

# Joshua Brody

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CONTACT INFORMATION	Swarthmore College Computer Science Department 500 College Ave Swarthmore, PA 19081	www.cs.swarthmore.edu/~brody joshua.e.brody@gmail.com (802)-738-0316
RESEARCH INTERESTS	Theoretical Computer Science, including communication complexity, unconditional lower bounds, property testing, streaming algorithms, data structures.	
EDUCATION	<b>Dartmouth College</b> , Hanover, NH Ph.D., “Some Communication Complexity Results and Their Applications” <b>Advisor:</b> Amit Chakrabarti <b>Research Area:</b> Communication Complexity <b>2005-2010</b>	
	<b>New York University</b> , New York, NY Master of Science in Computer Science <b>GPA:</b> 3.97/4.0 <b>2003-2005</b>	
	<b>Carnegie Mellon University</b> , Pittsburgh, PA Bachelor of Science in Mathematics/Computer Science <b>GPA:</b> 3.32/4.0 <b>1993-1997</b>	
EMPLOYMENT	<b>Swarthmore College</b> , Swarthmore, PA Assistant Professor Visiting Assistant Professor <b>2014-present</b> <b>2013-2014</b>	
	<b>Aarhus University</b> , Aarhus, Denmark Postdoctoral researcher, Computer Science <b>Supervisor:</b> Peter Bro Miltersen <b>2011-2013</b>	
	<b>Tsinghua University IIIS</b> , Beijing, China Postdoctoral researcher at the Institute for Interdisciplinary Information Sciences <b>Supervisor:</b> Andy Yao <b>2010-2011</b>	
	<b>Dartmouth College</b> , Hanover, NH Lecturer for Computer Architecture (CS 37) <b>2010</b>	
	<b>Dartmouth College</b> , Hanover, NH Research Assistant <b>2006-2010</b>	
	<b>Encoda Systems</b> , New York, NY Software Developer <b>2003-2004</b>	
	<b>Lycée Provincial de Yako</b> , Yako, Burkina Faso Peace Corps Volunteer (Secondary Math Education) <b>2000-2002</b>	
	<b>Lockheed Martin ATL</b> , Camden, NJ Software Engineer <b>1998-2000</b>	
	<b>6DOS, Inc.</b> , Pittsburgh, PA Software Developer <b>1996-1998</b>	
GRANTS AND FUNDING	<i>Lower Bounds via Communication Complexity.</i> Danish Council for Independent Research. DKK 1,718,502 (\$318,000). October 2011-June 2013.	

JOURNAL  
PUBLICATIONS

[J1] “Certifying Equality With Limited Interaction”, (with Amit Chakrabarti, Ranganath Kondapally, David P. Woodruff, and Grigory Yaroslavtsev), *Algorithmica*, 2016, pp. 1-60. Invited article for the Special Issue on Information Complexity and Applications. This article merges results from “Certifying Equality with Limited Interaction” and “Beyond Set Disjointness: The Communication Complexity of Finding the Intersection”. (see [C2] and [C4] below)

[J2] “Towards a Reverse Newman’s Theorem in Interactive Information Complexity”, (with Harry Buhrman, Michal Koucky, Bruno Loff, Florian Speelman, and Nikolay Vereshchagin), *Algorithmica*, 2016, pp. 1-33. Invited article for the Special Issue on Information Complexity and Applications. (see [C6] below)

[J3] “Adapt or Die: Polynomial Lower Bounds for Nonadaptive Data Structures,” (with Kasper Green Larsen), *Theory of Computing*, **11**(19), 2015, pp. 471-489.

[J4] “Property Testing Lower Bounds via Communication Complexity,” (with Eric Blais and Kevin Matulef), *Computational Complexity*, **21**(2), 2012, pp. 311-358. Special issue of selected papers from the 26th IEEE Conference on Computational Complexity (CCC 2011).

CONFERENCE  
PUBLICATIONS

[C1] “Dependent Random Graphs and Multi-Party Pointer Jumping,” (with Mario Sanchez), in *19th International Workshop on Randomization and Computation (RANDOM 2015)*.

[C2] “Certifying Equality with Limited Interaction,” (with Amit Chakrabarti, Ranganath Kondapally, David P. Woodruff, and Grigory Yaroslavtsev), in *18th International Workshop on Randomization and Computation (RANDOM 2014)*. **Invited to the Special Issue of Algorithmica on Information Complexity and Applications.** (see [J1] above)

[C3] “The Information Complexity of Hamming Distance,” (with Eric Blais and Badih Ghazi), in *18th International Workshop on Randomization and Computation (RANDOM 2014)*.

[C4] “Beyond Set Disjointness: The Communication Complexity of Finding the Intersection,” (with Amit Chakrabarti, Ranganath Kondapally, David P. Woodruff, and Grigory Yaroslavtsev), in *33rd Annual ACM Symposium on Principles of Distributed Computing (PODC 2014)*. **Invited to the Special Issue of Algorithmica on Information Complexity and Applications.** (see [J1] above)

[C5] “Cryptogenography,” (with Sune Jakobsen, Dominik Scheder, and Peter Winkler), in *5th Innovations in Theoretical Computer Science (ITCS 2014)*.

[C6] “Towards a Reverse Newman’s Theorem in Interactive Information Complexity,” (with Harry Buhrman, Michal Koucky, Bruno Loff, Florian Speelman, and Nikolay Vereshchagin), in *28th IEEE Conference on Computational Complexity (CCC 2013)*. **Invited to the Special Issue of Algorithmica on Information Complexity and Applications.** (see [J2] above)

[C7] “Space-Bounded Communication Complexity,” (with Shiteng Cheng, Periklis A. Papakonstantinou, Hao Song, and Xiaoming Sun), in *4th Innovations in Theoretical Computer Science (ITCS 2013)*.

[C8] “Space Efficient Approximation Scheme for Circular Earth Mover Distance,” (with Hongyu Liang and Xiaoming Sun), in *10th Latin American Theoretical Informatics Symposium (LATIN 2012)*.

[C9] “Streaming Algorithms with One-Sided Estimation,” (with David P. Woodruff), in *15th International Workshop on Randomization and Computation (RANDOM 2011)*.

[C10] “Lower Bounds for Testing Computability by Small Width OBDDs,” (with Kevin Matulef and Chenggang Wu), in *8th Annual Conference on Theory and Applications of Models of Computation (TAMC 2011)*.

[C11] “Property Testing Lower Bounds via Communication Complexity,” (with Eric Blais and Kevin Matulef), in *26th Annual IEEE Conference on Computational Complexity (CCC 2011)*. **Invited to the Special Issue of Computational Complexity.** (see [J4] above)

[C12] “The Coin Problem and Pseudorandomness for Branching Programs,” (with Elad Verbin), in *51st Annual IEEE Symposium on Foundations of Computer Science (FOCS 2010)*.

[C13] “Better Gap Hamming Lower Bounds via Better Round Elimination,” (with Amit Chakrabarti, Oded Regev, Thomas Vidick, and Ronald de Wolf), in *14th International Workshop on Randomization and Computation (RANDOM 2010)*.

[C14] “Distributed Monitoring of Conditional Entropy for Anomaly Detection in Streams,” (with Chrisil Arackaparambil, Sergey Bratus, and Anna Shubina), in *3rd International Workshop on Scalable Stream Processing Systems (SSPS 2010)*.

[C15] “A Multi-Round Communication Lower Bound for Gap Hamming and Some Consequences,” (with Amit Chakrabarti), in *24th Annual IEEE Conference on Computational Complexity (CCC 2009)*.

[C16] “The Maximum Communication Complexity of Multiparty Pointer Jumping,” (sole author), in *24th Annual IEEE Conference on Computational Complexity (CCC 2009)*.

[C17] “Functional Monitoring Without Monotonicity,” (with Chrisil Arackaparambil and Amit Chakrabarti), in *36th International Colloquium on Automata, Languages, and Programming (ICALP 2009)*.

[C18] “Streaming Estimation of Information-theoretic Metrics for Anomaly Detection,” (with Sergey Bratus, David Kotz, and Anna Shubina), in *11th International Symposium on Recent Advances in Intrusion Detection (RAID 2008)*.

[C19] “Sublinear Communication Protocols for Multi-Party Pointer Jumping and a Related Lower Bound,” (with Amit Chakrabarti), in *25th International Symposium on Theoretical Aspects of Computer Science (STACS 2008)*.

#### MANUSCRIPTS

[M1] “Position-Based Cryptography and Multiparty Communication.” (with Stefan Dziembowski, Krzysztof Pietrzak, and Sebastian Faust), 2016.

[M2] “Graph Containment Properties in Dependent Random Graphs.” (with Mario Sanchez), 2016.

[M3] “Non-Adaptive Data Structures for Predecessor Search.” (with Joe Boninger and Owen Kephart), 2016.

[M4] “Distance-Sensitive Property Testing Lower Bounds.” (with Pooya Hatami), 2014.

#### TEACHING EXPERIENCE

**Swarthmore College**, Swarthmore, PA *September 2013-present*  
Instructor for CPSC21 (*Introduction to Computer Science*), CPSC35 (*Data Structures and Algorithms*), CPSC41 (*Algorithms*), CPSC49/Math59 (*The Probabilistic Method*), CPSC93 (*Directed Reading Course in Communication Complexity*).

**Aarhus University**, Aarhus, Denmark *Third Quarter, Winter 2013*  
Instructor for *Sublinear Time Algorithms: Property Testing*

**KTH Royal Institute of Technology**, Stockholm, Sweden *September 2012*  
Guest Lecturer for *Seminars on Theoretical Computer Science: Communication Complexity*. Six lecture hours total. Primary Instructor: Jakob Nordström.

**Aarhus University**, Aarhus, Denmark *Second Quarter, Fall 2011*  
Instructor for *Communication Complexity*

	<p><b>Tsinghua University IIIS</b>, Beijing, China <span style="float: right;"><i>Summer 2011</i></span>  Instructor for <i>Yao Class Research Immersion Course in Theoretical Computer Science</i></p> <p><b>Dartmouth College</b>, Hanover, NH <span style="float: right;"><i>Summer 2010</i></span>  Instructor for CS37 (<i>Computer Architecture</i>)</p> <p><b>Dartmouth College</b>, Hanover, NH <span style="float: right;"><i>2005-2010</i></span>  Teaching Assistant for CS4 (<i>Concepts in Computing</i>), CS5 (<i>Introduction to Computer Science</i>), CS37 (<i>Computer Architecture</i>)</p> <p><b>New York University</b>, New York, NY <span style="float: right;"><i>Spring 2005</i></span>  Grader for V22.0478 (<i>Introduction to Cryptography</i>)</p> <p><b>Lycée Provincial de Yako</b>, Yako, Burkina Faso <span style="float: right;"><i>2000-2002</i></span>  Teacher for Junior and Senior High School Mathematics (instruction in French)</p> <p><b>Carnegie Mellon University</b>, Pittsburgh, PA <span style="float: right;"><i>Spring 1995</i></span>  Teaching Assistant for <i>Introduction to Calculus</i></p>
UNIVERSITY ACTIVITIES	<p><b>Swarthmore College</b>  ITS Committee (2014-2015),  Aydelotte Foundation Faculty Seminar in Collaboration (2015-2016),  Aydelotte Foundation Faculty Seminar in Pedagogy (2016-2017),  Sigma Xi Treasurer, Swarthmore College Chapter (2015-present),  Coach of the ACM-ICPC Programming Team (2014-present)</p> <p><b>Tsinghua University IIIS</b>  Organizer, Theory Lunch (2010-2011)  Organizer, Algorithms, Complexity, Cryptography Seminar (2011)</p> <p><b>Dartmouth College</b>  Ph.D. Admissions Committee, student member (2006, 2008)  Co-founder and organizer, Dartmouth Computer Science Research Symposium (2006,2007)</p>
PROFESSIONAL SERVICE	<p><b>Co-Organizer:</b> CTIC Workshop on Synergies in Lower Bounds (2009)</p> <p><b>Funding Reviewer:</b> Israeli Science Foundation.</p> <p><b>Journal Referee:</b> Algorithmica, Computational Complexity, DIST, JACM, Journal of Cryptography, SICOMP, Theory of Computing, Theory of Computing Systems, Transactions on Computation Theory, Transactions on Information Theory.</p> <p><b>Conference Referee:</b> APPROX, CCC, DISC, FOCS, ICALP, ITCS, PODS, RANDOM, SIROCCO, SODA, SOFSEM, SPAA, STACS, STOC.</p>
INVITED TALKS	<p>“Dependent Random Graphs and Multiparty Pointer Jumping,” <i>Johns Hopkins Algorithms and Complexity Seminar</i>, Baltimore, MD. March 2016.</p> <p>“Dependent Random Graphs and Multiparty Pointer Jumping,” <i>University of Pennsylvania Theory Seminar</i>, Philadelphia, PA. December 2015.</p> <p>“Property Testing Lower Bounds via Communication Complexity,” <i>BIRS Workshop on Communication Complexity and Applications</i>, Banff, Canada. August 2014.</p> <p>“Amazingly Dense Ruzsa-Szemerédi Graphs, Plus Applications,” <i>KTH Theory Reading Group</i>, Stockholm, Sweden. September 2012.</p> <p>“Streaming Algorithms with One-Sided Estimation,” <i>TU Dortmund Workshop on Algorithms for Data Streams</i>, Dortmund, Germany. July 2012.</p>

“Property Testing Lower Bounds via Communication Complexity: A Survey,” *Centrum Wiskunde & Informatica (CWI)*, Amsterdam, Netherlands. March 2012.

“Property Testing Lower Bounds via Communication Complexity: A Survey,” *LIAFA Theory Seminar*, Paris, France. March 2012.

“Property Testing Lower Bounds via Communication Complexity,” *University of Massachusetts-Amherst Theory Seminar*, Amherst, MA. June 2011.

“Property Testing Lower Bounds via Communication Complexity,” *Dartmouth College Theory Seminar*, Hanover, NH. June 2011.

“Communication Complexity and Applications,” *Tsinghua University ITCS Institute Seminar*, Beijing, China. September 2010.

“Better Gap Hamming Lower Bounds via Better Round Elimination,” *University of Massachusetts-Amherst Theory Seminar*, Amherst, Massachusetts. February 2010.

“The NOF Communication Complexity of Multi-Party Pointer Jumping,” *Institute for Advanced Study (IAS) Computer Science/Discrete Mathematics Seminar*, Princeton, NJ. December 2009.

“Multiround Lower Bounds for Gap Hamming via Round Elimination,” *Aarhus University*, Aarhus, Denmark. November 2009.

“The NOF Communication Complexity of Multi-Party Pointer Jumping,” *Aarhus University*, Aarhus, Denmark. November 2009.

“Lower Bounds for Gap-Hamming-Distance and Consequences for Streaming Algorithms,” *Centrum Wiskunde & Informatica (CWI)*, Amsterdam, Netherlands. July 2009.

“A Multi-Round Communication Lower Bound for the Gap Hamming Problem,” *Tel Aviv University Theory of Computation Seminar*, Tel Aviv, Israel. June 2009.

“Some Applications of Communication Complexity,” *Northeastern University Theory of Computation Seminar*, Boston, MA. February 2009.