisfiable sub-clause-sets and the lean kernel*, joint work with Inês Lynce and João Marques-Silva, University of Wales Swansea, Computer Science Report Series, 2006, CSR 3-2006, 17 pages.
12. *Constraint satisfaction problems in clausal form: Autarkies, minimal unsatisfiability, and applications to hypergraph inequalities*, University

of Wales Swansea, Computer Science Report Series, 2006, CSR 13-2006, 69 pages.

13. *Polynomial time SAT decision for linearly lean complementation-invariant clause-sets of minimal relative deficiency*, Swansea University, Computer Science Report Series, 2007, CSR 1-2007, 14 pages.
14. *Constraint satisfaction problems in clausal form: Autarkies and minimal unsatisfiability*, Swansea University, Computer Science Report Series, 2007, CSR 8-2007, 69 pages.
15. *Constraint satisfaction problems in clausal form: Autarkies, deficiency and minimal unsatisfiability*, Swansea University, Computer Science Report Series, 2007, CSR 12-2007, 76 pages.
16. *The OKlibrary: A generative research platform for (generalised) SAT solving*, Swansea University, Computer Science Report Series, 2008, CSR 1-2008, 16 pages.
17. *Fundamentals of Branching Heuristics: Theory and Examples*, Swansea University, Computer Science Report Series, 2008, CSR 7-2008, 54 pages.
18. *Present and future of practical SAT solving*, Swansea University, Computer Science Report Series, 2008, CSR 8-2008, 37 pages.
19. *The OKlibrary: Introducing a "holistic" research platform for (generalised) SAT solving*, Swansea University, Computer Science Report Series, 2009, CSR 1-2009, 29 pages.
20. *Exact Ramsey Theory: Green-Tao numbers and SAT*, arXiv, April 2010, arXiv:1004.0653v2 [cs.DM], 25 pages. [29] www
21. *On variables with few occurrences in conjunctive normal forms*, joint work with Xishun Zhao, arXiv, October 2010, arXiv:1010.5756v3 [cs.DM], 14 pages. [35] www
22. *Constraint satisfaction problems in clausal form*, arXiv, March 2011, arXiv:1103.3693v1 [cs.DM], 91 pages. [30] www
23. *On Davis-Putnam reductions for minimally unsatisfiable clause-sets*, joint work with Xishun Zhao, arXiv, December 2012, arXiv:1202.2600v5 [cs.DM], 31 pages. [37] www

24. *Generalising unit-refutation completeness and SLUR via nested input resolution*, joint work with Matthew Gwynne, arXiv, January 2013, arXiv:1204.6529v5 [cs.LO], 41 pages. [12] [www](#)
25. *Towards a theory of good SAT representations*, joint work with Matthew Gwynne, arXiv, May 2013, arXiv:1302.4421v4 [cs.AI], 59 pages. [14] [www](#)
26. *On the van der Waerden numbers  $w(2; 3, t)$* , joint work with Tanbir Ahmed and Hunter Snevily, arXiv, August 2013, arXiv:1102.5433v3 [math.CO], 42 pages. [2] [www](#)
27. *On SAT representations of XOR constraints*, joint work with Matthew Gwynne, arXiv, October 2013, arXiv:1309.3060v3 [cs.CC], 38 pages. [13] [www](#)
28. *Trading inference effort versus size in CNF Knowledge Compilation*, joint work with Matthew Gwynne, arXiv, November 2013, arXiv:1310.5746v2 [cs.CC], 43 pages. [15] [www](#)
29. *Hardness measures and resolution lower bounds*, joint work with Olaf Beyersdorff, arXiv, October 2013, arXiv:1310.7627v2 [cs.CC], 43 pages. [3] [www](#)
30. *A framework for good SAT translations, with applications to CNF representations of XOR constraints*, joint work with Matthew Gwynne, arXiv, August 2014, arXiv:1406.7398v2 [cs.CC], 67 pages. [16] [www](#)
31. *Bounds for variables with few occurrences in conjunctive normal forms*, joint work with Xishun Zhao, arXiv, August 2014, arXiv:1408.0629v2 [math.CO], 90 pages. [39] [www](#)
32. *Computing maximal autarkies with few and simple oracle queries*, joint work with João Marques-Silva, arXiv, August 2015, arXiv:1505.02371v2 [cs.LO], 18 pages. [34] [www](#)
33. *Parameters for minimal unsatisfiability: Smarandache primitive numbers and full clauses*, joint work with Xishun Zhao, arXiv, July 2015, arXiv:1505.02318v2 [cs.DM], 19 pages. [40] [www](#)

### 3.7 Theses

1. *Upper and lower bounds for the complexity of propositional resolution proofs and classes of SAT algorithms* (German). Diploma thesis. Frankfurt 1992, 112 pages.
2. *The SAT-problem: A systematic approach towards efficient algorithms for the propositional satisfiability problem, building up on new instruments for worst-case analysis* (German). Dissertation, Frankfurt 1997, xlv + 80 pages.

## 4 Talks given at conferences and other institutions

### 4.1 Talks at conferences

1. Sixth International Symposium on Artificial Intelligence and Mathematics, Fort Lauderdale, Florida, January 5 - 7, 2000.
2. Computational Complexity, 15th IEEE Annual Conference, July 4 - 7, 2000, Florence, Italy.
3. ODSA 2000 (Optimal Discrete Structures and Algorithms), September 11 - 13, 2000, Rostock, Germany.
4. Sixth International Conference on Theory and Applications of Satisfiability Testing, May 5 - 8, 2003, S. Margherita Ligure - Portofino, Italy.
5. Seventh International Conference on Theory and Applications of Satisfiability Testing, May 10 - 13, 2004, Vancouver, Canada.
6. Invited talk at the ACCU Conference, Wednesday 19 April to Saturday 22 April, 2006, Oxford.
7. Ninth International Conference on Theory and Applications of Satisfiability Testing (SAT 2006), Seattle (USA), August 12 - 15, 2006.
8. Tenth International Conference on Theory and Applications of Satisfiability Testing (SAT 2007), Lisbon (Portugal), May 28 - 31, 2007.
9. Special talk on the `OKlibrary` at the Eleventh International Conference on Theory and Applications of Satisfiability Testing (SAT 2008), Guangzhou (China), May 12 - 15, 2008.

10. Thirteenth International Conference on Theory and Applications of Satisfiability Testing (SAT 2010), Edinburgh (United Kingdom), July 11 - 14, 2010. [www](#)
11. Fourteenth International Conference on Theory and Applications of Satisfiability Testing (SAT 2011), Ann Arbor (USA), June 19 - 22, 2011. [www](#)
12. Seventh Haifa Verification Conference 2011 (HVC 2011), Haifa (Israel), December 6-8, 2011 (joint work with Marijn J.H. Heule, Siert Wieringa and Armin Biere, presented by Marijn Heule). [www](#)
13. Fifteenth International Conference on Theory and Applications of Satisfiability Testing (SAT 2012), Trento (Italy), June 17 - 20, 2012. [www](#)
14. 39th International Conference on Current Trends in Theory and Practice of Computer Science (SOFSEM 2013), Špindlerův Mlýn (Czech Republic), January 26-31, 2013 (joint work with Matthew Gwynne, presented by Matthew Gwynne). [www](#)
15. 8th International Conference on Language and Automata Theory and Applications (LATA 2014), Madrid (Spain), March 10-14, 2014 (joint work with Matthew Gwynne). [www](#)
16. 17th International Conference on Theory and Applications of Satisfiability Testing (SAT 2014), Vienna (Austria), July 14-17, 2014 (joint work with Olaf Beyersdorff). [www](#)
17. 18th International Conference on Theory and Applications of Satisfiability Testing (SAT 2015), Austin (USA), September 24-27, 2015 (joint work with João Marques-Silva). [www](#)

## 4.2 Invited talks

1. Invited talk at the DIMACS Workshop “Satisfiability Problem: Theory and Applications”, NSF DIMACS National Research Center, Rutgers University, March 11-13, 1996.
2. Invited talk at the ASL Annual meeting at the University of Illinois at Urbana-Champaign, June 3-7, 2000.
3. Invited speaker at the International School-Seminar on Discrete Mathematics and Mathematical Cybernetics, Dubna, May 31 – June 3, 2001.

4. Guangzhou Symposium on Satisfiability and its Applications, Guangzhou, China, September 25 - 28, 2004 (invited speaker).
5. Guangzhou Symposium on Satisfiability in Logic-Based Modeling, Guangzhou, China, September 24 - 27, 2006 (invited speaker).
6. Invited talk at Dagstuhl-Seminar Complexity of Constraints, October 1 - 6, 2006.
7. Invited speaker for the “Workshop on Satisfiability - Assessing the Progress”, March 3 - 5, 2008, Baltimore (National Security Agency’s 8th Annual High Confidence Software and Systems (HCSS) conference). Member of the final panel (consisting of Karem Sakallah (University of Michigan), Douglas R. Smith (Kestrel Institute), Mark Saaltink (Communications Security Establishment Canada (CSEC)), and me).
8. Guangzhou Symposium on Satisfiability in Logic-Based Modeling, Zhuhai, China, September 25 - 29, 2010 (invited speaker).
9. Invited speaker at Fourth Workshop on Formal and Automated Theorem Proving and Applications 2011, Belgrade, February 4 - 5, 2011.
10. Invited participant (with a talk) at workshop Proof complexity at the Banff International Research Station (BIRS), Canada, October 2 - 7, 2011. [www](#)
11. Invited speaker at workshop Logical Approaches to Barriers in Complexity II, Isaac Newton Institute for Mathematical Sciences, 26 - 30 March 2012, Cambridge. [www](#)
12. Invited tutorial at Second International Workshop on the Cross-Fertilization Between CSP and SAT, June 16, 2012, Trento, Italy (in conjunction with SAT 2012). [www](#)
13. Invited participant (with a talk) at workshop Theoretical Foundations of Applied SAT Solving at the Banff International Research Station (BIRS), Canada, January 19 - 24, 2014. [www](#)
14. Invited speaker at Center for Exploring the Limits of Computation (CELC), Tokyo, Japan, November 6 - 10, 2014. [www](#)
15. Scheduled: Invited participant (with a talk) at workshop Fields Institute August 2016.



### 4.3 Talks at workshops and colloquia

1. Students-Conference Mathematics' 92, Berlin, September, 1992 (awarded with a special price of the "Bundesminister für Bildung und Wissenschaft").
2. Logic Colloquium' 93 of the Association of Symbolic Logic, Keele, England, July 20 - 29, 1993.
3. Logic Colloquium' 95 of the Association of Symbolic Logic, Haifa, Israel, August 9 - 17, 1995.
4. Workshop on Complexity Theory, Data Structure and Efficient Algorithms, Köln, Germany, February 27, 1996.
5. Workshop on the Satisfiability Problem, Siena, Italy, April 29 - May 3, 1996.
6. Logic Colloquium' 96 of the Association of Symbolic Logic, Donostia-San Sebastián, Spain, July 9 - 15, 1996.
7. Logic Colloquium' 97 of the Association of Symbolic Logic, Leeds, England, July 6 - 13, 1997.
8. SAT' 98, Second Workshop On The Satisfiability Problem, Eringerfeld, Germany, May 10 - 14, 1998.
9. Logic Colloquium' 98 of the Association of Symbolic Logic, Prague, Czech Republic, August 9 - 16, 1998.
10. Workshop on Complexity Theory, Data Structure and Efficient Algorithms, München, Germany, October 27, 1998.
11. Logic Colloquium' 99 of the Association of Symbolic Logic, Utrecht, The Netherlands, August 1 - 6, 1999.
12. DIMACS Workshop on Faster Exact Solutions for NP-Hard Problems, Princeton, New Jersey, February 23 - 24, 2000.
13. Third Workshop on the Satisfiability Problem, Renesse, The Netherlands, May 14 - 18, 2000.
14. Logic Colloquium 2000, Paris, July 23 - 31, 2000.
15. LICS 2001 Workshop on Theory and Applications of Satisfiability Testing (SAT 2001), June 14-15, 2001, Boston University, Massachusetts.

16. Logic Colloquium 2001, Vienna, August 6 - 11, 2001.
17. Logic, Model Theory and Computation, Clyne Castle, Swansea, September 20-21, 2001.
18. Proof Theory in Computer Science, Schloß Dagstuhl, Dagstuhl-Seminar, October 7 - 12, 2001.
19. Fifth International Symposium on Theory and Applications of Satisfiability Testing, May 6-9, 2002, Cincinnati, Ohio.
20. The Propositional Satisfiability Problem – Algorithms and Lower Bounds, Schloß Dagstuhl, Dagstuhl-Seminar, March 30 - April 4, 2003.
21. Logic Colloquium 2004, Turin, Italy, July 2004.
22. 21st British Colloquium for Theoretical Computer Science, Nottingham, United Kingdom, March 22-24, 2005.
23. Algorithms and Complexity in Durham (ACID) 2005, Durham, United Kingdom, July 8 - 10, 2005.
24. 4th International Workshop on Proof, Computation, Complexity, Lisbon, July 16 - 17, 2005.
25. Logic Colloquium 2005, Athens, Greece, July 28 - August 3, 2005.
26. British Logic Colloquium 2005, Bristol, September 1 - 3, 2005.
27. 22nd British Colloquium for Theoretical Computer Science, Swansea, United Kingdom, April 4 - 7, 2006.
28. PCC - Proof, Computation, Complexity, July 24th - 25th, 2006, Ilmenau, Germany.
29. Logic Colloquium 2006, Thursday, July 27 - Wednesday, August 2, 2006, Nijmegen, the Netherlands.
30. 23rd British Colloquium for Theoretical Computer Science, Oxford, United Kingdom, April 2 - 5, 2007.
31. 59th British Mathematical Colloquium, Swansea, United Kingdom, April 16 - 19, 2007.
32. Algorithms and Complexity in Durham (ACID) 2007, Durham, United Kingdom, September 17 - 19, 2007.

33. Moderately Exponential Time Algorithms, Dagstuhl, October 19-24, 2008.
34. 25th British Colloquium for Theoretical Computer Science, Warwick, United Kingdom, April 6 - 9, 2009.
35. RaTLoCC 2009, Ramsey Theory in Logic, Combinatorics and Complexity, Bertinoro, Italy, October 25-30, 2009.
36. Third Workshop on Formal and Automated Theorem Proving and Applications 2010, Belgrade, January 29 - 30, 2010.
37. 26th British Colloquium for Theoretical Computer Science, Edinburgh, United Kingdom, April 6 - 9, 2010.
38. Exact Complexity of NP-Hard Problems, Dagstuhl, October 31 - November 5, 2010.
39. A Set Theory Postgraduate Workshop for Readers of Being and Event, The London Consortium, London, June 7, 2011.
40. SPA 2011, SAT for Practical Applications, Ann Arbor, June 23, 2011.
41. LCC 2011, Logic and Computational Complexity, Toronto, June 25, 2011.
42. CP 2011, 17th International Conference on Principles and Practice of Constraint Programming, Doctoral Program, Perugia, September 12, 2011 (joint work with Matthew Gwynne, presented by Matthew Gwynne).
43. Fifth Workshop on Formal and Automated Theorem Proving and Applications 2012, Belgrade, February 3 - 4, 2012. [www](#)
44. Limits of Theorem Proving, 25 - 27 September 2012, Rome (organisers Olaf Beyersdorff, Lorenzo Carlucci, Nicola Galesi, Toniann Pitassi). [www](#)
45. SAT Interactions, November 18-23, 2012, Dagstuhl (organised by Nadia Creignou, Nicola Galesi, Oliver Kullmann, Heribert Vollmer). [www](#)
46. 29th British Colloquium for Theoretical Computer Science (BCTCS), Edinburgh, United Kingdom, March 24 - 27, 2013 (joint work with Matthew Gwynne, presented by Matthew Gwynne). [www](#)

47. Horn formulas, directed hypergraphs, lattices and closure systems: related formalisms and applications, May 11 - 16, 2014, Dagstuhl. [www](#)
48. Symposium on New Frontiers in Knowledge Compilation, Vienna, June 4 - 6, 2015. [www](#)
49. Non-Combinatorial Combinatorics, Warwick, September 14 - 16, 2015. [www](#)
50. Scheduled: Dagstuhl September 2016.

#### 4.4 Talks at other institutions

1. Chemnitz (Germany), 3.7.1995, invited by Prof. Andreas Goerdts.
2. Köln (Germany), February 1996, invited by Prof. Ewald Speckemeyer.
3. Delft (Netherlands), 12.11.1996, invited by Prof. Hans van Maaren.
4. Aarhus (Denmark), 25.2.1998, BRICS, Department for Computer Science.
5. Toronto (Canada), March 5, 1999, and June 16, 2000, Theory group at the Department of Computer Science.
6. The Fields Institute (Toronto, Canada), April 18 - 19, 2000 (Seminar Series w.r.t the Special Year on Graph Theory and Combinatorial Optimization).
7. Cincinnati (USA), December 2000, invited by Prof. John Franco.
8. Paderborn (Germany), September 2002, invited by Prof. Hans Kleine Büning.
9. Trieste (ICTP, Italy), July 2003, invited by Prof. Riccardo Zecchina.
10. Lisbon (Portugal), September 2003, invited by Prof. João Marques Silva (at INESC).
11. Barcelona (Spain), January 2004, invited by Prof. Nicola Galesi.
12. Durham (United Kingdom), November 2004, Computer Science, Theory Seminar.

13. Lisbon (Portugal), May 2006, invited by Prof. Inês Lynce (at INESC).
14. Lisbon (Portugal), May 2006, invited by Prof. Fernando Ferreira (at CMAF).
15. Coimbra (Portugal), May 2006, invited by Prof. Isabel Oitavem and Prof. Reinhard Kahle.
16. Berlin (Germany), July 2006, Humboldt-Universität, invited by Prof. Stephan Kreutzer.
17. Computer Science Department, University of Kentucky, January 2007.
18. University of Bath, Computer Science Department, February 2007.
19. Coimbra (Portugal), May 2007, invited by Prof. Isabel Oitavem and Prof. Reinhard Kahle.
20. Southampton (United Kingdom), June 2008, Computer Science Colloquium, invited by Prof. Joao Marques-Silva.
21. Cardiff (United Kingdom), November 2010, Reading Seminar Philosophy, invited by Prof. Chistopher Norris.
22. Guangzhou (China), April 2011, Institute of Logic & Cognition, invited by Prof. Xishun Zhao. [www](#)
23. Beijing (China), April 2011, Institute of Software, Academy of Sciences, invited by Prof. Kaile Su.
24. Leicester (United Kingdom), May 2012, Computer Science Seminar, invited by Dr. Igor Razgon. [www](#)
25. Southwest Jiaotong University (China), Department of Mathematics, April 2013, invited by Prof. Yang Xu.

#### **4.5 Workshop participations**

1. Mathematics of Constraint Satisfaction: Algebra, Logic and Graph Theory (Oxford, 20 - 24 March, 2006; satellite workshop of “Logic and Algorithms” at the Isaac Newton Institute for Mathematical Sciences).
2. New Directions in Proof Complexity (10 - 13 April, 2006; workshop of “Logic and Algorithms” at the Isaac Newton Institute for Mathematical Sciences).

3. Constraints and Verification (8 - 12 May, 2006; workshop of “Logic and Algorithms” at the Isaac Newton Institute for Mathematical Sciences; invited participant).
4. Algebra and Analysis around the Stone-Ćech Compactification, July 5-8, 2009, at the Centre for Mathematical Sciences in Cambridge.
5. XXX QCA in Manchester 2010 XXX
6. Cambridge 2015
7. Theory and Practice of SAT Solving, April 19 - 24, 2015, Dagstuhl.

## 5 Software Projects

### 5.1 Before the OKlibrary

#### 5.1.1 OKsolver

Starting in February 1998, the SAT-solver `OKsolver` has been written (in the C programming language), both for theoretical as well as practical investigations. `OKsolver` represents an efficient DPLL-like SAT algorithm, with special emphasise on mathematically well-defined concepts and strong use of reasoning and look-ahead methods for shortening the search tree. Available at <http://cs.swan.ac.uk/~csoliver/OKsolver.html>.

At the *SAT 2002 competition for SAT solvers*, `OKsolver` won two out of six categories (while being third in two others). See *The SAT2002 Competition* by Laurent Simon, Daniel Le Berre and Edward A. Hirsch, preprint available at <http://www.satlive.org/hits.jsp?id=253> (Tables 7-9 show the overall results).

#### 5.1.2 OKgenerator

At the beginning of 2002 I’ve written `OKgenerator`, a random CNF generator based on AES (the Advanced Encryption Standard), as well as a series of accompanying tools. Available at <http://cs.swan.ac.uk/~csoliver/OKgenerator.html>.

### 5.2 The OKlibrary

In 2002 the development of `OKlibrary` has started, a generic library for SAT solving with the aim of extreme flexibility *and* efficiency. September

2007 version 0.2 was released, and the beta release is planned for December 2012; see <http://www.ok-sat-library.org>.

## 6 Professional activities

1. Refereeing for numerous journals and conferences.
2. EPSRC panel member.
3. I have been on the program committee for SAT 2001, 2002, 2003, 2007, 2008, 2010, 2011, 2012, XXX. For SAT 2004 I served as a referee for the random benchmark competition, for SAT 2005 I was one of the three judges for the competition, and for SAT 2010, 2012 I was a judge for the QBF evaluation.
4. Member of programm committee for AAAI 2010, and for workshops CADE-CFV and EPIA-STCS. XXX
5. Member of
  - ACCU (Association for C and C++ Users)
  - ASL (Association for Symbolic Logic)
  - DMV (Deutsche Mathematiker-Vereinigung)
  - EATCS (European Association for Theoretical Computer Science)
  - EMS (European Mathematical Society)
  - LMS (London Mathematical Society)

### 6.1 Conference and Workshop Chairs

1. Chair and host for SAT 2009 in Swansea (with 100 participants); Editor of *Theory and Applications of Satisfiability Testing - SAT 2009*, 2009, Springer, Lecture Notes in Computer Science, vol. 5584.
2. Organised the Dagstuhl workshop SAT Interactions together with Nadia Creignou, Nicola Galesi and Heribert Vollmer, November 18-23, 2012.

## 6.2 Editor

1. From 2005 – 2012 *Associate Editor* for *Journal on Satisfiability, Boolean Modeling and Computation (JSAT)* (<http://jsat.ewi.tudelft.nl/>, ISSN 1574-0617).
2. From March 2012 *Editor in Chief* of *Journal on Satisfiability, Boolean Modeling and Computation (JSAT)*. XXX

## 7 Grants

1. February 2004 a 3-years project with the title *An algorithmic platform for efficient satisfiability based problem solving* has been awarded, funded by the EPSRC with £ 111 440.

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