Curriculum Vitae

Prof. Dr. Byron Cook, FREng

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Short biography

Dr. Byron Cook is *Professor of Computer Science* at UCL and *Senior Principal Applied Scientist* at AWS. Byron's interests include many topics in formal methods, logic, and their applications, *e.g.* biological systems, hardware design, networking, operating systems, programming languages, and security. Byron's work has gained significant attention, *e.g.* a substantial publication record, numerous keynote speaker invitations, and press coverage from Economist, Financial Times, Science, Scientific American, TechCrunch, Vogue, and Wired. Byron's recent work at AWS has focused on automated logic-based reasoning for cloud security, with applications to cryptography, networks, policies, and virtualization. Prior to joining AWS, Byron was particularly well known for his work on automatic methods for proving program termination and the TERMINATOR termination prover. This work represented a breakthrough, challenging the prevailing opinion in computer science at the time that automatic termination proving was impossible. Byron was also known for his contributions to SLAM and the Microsoft product Static Driver Verifier, which is sometimes credited for the revival of automatic program verification research.

Publications

Refereed conference articles

1. *Stratified Abstraction of Access Control Policies*
   John Backes, *et al*
   CAV [International Conference on Computer-Aided Verification], Los Angeles, 2020

2. *Block Public Access: Trust Safety Verification of Access Control Policies*
   Malik Bouchet, *et al*
   ESEC/FSE20 [28th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 20)], Sacramento, 2020

3. *Reachability Analysis for AWS-based Networks*
   John Backes, *et al*
   CAV [International Conference on Computer-Aided Verification], New York City, 2019

4. *Formal reasoning about the security of Amazon Web Services*
   Byron Cook
   CAV [International Conference on Computer-Aided Verification], Oxford, 2018

5. *Semantic-based Automated Reasoning for AWS Access Policies using SMT*
   John Backes, *et al*
   FMCAD [International Conference on Formal Methods in Computer Aided Design], Austin, 2018

6. *Model checking boot code from AWS data centers*
   B. Cook, K. Khazem, D. Kroening, S. Tasiran, M. Tautschnig and M. Tuttle.
   CAV [International Conference on Computer-Aided Verification], Oxford, 2018

7. *Continuous formal verification of Amazon s2n*
   Andrey Chudnov, Nathan Collins, Byron Cook, Josiah Dodds, Brian Huffman, Stephen Magill, Colm MacCarthaigh, Eric Mertens, Eric Mullen, Serdar Tasiran, Aaron Tomb, and Edwin Westbrook
   CAV [International Conference on Computer-Aided Verification], Oxford, 2018

8. *SideTrail: Verifying Time-Balancing of Cryptosystems*
   K. Athanasiou, B. Cook, M. Emmi, C. MacCarthaigh, D. Schwartz-Narbonne and S. Tasiran
   VSTTE [Working Conference on Verified Software: Theories, Tools, and Experiments], Oxford, 2018

9. *T2: temporal property verification*
   Marc Brockschmidt, Byron Cook, Samin Ishtiaq, Heidy Khlaaf, and Nir Piterman
   TACAS [International Conference on Tools and Algorithms for the Construction and Analysis of Systems], Eindhoven, 2016

10. *On automation of CTL* verification for infinite-state systems*
    Byron Cook, Heidy Khlaaf and Nir Piterman
    CAV [International Conference on Computer-Aided Verification], San Francisco, 2015

11. *Spatial interpolants*
    Aws Albarghouthi, Josh Berdine, Byron Cook and Zachary Kincaid
    ESOP [European Symposium on Programming], London, 2015

12. *Fairness for infinite-state systems*
    Byron Cook, Heidy Khlaaf and Nir Piterman
    TACAS [International Conference on Tools and Algorithms for the Construction and Analysis of Systems], London, 2015

13. *Proving nontermination via safety*
    Hong Yi Chen, Byron Cook, Carsten Fuhs, Kaustubh Nimkar, Peter W. O'Hearn
    TACAS [International Conference on Tools and Algorithms for the Construction and Analysis of Systems], Grenoble, 2014

14. *Faster temporal reasoning for infinite-state programs*
    Byron Cook, Heidy Khlaaf, Nir Piterman
    FMCAD [International Conference on Formal Methods in Computer Aided Design], Lausanne, 2014

15. *Disproving termination with overapproximation*
    Byron Cook, Carsten Fuhs, Kaustubh Nimkar, Peter O'Hearn
    FMCAD [International Conference on Formal Methods in Computer Aided Design], Lausanne, 2014

16. *Finding instability in biological models*
    Byron Cook, Jasmin Fisher, Benjamin A. Hall, Samin Ishtiaq, Garvit Juniwal, Nir Piterman
    CAV [International Conference on Computer-Aided Verification], Vienna, 2014

17. *Better termination proving through cooperation*
    Marc Brockschmidt, Byron Cook and Carsten Fuhs
    CAV [International Conference on Computer-Aided Verification], St. Petersburg, 2013

18. *Reasoning about nondeterminism in programs*
    Byron Cook and Eric Koskinen

PLDI [International Conference on Programming Language Design and Implementation], Seattle, 2013

19. *Ramsey vs. lexicographic termination proving*
Byron Cook, Abigail See, and Florian Zuleger
TACAS [International Conference on Tools and Algorithms for the Construction and Analysis of Systems], Rome, 2013

20. *At the interface of biology and computation*
Alex S. Taylor, Nir Piterman, Samin Ishtiaq, Jasmin Fisher, Byron Cook, Caitlin Cockerton, Sam Bourton, and David Benque
CHI [ACM SIGCHI Conference on Human Factors in Computing Systems], Paris, 2013

21. *BMA: visual tool for modeling and analysis of biological networks* (tool paper)
David Benque, Sam Bourton, Caitlan Cockerton, Byron Cook, Jasmin Fisher, Samin Ishtiaq, Nir Piterman, Alex Taylor, Moshe Vardi
CAV [International Conference on Computer-Aided Verification], Berkeley, 2012

22. *Temporal property verification as a program analysis task*
Byron Cook, Eric Koskinen, Moshe Vardi
CAV [International Conference on Computer-Aided Verification], Snowbird, 2011

23. *SLAyer: Memory safety for systems-level code*
Josh Berdine, Byron Cook, Samin Ishtiaq
CAV [International Conference on Computer-Aided Verification], Snowbird, 2011

24. *Making prophecies with decision predicates*
Byron Cook and Eric Koskinen
POPL [International Symposium on Principles of Programming Languages], Austin, 2011

25. *Proving stabilization of biological systems*
Byron Cook, Jasmin Fisher, Elzbieta Krepska, Nir Piterman
VMCAI [International Conference on Verification, Model Checking, and Abstract Interpretation], Savannah, 2011

26. *Tractable Reasoning in a Fragment of Separation Logic*
Byron Cook, Christoph Haase, Joel Ouaknine, Matthew Parkinson and James Worrell
CONCUR [International Conference on Concurrency Theory], Aachen, 2011

27. *Ranking function synthesis for bit-vector relations*
Byron Cook, Daniel Kroening, Philipp Ruemmer, and Christoph Wintersteiger
TACAS [International Conference on Tools and Algorithms for the Construction and Analysis of Systems], Paphos, 2010

28. *Finding heap-bounds for hardware synthesis*
Byron Cook, Ashutosh Gupta, Stephen Magill, Andrey Rybalchenko, Jiri Simsa, Satnam Singh, and Viktor Vafeiadis
FMCAD [International Conference on Formal Methods in Computer Aided Design], Austin, 2010

29. *Proving that non-blocking algorithms don't block*
Alexey Gotsman, Byron Cook, Matthew Parkinson, and Viktor Vafeiadis
POPL [International Symposium on Principles of Programming Languages], Savannah, 2009

30. *Proving conditional termination*
Byron Cook, Sumit Gulwani, Tal Lev-Ami, Andrey Rybalchenko, and Mooly Sagiv
CAV [International Conference on Computer-Aided Verification], Princeton, 2008

31. *Scalable shape analysis for systems code*
Hongseok Yang, Oukseh Lee, Josh Berdine, Cristiano Calcagno, Byron Cook, Dino Distefano, and Peter O'Hearn
CAV [International Conference on Computer-Aided Verification], Princeton, 2008

32. *Ranking abstractions*
Aziem Chawdhary, Byron Cook, Sumit Gulwani, Mooly Sagiv, and Hongseok Yang
ESOP [European Symposium on Programming], Budapest, 2008

33. *Proving thread termination*
Byron Cook, Andreas Podelski, and Andrey Rybalchenko,
PLDI [International Conference on Programming Language Design and Implementation], San Diego, 2007

34. *Thread-modular shape analysis*
Alexey Gotsman, Josh Berdine, Byron Cook, and Mooly Sagiv,
PLDI [International Conference on Programming Language Design and Implementation], San Diego, 2007

35. *Local reasoning for storable locks and threads*
Alexey Gotsman, Josh Berdine, Byron Cook, Noam Rinetzky, and Mooly Sagiv
APLAS [Asian Symposium on Programming Languages and Systems], Singapore, 2007

36. *Proving that programs eventually do something good*
Byron Cook, Alexey Gotsman, Andreas Podelski, Andrey Rybalchenko, and Moshe Vardi
POPL [International Symposium on Principles of Programming Languages], Nice 2007

37. *Variance analyses from invariance analyses*
Josh Berdine, Aziem Chawdhary, Byron Cook, Dino Distefano, and Peter O'Hearn
POPL [International Symposium on Principles of Programming Languages], Nice 2007

38. *Shape analysis for composite data structures*
Josh Berdine, Cristiano Calcagno, Byron Cook, Dino Distefano, Peter O'Hearn, Thomas Wies, and Hongseok Yang
CAV [International Conference on Computer-Aided Verification], Berlin, 2007

39. *Arithmetic strengthening for shape analysis*
Stephen Magill, Josh Berdine, Edmund Clarke, and Byron Cook,
SAS [International Static Analysis Symposium], Denmark, 2007

40. *Proving termination by divergence*
Domagoj Babic, Byron Cook, Alan Hu, and Zvonimir Rakamaric
SEFM [International Conference on Software Engineering and Formal Methods], London, 2007

41. *Shape analysis by graph decomposition*
Roman Manevich, Josh Berdine, Byron Cook, Ganesan Ramalingam, and Mooly Sagiv
TACAS [International Conference on Tools and Algorithms for the Construction and Analysis of Systems], Braga, 2007

42. *Over-approximating Boolean programs with unbounded thread creation*
Byron Cook, Daniel Kroening, Natasha Sharygina
FMCAD [International Conference on Formal Methods in Computer Aided Design], San Jose, 2007

43. *Interprocedural shape analysis with separated heap abstractions*
Alexey Gotsman, Josh Berdine, and Byron Cook
SAS [International Symposium on Static Analysis], Seoul, 2007

44. *Automatic termination proofs for programs with shape-shifting heaps*
Josh Berdine, Byron Cook, Dino Distefano, and Peter O'Hearn
CAV [International Conference on Computer-Aided Verification], Seattle, 2006

45. *Terminator: Beyond safety*
Byron Cook, Andreas Podelski, and Andrey Rybalchenko
CAV [International Conference on Computer-Aided Verification], Seattle, 2006

46. *Repair of Boolean programs with an application to C*
Andreas Griesmayer, Roderick Bloem, and Byron Cook
CAV [International Conference on Computer-Aided Verification], Seattle, 2006

47. *Termination proofs for systems code*
Byron Cook, Andreas Podelski, and Andrey Rybalchenko
PLDI [International Conference on Programming Language Design and Implementation], Ottawa, 2006

48. *Thorough static analysis of device drivers*
Thomas Ball, Ella Bounimova, Byron Cook, Vladimir Levin, Jakob Lichtenberg, Con McGarvey, Bohus Ondrusek, Sriram K. Rajamani, Abdullah Ustuner
EuroSys [European Systems Conference], Leuven, 2006

49. *Abstraction-refinement for termination*
Byron Cook, Andreas Podelski, Andrey Rybalchenko
SAS [International Symposium on Static Analysis], London, 2005

50. *Using Stålmarck's algorithm to prove inequalities*
Byron Cook and George Gonthier
ICFEM [International Conference on Formal Engineering Methods], Manchester, 2005

51. *Predicate abstraction via symbolic decision procedures*
Shuvendu Lahiri, Thomas Ball, and Byron Cook
CAV [International Conference on Computer-Aided Verification], Edinburgh, 2005

52. *Cogent: Accurate theorem proving for program verification*
Byron Cook, Daniel Kroening, and Natasha Sharygina
CAV [International Conference on Computer-Aided Verification], Edinburgh, 2005

53. *Zapato: Automatic theorem proving for predicate abstraction refinement*
Thomas Ball, Byron Cook, Shuvendu K. Lahiri, and Lintao Zhang
CAV [International Conference on Computer-Aided Verification], Boston, 2004

54. *Refining approximations in software predicate abstraction*
Thomas Ball, Byron Cook, Satyaki Das, and Sriram K. Rajamani
TACAS [International Conference on Tools and Algorithms for the Construction and Analysis of Systems], Barcelona, 2004

55. *SLAM and Static Driver Verifier: technology transfer of formal methods inside Microsoft*,
Thomas Ball, Byron Cook, Vladimir Levin and Sriram K. Rajamani.
IFM [International Conference on Integrated Formal Methods], Kent, 2004

56. *Accurate theorem proving for program verification*,
Byron Cook, Daniel Kroening, Natasha Sharygina,
ISoLA [Leveraging Applications of Formal Methods], Paphos, 2004

57. *A symbolic approach to predicate abstraction*
Shuvendu K. Lahiri, Randall E. Bryant, and Byron Cook
CAV [International Conference on Computer-Aided Verification], Boulder, 2003

58. *A proof engine approach to solving combinational design automation problems*
Gunnar Andersson, Per Bjesse, Byron Cook, and Ziyad Hanna
DAC [Design Automation Conference], Las Vegas, 2002

59. *A framework for microprocessor correctness statements*
Mark Aagaard, Byron Cook, Nancy Day, and Robert Jones
CHARME [Advanced Research Working Conference on Correct Hardware Design and Verification Methods], Edinburgh, 2001

60. *Combining stream-based and state-based verification techniques for microarchitectures*
Mark Aagaard, Byron Cook, and Nancy Day
FMCAD [International Conference on Formal Methods in Computer Aided Design], Austin, 2000

61. *Formal verification of explicitly parallel microprocessors*
Byron Cook, John Launchbury, John Matthews, and Dick Kieburtz
CHARME [Advanced Research Working Conference on Correct Hardware Design and Verification Methods], Bad Herrenalb, 1999

62. *On embedding a microarchitectural design language within Haskell*
John Launchbury, Jeff Lewis and Byron Cook
ICFP [International Conference on Functional Programming], Paris, 1999

63. *Microprocessor specification in Hawk*
John Matthews, John Launchbury, and Byron Cook
ICCL [International Conference on Computer Languages], Chicago, 1998

Refereed journal articles

64. *Model checking boot code from AWS data centers*
B. Cook *et al.*, Journal of Formal Methods in Systems Design (2020)

65. *One-click formal methods*
P. Bolignano *et al.*, IEEE Software Magazine, November/December 2019

66. *Verifying Increasingly Expressive Temporal Logics for Infinite-State Systems*
B. Cook, H. Khlaaf, and N. Piterman.
Journal of the the ACM, 64, 2, Article 15 (May 2017), 39 pages.

67. *Drug target optimization in chronic myeloid leukemia using innovative computational platform*
R. Chuang, B. Hall, D. Benque, B. Cook, S. Ishtiaq, N. Piterman, A. Taylor, M. Vardi, S. Koschmieder, B. Gottgens, and J. Fisher
Scientific Reports, 5:8190, Nature Publishing Group, February 2015

68. *Relations*
Tauba Auerbach, Byron Cook, David Reinfurt
Bulletins of the Serving Library, 2014

69. *Mathematical artifacts*
Byron Cook
Parkett 94, 2014

70. *Ranking function synthsis for bit-vector relations*
Byron Cook, Daniel Kroening, Philipp Rümmer, Christoph Winterstieger
International Journal on Formal Methods in System Design, March, 2013

71. *Proving termination of nonlinear command sequences*
Domagoj Babic, Byron Cook, Alan J. Hu, Zvonimir Rakamaric
International Journal on Formal Aspects of Computing (special issue from SEFM), 2013

72. *Temporal property verification as a program analysis task (extended version)*
Byron Cook, Eric Koskinen, Moshe Vardi
International Journal on Formal Methods in System Design (special issue from CAV), 2012

73. *Proving program termination*
Byron Cook, Andreas Podelski, Andrey Rybalchenko
Communications of the ACM, Volume 54 Issue 5, May 2011

74. *Summarization for termination*
Byron Cook, Andreas Podelski, and Andrey Rybalchenko
International Journal on Formal Methods in System Design, Vol 35, pp. 369–387

75. *Software engineering and formal methods*
Mike Hinchey, Michael Jackson, Patrick Cousot, Byron Cook, Jonathon P. Bowen
Communications of the ACM, Vol. 51, 2008, pp. 54-59

76. *Verification of Boolean programs with unbounded thread creation*
Byron Cook, Daniel Kroening, and Natasha Sharygina
Journal of Theoretical Computer Science, Vol. 388, 2007, pp. 227-242

77. *Predicate abstraction via symbolic decision procedures*
Shuvendu Lahiri, Tom Ball, and Byron Cook
Journal of Logic Methods in Computer Science, Vol. 3(1:2), 2007, pp. 1-20

78. *Design automation with mixtures of proof strategies for propositional logic*
Gunnar Andersson, Per Bjesse, Byron Cook, and Ziyad Hanna
IEEE Transactions on CAD, Vol. 22(8), 2003, pp. 1042-1048

79. *A framework for microprocessor correctness statements*
Mark Aagaard, Byron Cook, Nancy Day, and Robert Jones
International Journal on Software Tools for Technology Transfer, Vol 4(3), 2002, pp. 298-312

Books

80. *Program termination*
Byron Cook
Cambridge University Press (forthcoming)

81. *Computer Aided Verification*
Byron Cook, Tayssir Touili, Paul Jackson (Eds.)
Springer, 2010

82. *Formal Methods for Industrial Critical Systems*
Maria Alpuente, Byron Cook, Christophe Joubert (Eds.)
Springer, 2009

83. *Proceedings of the 8th International Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI)*
Byron Cook and Andreas Podelski (Eds.)
Springer, 2007

Journal special issues

84. *Special Issue on Satisfiability Modulo Theories*
Byron Cook and Roberto Sebastiani (Eds.)
Journal on Satisifiability, Boolean Modeling and Computation

Workshop articles

85. *Learning to decipher the heap for program verification*
Mark Brockschmidt, Yuxin CHen, Byron Cook, Pushmeet Kohli, and Daniel Tarlow
Workshop on Constructivee Machine Learning at ICML, 2015

86. *Symbolic model checking for asynchronous Boolean programs*
Byron Cook, Daniel Kroening, and Natasha Sharygina
SPIN [SPIN Workshop on Model Checking of Software], San Francisco, 2005

87. *Specifying superscalar microprocessors in Hawk*
Byron Cook, John Launchbury, and John Matthews
FTH [International Workshop on Formal Techniques for Hardware], Marstrand, 1998

88. *Disposable memo functions*
Byron Cook and John Launchbury
Haskell Workshop, Amsterdam, 1997

Invited articles

89. *Formal reasoning about the security of Amazon Web Services*
Byron Cook
CAV [International Conference on Computer-Aided Verification], Oxford, 2018

90. *Principles of program termination*
Byron Cook
Lecture notes from 2008 Marktoberdorf summer school (Marktoberdorf)

91. *Advances in Program Termination and Liveness*
Byron Cook
VMCAI [International Conference on Verification, Model Checking, and Abstract Interpretation], Savannah, 2009

92. *Computing bounds on space and time for hardware compilation*
Byron Cook
FMCAD [Formal Methods in Computer Aided Design], Portland, 2008

93. *Automatically proving program termination*
Byron Cook
CAV [International Conference on Computer-Aided Verification], Berlin, 2007

94. *Bringing hardware and software closer together with termination analysis*
Byron Cook
MEMOCODE [International Conference on Formal Methods and Models for Codesign], Nice, 2007

95. *Automatically Proving Concurrent Programs Correct*
Byron Cook
SEFM [IEEE International Conference on Software Engineering and Formal Methods], London, 2007

96. *Finding bugs in device drivers with Static Driver Verifier*
Byron Cook
ASM [International Conference on Abstract State Machines], Paris, 2005

97. *Finding API usage rule violations in Windows device drivers using Static Driver Verifier*
Byron Cook
ISoLA [Leveraging Applications of Formal Methods], Paphos, 2004

Grants

- "IRIS: Interface Reasoning for Interacting Systems" (EPSRC program grant), 6.1m GBP
- "Compositional Security Analysis for Binaries" (EPSRC), 290k GBP
- "Boosting Automated Verification Using Cyclic Proof" (EPSRC), 550k GBP
- "Program Verification Techniques for Understanding Security Properties of Software" (EPSRC), 877k GBP
- "Resource Reasoning" (EPSRC), 3.1m GBP

Patents

- US Patent No. 10,630,695, "SECURITY POLICY MONITORING SERVICE."
- US Patent No. 10,469,324, "VIRTUAL NETWORK VERIFICATION SERVICE."
- US Patent No. 10,652,266, "AUTOMATED THREAT MODELING USING MACHINE-READABLE THREAT MODELS."

Awards

- Elected *Fellow of the Royal Academy of Engineering*, 2019. Text from the award: *"Byron Cook is a world-renowned leader in the field of formal verification. For over 20 years Byron has worked to bring this field from academic hypothesis to mechanised industrial reality. Byron has made major research contributions, built influential tools, led teams that operationalised formal verification activities, and helped establish connections between others that have dramatically accelerated growth of the area. Byrons tools have been applied to a wide array of topics, e.g. biological systems, computer operating systems, programming languages, and security. Byrons Automated Reasoning Group at Amazon is leading the field to even greater success"*
- Honorable mention, NSA Annual Best Scientific Cybersecurity Paper Competition, 2019. This is a competition run by NSA that examines all computer security papers published in the last year and selects those papers they view as most impactful. Each year there is 1 winner, between 0-2 honorable mentions.
- Roger Needham Award, 2009. The Roger Needham Award is made annually by the British Computer Society for a distinguished research contribution in computer science by a UK based researcher within ten years of their PhD. The award includes a 5,000 GBP cash prize, and a public lecture at the UK's Royal Society in London.

Press coverage

- *Next Generation Security with Automated Reasoning, an Artificial Intelligence Technology*
  AWS Podcast no.266, Oct 2018
  `https://aws.amazon.com/podcasts/aws-podcast/#266`
- *What are Amazon Zelkova and Tiros? AWS looks to reduce S3 configuration errors*, IDG, August, 2018
  `https://www.csoonline.com/article/3298166/cloud-security/what-are-amazon-zelkova-and-tiros-aws-`

- *Amazon tests out two tools to help keep its cloud secure*, Wired, Lily Hay Newman, July, 2018 `https://www.wired.com/story/aws-cloud-security-tools-leaks/`
- *Amazon is quietly doubling down on cryptographic security*, TechCrunch, August, 2018 `https://techcrunch.com/2018/08/30/amazon-aws-cryptography-security/`
- *How Do You Explain The Unreasonable Effectiveness Of Cloud Security?* highscalability.com, September 2018 `http://highscalability.com/blog/2018/9/19/how-do-you-explain-the-unreasonable-effectiveness-of-`
- *Amazon Adds Crypto-Based Security Tools*, pymnts.com, September 2018 `https://www.pymnts.com/amazon/2018/ai-security-software-tools-aws-arg/}`
- *Why the blue screen of death no longer plagues Windows users* , Nick Heath, ZDNet, September, 2013
- *Modelling: Computing Cancer*, Neil Savage, Nature, November 2012
- *Dr. Byron Cook: Geek of the week*, Richard Morris, Simple-Talk, September, 2010
- *Sign Of The Times*, Cameron Bird, Wired, December 2009
- *A Good Sign*, Angela Saini, Science, July 2009
- *Optic Nerve*, Dodie Kazanjain, Vogue, January 2009
- *All Shook Down*, Hiya Swanhuyser, San Francisco Weekly, December 2008
- *Byron Cook: Terminator - Proving good things will eventually happen* (Video interview), Charles Torre, MSDN, July 2007
- *Byron Cook: Inside Terminator* (Video interview), Charles Torre, MSDN, September 2007
- *Send in the Terminator*, Gary Stix, Scientific American, December 2006
- *Testers aim to kill off dreaded blue screens*, Mary Branscombe, Financial Times, November 22nd, 2006
- *Microsoft creates an application terminator*, Andy Patrizio, Internet News, August, 2006
- *Microsoft researcher aims to make software more predictable*, Tony Baer, Computer Wire, August, 2006,
- *Microsoft bug-checking tools promise fewer crashes*, Joris Evens, CNET, May 26, 2006
- *Microsoft's secret bug squasher*, Simson Garfinkel, Wired, November, 2005
- *Researching a path to fewer bugs*, Patrick Meader, Visual Studio Magazine, February 2003
- *Building a better bug-trap* , Economist, June 19th, 2003

Graduate students

- Alexey Gotsman. Completed PhD: 2009. Now at IMDEA (Madrid Institute for Advanced Studies)
- Eric Koskinen. Completed PhD: 2012. Now at Stevens Institute of Technology
- Kaustubh Nimkar. Completed PhD: 2015. now at Bloomberg
- Heidy Khlaaf. Completed PhD: 2018. Now at Adelard LLP
- Paul Subotic. Completed PhD: 2019. Now at Amazon

Teaching

- *Program termination*, 4 graduate-level lecture hours at University of California, Berkeley, 2009
- *Program termination*, 6 graduate-level lecture hours at the International Summer School on Trends in Concurrency (Prague), 2008
- *Program termination*, 5 graduate-level lecture hours at the Marktoberdorf Summer School, 2008
- *Program termination*, 6 graduate-level lecture hours at the International Summer School on Trends in Concurrency (Prague), 2008
- *Program termination*, 24 graduate-level lecture hours at Carnegie Mellon University, 2008
- *Program termination*, 6 graduate-level lecture hours at Imperial College, 2008
- *Program termination*, 6 graduate-level lecture hours at Cambridge University, 2007
- *Introduction to C++*, 20 undergraduate-level lecture hours at The Evergreen State College, 1998
- *Constructing Applets in Java*, 10 undergraduate-level lecture hours at The Evergreen State College, 1998
- *C++ and Java, Object Oriented Programming*, 20 undergraduate-level lecture hours at The Evergreen State College, 1997
- *C programming language: Introduction*, 20 undergraduate-level lecture hours at The Evergreen State College, 1997
- *Web programming in Perl*, 10 undergraduate-level lecture hours at The Evergreen State College, 1997
- *Introduction to Computer Science II*, 20 undergraduate-level lecture hours at Portland Community College, 1997
- *Introduction to Computer Programming*, 20 undergraduate-level lecture hours at Oregon Institute of Technology, 1997
- *Introduction to Data Structures*, 20 undergraduate-level lecture hours at Oregon Institute of Technology, 1997
- *Introduction to Programming for the World Wide Web*, 20 undergraduate-level lecture hours at The Evergreen State College, 1996
- *Introduction to UNIX Operating System*, 20 undergraduate-level lecture hours at The Evergreen State College, 1996

- *Introduction to Computer Science I*, 20 undergraduate-level lecture hours at Portland Community College, 1996

Tools developed

- ZELKOVA* : Constraint-based IAM policy reasoning tool. Internal Amazon tool used by Amazon/AWS products S3, Macie, Trusted Advisor, Config, and various internal tools. Discussed in `https://www.youtube.com/watch?v=Wvyc-VEUOns&t=2214` and `https://www.wired.com/story/aws-cloud-security-tools-leaks/` .
- TIROS* : Constraint-based EC2 network reasoning tool. Internal Amazon tool used by forthcoming Amazon/AWS product and various internal tools. Discussed in `https://www.wired.com/story/aws-cloud-security-tools-leaks/` .
- BMA* : Biological model analysis tool `http://biomodelanalyzer.org/` Used in drugs discovery research by companies such as AstraZeneca (as discussed in `https://www.youtube.com/watch?v=0OEvk79JW78`)
- TERMINATOR and T2 : Program termination prover `http://github.com/mmjb/T2`
- SLAYER* : Shape analysis engine `http://research.microsoft.com/SLAyer`
- SLAM : Symbolic software model checker `http://research.microsoft.com/SLAM`
- Static Driver Verifier : Device driver correctness tool (Microsoft Windows product released through the Windows Device Driver Development Kit) `https://docs.microsoft.com/en-us/windows-hardware/drivers/devtest/static-driver-verifier`
- ZAPATO : Microsoft internal decision procedure framework used in SLAM. Note that ZAPATO led to ZAP, which led to Z3
- PROVER CL : Propositional SAT solver `http://www.prover.com/products/ppi/cl.xml`
- PROVER SL : Symbolic model checker for finite-state systems `http://www.prover.com/products/ppi/sl.xml`
- HLSPEC : High-level microprocessor design language and tools (Intel internal)
- HAWK : High-level microprocessor design language and tools `http://www.cse.ogi.edu/PacSoft/projects/Hawk/`

For tool names marked with $*$, Byron was involved in the founding, strategy, and/or design, but did not write/maintain the source code.

Invited, plenary, keynote and tutorial talks

- Ask me anything interview. PLDI [International Conference on Programming Language Design and Implementation], 2020 See https://www.youtube.com/watch?v=jGgQmnPH0dQ&t=1h19m56s
- NASA Formal Methods Symposium, Moffett Field, 2020
- IBM Programming Languages Day, 2019
- Graz Security Week, 2019
- MODELS 2019, Munich
- FLoC [Federated Logic Conference], Oxford, 2018. FLoC occurs every 4 years as the amalgamation of CAV, CSF, FM, FSCD, ICLP, IJCAR, ITP, LICS, SAT
  - Plenary speaker. See https://www.youtube.com/watch?v=JfjLKBO27nw
  - Invited speaker, "Formal methods in Industry" special session
  - Verification and Deduction Mentoring Workshop
- SPLASH/OOPSLA, 2018, https://www.youtube.com/watch?v=9lPR0d2uijo
- Philosophical Society of Washington, Lecture 2382, Washington DC, 2017 https://www.youtube.com/watch?v=eJ88cIDUNXY
- FMCAD[Formal Methods in Computer Aided Design], Vienna, 2017
- SPIN Symposium, Santa Barbara, 2017
- PiP [POPL Workshop on Principles in Practice], Paris, 2017
- N40AI [POPL Workshop on Next 40 years of abstract interpretation], Paris, 2017
- AWS Re:Invent, Las Vegas, 2016 https://www.youtube.com/watch?v=U40bWY6oVtU
- CAV Mentoring Workshop, San Francisco, 2015
- WST [International Workshop on Termination], Bertinoro (Italy), 2013
- Workshop on Software Correctness and Reliability, Zurich, 2013 https://www.youtube.com/watch?v=_LqXVnq_rWM
- POPL (tutorial) [Symposium on Principles of Programming Languages], Philadelphia, 2012
- Dutch Model Checking Day, Amsterdam, 2012
- SIGPLAN Programming Languages Mentoring Workshop, Philadelphia, 2012
- Manycore workshop, Birmingham, 2012
- CAV workshop on Applications of Formal Methods in Systems Biology, Berkeley, 2012
- Bright Club, London, April 2012
- HCSS [International Conference on High Confidence Software and Systems], Annapolis, 2012
- CADE [International Conference on Automated Deduction], Wroclaw, 2011
- ECOOP Summer School [European Conference on Object-Oriented Programming], Lancaster, 2011
- Dutch Model Checking Day, Delft, 2011

- IFIP Working Group 2.3, Santa Barbara, 2011
- Workshop on Theory Engineering, Cambridge, 2010
- IFIP Working Group 2.3, Zurich, 2010
- Royal Society, London, 2009
- Midlands Graduate School Christmas Seminar, 2009
- HCSS [International Conference on High Confidence Software and Systems], Baltimore, 2009
- NFM [NASA Formal Methods Symposium], Moffett Field, 2009
- VMCAI [International Conference on Verification, Model Checking, and Abstract Interpretation], Savannah, 2009
- IFM [Integrated Formal Methods], Dusseldorf, 2009
- Infinity [International Workshop on Verification of Infinite-State Systems], Bologna, 2009
- Workshop on Applied Logic: Inductive and Deductive Reasoning, 2009
- IFIP Working Group 2.3, Cambridge, 2008
- Marktoberdorf Summer School, 2008
- FMCAD [Formal Methods in Computer Aided Design], Portland, 2008
- HCSS [International Conference on High Confidence Software and Systems], Baltimore, 2008
- International Summer School on Trends in Concurrency (Prague), 2008
- CAV Workshop on Numerical Abstractions for Software Verification, 2008
- Science of Security Workshop, Berkeley, 2008
- QCon Enterprise Software Development Conference, San Francisco, 2007
- CAV [International Conference on Computer-Aided Verification] Berlin, 2007
- HCSS [International Conference on High Confidence Software and Systems], Baltimore, 2007
- MEMOCODE [International Conference on Formal Methods and Models for Codesign] (Nice), 2007
- SEFM [IEEE International Conference on Software Engineering and Formal Methods] London, 2007
- Seminar on the Challenge of Software Verification, Dagstuhl, 2006
- WST [International Workshop on Termination], Seattle, 2006
- SVV [International Workshop on Software Verification and Validation], Seattle, 2006
- AVoCS [International Workshop on Automated Verification of Critical Systems], Nancy, 2006
- ARW [Automated Reasoning Workshop], Bristol, 2006
- ICSSR [International Computer Science Symposium in Russia], St. Petersburg, 2006
- ESCAR [CADE Workshop on Empirically Successful Classical Automated Reasoning], 2005
- DISPROVING [Workshop on Disproving - Non-Theorems, Non-Validity, Non-Provability] Tallinn, 2005

- ASM [International Workshop on Abstract State Machines], Paris, 2005
- Combination of Decision Procedures Summer School, Stanford, 2004
- HCSS [Conference on High Confidence Software and Systems], Baltimore, 2004
- ISoLA [Leveraging Applications of Formal Methods] (Paphos)
- Colloquium L'ingnierie du logiciel, Paris, 2004
- DAC [Design Automation Conference], Las Vegas 2001
- University colloquium lectures at Stanford, Berkeley, Carnegie Mellon, Harvard, MIT, ETH, INRIA, University of Toronto, University of Birmingham, University of Manchester, University of British Columbia, University of Utah, University of Colorado, Oxford, Cambridge, Chalmers, and New York University. See `https://vimeo.com/81641895` for an example.
- Microsoft Techfest[1] in 2011, 2009, 2007, 2006, and 2005
  `https://www.youtube.com/watch?v=V91oBk-nWCg`
  `https://archive.org/details/Microsoft_Research_Video_104033`

Panel discussions

- NASA Formal Methods Symposium, Moffett Field, 2009
- Science of Security Workshop, Berkeley, 2008
- SMT [International Workshop on Satisfiability Modulo Theories], Princeton, 2008
- HCSS [International Conference on High Confidence Software and Systems], Baltimore, 2008
- University of Illinois Affiliates Conference, 2006
- MEMOCODE [International Conference on Formal Methods and Models for Codesign] Verona, 2005

Professional activities

- Advisory board
  - DeepSpec/NSF
- Program committee appointments:
  - 2017– : no longer accepting program committee requests
  - VMCAI [International Conference on Verification, Model Checking, and Abstract Interpretation], 2017
  - CAV [International Conference on Computer-Aided Verification], 2015
  - CAV [International Conference on Computer-Aided Verification], 2014

[1] Techfest is a Microsoft event in which researchers give lectures and make demos available to Microsoft employees and the press. The event is high-profile (>30,000 attendees) and the lectures are selected using a competitive process.

  - CAV [International Conference on Computer-Aided Verification], 2013
  - RTA [Rewriting Techniques and Applications], 2013
  - PLDI [International Conference on Programming Language Design and Implementation], 2012
  - FMCAD [Formal Methods in Computer-Aided Design], 2012
  - SAS [International Static Analysis Symposium], 2011
  - FM [International Symposium on Formal Methods], 2011
  - PADL [International Symposium on Practical Aspects of Declarative Languages], 2011
  - SAS [International Static Analysis Symposium], 2010
  - CAV [International Conference on Computer-Aided Verification], 2010
  - CAV [International Conference on Computer-Aided Verification], 2009
  - FMICS [Formal Methods for Industrial Critical Systems], 2009
  - WST [International Workshop on Termination], 2009
  - POPL [Symposium on Principles of Programming Languages], 2008
  - TACAS [International Conference on Tools and Algorithms for the Construction and Analysis of Systems], 2008
  - SSV [International Workshop on Systems Software Verification], 2008
  - LPAR [International Conference on Logic for Programming Artificial Intelligence and Reasoning], 2007
  - VMCAI [International Conference on Verification, Model Checking, and Abstract Interpretation], 2007
  - TACAS [International Conference on Tools and Algorithms for the Construction and Analysis of Systems], 2007
  - SMT [International Workshop on Satisfiability Modulo Theories], 2007
  - SV [International Workshop on System Verification], 2007
  - TV [Thread Verification Workshop], 2006
  - PDPAR [Pragmatics of Decision Procedures in Automated Reasoning], 2006
  - SoftMC [Software Model Checking Workshop], 2005
  - CUFP [ICFP Workshop on Commercial Users of Functional Programming], 2004
  - SoftMC [Software Model Checking Workshop], 2003
  - CHARME [Advanced Research Working Conference on Correct Hardware Design and Verification Methods], 2003

- Co-organizer, HCSS [International Conference on High Confidence Software and Systems], Annapolis, 2013
- External review committee, PLDI [International Conference on Programming Language Design and Implementation], 2013
- External review committee, PLDI [International Conference on Programming Language Design and Implementation], 2010
- Steering committee, International Workshop on Satisfiability Modulo Theories
- Co-chair, CAV [International Conference on Computer-Aided Verification], Edinburgh, 2010
- Co-chair, FMICS [Formal Methods for Industrial Critical Systems], Eindhoven, 2009

- Workshops chair, CAV [International Conference on Computer-Aided Verification], Princeton, 2008
- Associate Editor, ACM Transactions on Programming Languages and Systems, 2009-2012
- Guest co-editor, Journal on Satisfiability, Boolean Modeling, and Computation (Special Issue on Satisfiability Modulo Theories),
- Program chair for tools papers, TACAS [International Conference on Tools and Algorithms for the Construction and Analysis of Systems], 2008
- Co-organizer, *Seminar on Deduction and Decision Procedures*, Schloss Dagstuhl, 2007
- Co-chair, AHA [International Symposium on Automatic Heap Analysis], 2007
- Co-chair, VMCAI [International Conference on Verification, Model Checking, and Abstract Interpretation], 2007
- Co-organizer, SSPV [Symposium on SAT-solvers and Program Verification], 2006
- Co-chair, PDPAR [Pragmatics of Decision Procedures in Automated Reasoning], 2006
- Program chair for tools papers, TACAS [International Conference on Tools and Algorithms for the Construction and Analysis of Systems], 2007
- Co-organizer of SoftMC'05 and SoftMC'03 [CAV Workshop on Software Model Checking]
- Co-organizer of CFDP'05 [Cambridge Forum on Decision Procedures]
- External Ph.D. reviewer: Albert Oliveras (Barcelona), Stephen Magill (CMU), Daron Vroon (Georgia Tech), Jonathan Heusser (Queen Mary), Jules Villard (Cachan), Elzbieta Krepska (VU Amsterdam)
- Grant reviewing: UK Engineering and Physical Sciences Research Council (EPSRC), European Research Council (ERC)
- Committee EAPLS Best PhD Dissertation Award 2011
- MSR Internship supervision: Aws Albarghouthi, Mary Boeker, Marc Brockschmidt, Hongyi Chen, Ashutosh Gupta, Mihaela Gheorghiu, Alexey Gotsman, Christoph Haase, Zachary Kincaid, Heidy Khlaaf, Matt Lewis, Shuvendu Lahiri, Stephen Magill, Andrei Popescu, Patrick Rondon, Andrey Rybalchenko, Abigail See, Vlad Shcherbina, Jiri Simsa, Thomas Stroeder, Viktor Vafeiadis, Georg Weissenbacher, Thomas Wies, and Greta Yorsh.

Work history

Academic positions

- University College London, Professor (joint with Microsoft and now Amazon), 2012-Current
- Queen Mary, University of London, Professor (joint with Microsoft), 2008-2012
- Carnegie Mellon University, Visiting Professor, 2008
- Queen Mary, University of London, Visiting Professor, 2006-2008
- Chalmers University, Visiting Lecturer, 2005-2006

- The Evergreen State College, Adjunct Lecturer, 1996-1998
- Portland Community College, Adjunct Lecturer, 1996-1997
- Oregon Institute of Technology, Adjunct Lecturer, 1997

Industrial positions

- Amazon Web Services, 2014-Current
  - Senior Principal Applied Scientist, Engineer, Director, 2014-Current
- Microsoft Research 2004-2014
  - Principal Researcher, group manager (Programming, Principles, and Tools group), MSR-Cambridge senior leadership team member 2011-2014
  - Principal Researcher, 2009-2011,
  - Senior Researcher, 2008-2009,
  - Researcher, 2004-2008
- Microsoft, Software developer (Base OS kernel team), 2002-2004
- Prover Technology AB, Pre-sales engineer, 1999-2002
- Intel Strategic CAD Labs, Software developer, 1998-1999

Education

- Ph.D. The Oregon Graduate Institute of Science and Technology, 2005, Advisor: John Launchbury
- B.Sci. The Evergreen State College, 1995.
- Secondary/high school – The Jefferson County Open School (Colorado), 1990

References

- Don "Beetle" Bailey– AWS Security
  `beetle@amazon.com`
- Dr. Jasmin Fisher – Microsoft Research
  `Jasmin.Fisher@microsoft.com`
- Prof. Dr. Daniel Kroening – Oxford University
  `kroening@cs.ox.ac.uk`
- Prof. Dr. Peter O'Hearn – University College London and Facebook
  `p.ohearn@ucl.ac.uk`
- Prof. Dr. Moshe Vardi – Rice University
  `vardi@cs.rice.edu`