

## Curriculum Vitae for Ernest S. Croot III

### I. Education.

BS in Mathematics and in Computer science from Centre College, Danville KY in 1994.

Ph.D. in Mathematics from The University of Georgia, 1994-2000.

Post-doctorate position U.C. Berkeley, 2000-2003.

### II. Publications

Work which already appears, is to appear, or has been accepted:

1. *On Non-Intersecting Arithmetic Progressions*, Acta Arith. **110** (2003), no. 3, 233-238.
2. *On a Coloring Conjecture about Unit Fractions*, Ann. of Math. **157** (2003), no. 2, 545-556.
3. *On the Oscillations of Multiplicative Functions Taking Values  $\pm 1$* , J. Number Theory **98** (2003), no. 1, 184-194.
4. *Unit Fractions and the Class Number of a Cyclotomic Field* (with Andrew Granville), J. London Math. Soc. **66** (2002), no. 3, 579-591.
5. *On Unit Fractions with Denominators in Short Intervals*, Acta. Arith **99** (2001), 99-114.
6. *Binary Egyptian Fractions*, with D. Dobbs, J. Friedlander, A. Hetzel, and F. Pappalardi, J. of Number Theory **84** (2000), 63-79.
7. *On Some Questions of Erdős and Graham about Egyptian Fractions*, Mathematika **46** (1999), 359-372.
8. *On Variants of the Larger Sieve*, with C. Elsholtz. Acta Math. Hungar. **103** (2004), 243-254.
9. *On the Distribution of Grand Canonical Density Matrices*, with G. Kin-Lic Chan, P. Ayers, and M. Head-Gordon, J. Statist. Phys. **109** (2002), no. 1-2, 289-299.

10. *The ABC Conjecture and Correctly Rounded Reciprocal Square-Roots* (with Ren-Cang Li and H. J. Zhu), Theoret. Comput. Sci. **315** (2004), 405–417.
11. *On Thin Sets of Primes Expressible as a Ternary Sumset*, Acta Math. Hungar. **106** (2005), 197-226.
12. *Sums of the Form  $1/x_1^k + \cdots + 1/x_n^k$  Modulo a Prime*, INTEGERS **4** (2004).
13. *Long Arithmetic Progressions in Critical Sets*, Jour. Comb. Theory Ser. A **113** (2006), 53-66.
14. *Complexity of Inverting the Euler Function* (with I. Shparlinski and S. Contini), Math. Comp. **75** (2006), 983–996.
15. *A Combinatorial Method for Counting Smooth Numbers in Sets of Integers*, Journal of Number Theory **126** (2007), 237-253.
16. *Long Arithmetic Progressions in Sparse Sumsets* (with I. Ruzsa, and T. Schoen), Combinatorial Number Theory, 157-164, de Gruyter, Berlin, 2007.
17. *The Minimal Number of Three-Term Arithmetic Progressions Modulo a Prime Converges to a Limit*, Canadian Math Bulletin **51** (2008), 47-56.
18. *Smooth Numbers in Short Intervals*, Intern. Jour. of Number Theory **3** (2007), 159-169.
19. *On the Decay of the Fourier Transform and Three-Term Arithmetic Progressions*, J. of Analytic Combinatorics **2** (2007).
20. *Running Time Predictions for Factoring Algorithms* (with A. Granville, P. Tetali, and A. Granville), Lecture Notes in Computer Science (part of proceedings of ANTS),
21. *Open Problems in Additive Combinatorics* (with S. Lev), CRM Proceedings and Lecture Notes **43** (2007), 207-233.
22. *On a Combinatorial Method for Developing Lucas Sequence Identities*, Anatomy of the Integers Conference Proceedings.

23. *A New Proof of Roth's Theorem on Arithmetic Progressions* (with O. Sisask), Proc. of the American Math. Soc. **137** (2009), 805-809.
24. *On Sumsets and Spectral Gaps* (with T. Schoen), Acta Arith. **136** (2009), 47-55.
25. *h-fold sums from a set with few products* (with D. Hart), SIAM J. of Discrete Math. **24** (2010), 505-519.
26. *Sums and Products in  $C[x]$*  (with D. Hart), Ramanujan Jour. **22** (2010), 33-54.
27. *On the Structure of Sets with Few Three-Term Arithmetic Progressions*, Elec. J. of Comb. **17** (2010), R128.
28. *On Rich Lines in Grids* (with E. Borestein), Disc. and Comp. Geom. **43** (2010), 824-840.
29. *A Probabilistic Technique for Finding Almost-Periods of Convolutions* (with O. Sisask), Geom. Funct. Anal. **20** (2010), 1367-1396.
30. *Sum-product Inequalities with Perturbation* (with S. Backman, M. Hamel, and D. Hart), to appear in INTEGERS.
31. *On a Certain Generalization of the Balog-Szemerédi-Gowers Theorem* (with E. Borestein), SIAM J. Discrete Math. **25** (2011), 685-694.
32. *On Sharp Transitions in Making Squares* (with A. Granville, R. Pemantle and P. Tetali), to appear in Annals of Math.
33. *Deterministic Methods to Find Primes* (with T. Tao and H. Helfgott), Math. Comp. **81** (2012), 1233-1246.
34. *Threshold Results for the Inventory Cycle Offsetting Problem* (with K. Huang), to appear in Inter. Jour. of Math. in Operations Research.

**Submitted Work:**

35. *Arithmetic progressions in sumsets and  $L^p$ -almost-periodicity* (with I. Laba and O. Sisask), submitted to Crelle's Journal.

36. *Some properties of lower level-sets of convolutions*, provisionally accepted by Comb. Prob. and Computing, pending minor edit.

### III. Awards and Rewards.

CETL Appreciation Certificate (March 2011 for Math 3215).

NSF grant DMS-1001111 for the years 2011-2013

NSA grant for 2009-2010.

NSF grant DMS-0500863 for the years 2005-2007.

NSF grant DMS-0301282 for the years 2003-2006.

The Robert C. Anderson Memorial Research Award (2002), given by The University of Georgia.

VIGRE Postdoctoral Grant U. C. Berkeley, 2000-2003.

UGA Graduate School Assistantship (research assistantship) 1996-1997, 1997-1998, and 1998-1999.

Graduate School Research Award, 1999.

Solved a \$500 question of P. Erdős and R. L. Graham, which is the subject of paper 1 above.

### IV. Conferences Attended and Talks Given.

2011 : Attended part of the INTEGERS conference at West Georgia.

2011 : Attended PANTS conference at Emory University.

2011 : Invited to speak at Gregynog, Wales as part of an International Conference on Geometric Group Theory and Additive Combinatorics, hosted through the Isaac Newton Institute.

2010 : Invited to give a talk at a satellite ICM conference in Chennai, India in combinatorial and analytic number theory.

2010 : Invited to speak at SIAM J. of Discrete Math conference at CMU.

2010 : Invited to give colloquium at Kansas State University.

2010 : Organized a summer mini-conference on Additive Combinatorics.

2009 : Invited to speak in the IPAM (at UCLA) workshop in Analytic Additive Combinatorics.

5/09 : Invited to attend ergodic theory conference in Paris.

3/09 : Invited to speak at a number theory conference at UIUC.

2009 : Contributed lecture at PANTS conference at Clemson University.

10/08 : Invited to give a talk at the sectional AMS meeting in Alabama.

9/08 : Invited to attend Special Semester on Ergodic Theory in combinatorics held at MSRI.

6/08 : Invited to attend ANTS VIII (Algorithmic Number Theory Symposium), held this year at Banff.

5/08 : Invited to speak at the Cumberland Combinatorics Conference.

4/08 : Invited to attend and speak at Fields Institute workshop on Additive Combinatorics

12/07 : Contributed talk at PANTS, U. South Carolina (Palmetto Number Theory Series)

9/07-12/07: Invited to Attend IAS special Semester on Additive Combinatorics.

10/06: Invited to give a talk at the Clemson Combinatorics Conference.

1/06-6/06: Special Semester on Number Theory, U. Montreal (invited participant)

10/05: Attended INTEGERS conference (but did not speak).

9/05: Invited to give a lecture at Bristol College, England.

5/05: Invited to give a lecture at CUNY on Combinatorial and Additive Number Theory.

4/05: Invited to give a lecture at AMS meeting at UCSB.

11/04: Invited to deliver colloquium at Indiana University.

9/04: Invited to Attend Additive Number Theory Conference at the American Institute of Mathematics, Palo Alto, CA.

6/04: Attend CNTA VIII conference in Toronto to give a contributed lecture.

5/04: Invited to speak at U. of Illinois Number Theory Conference

3/04: Invited to speak at Clemson University in the Discrete Math Seminar

2/04: Invited to speak at the University of Michigan number theory seminar

11/03: Penn State University (invited to give a lecture)

10/03: West Georgia Conference on Combinatorial Number Theory (invited to give lecture).

2/03: Georgia Institute of Technology (to give a Colloquium)

2/03: University of South Carolina (to give a Colloquium)

2/03: University of Toronto (to give a Colloquium)

5/02: University of Georgia (to receive Robert C. Anderson Prize).

1/02: University of British Columbia, Vancouver (to give a colloquium).

1/02: AMS meeting in San Diego (to give a talk).

12/01: MSRI Conference on L-series (attended).  
 11/01: Santa Clara University (to give a colloquium).  
 9/00: AMS meeting at University of Toronto (to give a talk).  
 8/00: Workshop on Algorithmic Number Theory, MSRI (attended).  
 7/00: Millennial Number Theory Conference held at U. of Illinois, Urbana-Champaign (attended).  
 6/00: SIAM Discrete Mathematics Conference at Minneapolis (to give a talk).  
 9/99: University of Illinois Urbana-Champaign Number Theory Conference (to give a talk).  
 7/99: Erdős and His Mathematics held in Budapest, Hungary (attended).  
 12/98: Western Number Theory Conference held at San Francisco State University (to give a talk).  
 3/98: SERMON (South Eastern Regional Meet on Numbers) held at University of North Carolina, Greensboro (to give a talk).  
 12/97: Western Number Theory Conference held at Asilomar in Monterey, California (to give a talk).  
 4/97: SERMON held at the University of Georgia (to give a talk).  
 6/96: The National Security Agency Headquarters, Ft. Mead, Maryland (to give a talk).  
 2/96: DIMACS Conference at Rutgers University (attended).  
 10/95: Western Number Theory Conference at Asilomar in Monterey, California (to give a talk).

## V. Professional Services.

I have refereed (or am refereeing) papers submitted to:

1. *INTEGERS*
2. *The Ramanujan Journal*
3. *Journal of Number Theory* (many times)
4. *Electronic Journal of Combinatorics*
5. *New York Journal of Mathematics*
6. Several ANTS (Algorithmic Number Theory Symposium) Conference Proceedings articles
7. *Mathematics of Computation*
8. *Combinatorica*
9. *Transactions of the AMS*

10. *Journal of the AMS*
11. *Israel Journal of Mathematics*
12. *Journal of Combinatorial Theory Series A*
13. *Proceedings of the AMS*
14. A few papers for an MSRI conference on combinatorics
15. Various computer science conference proceedings
16. *SIAM J. of Comp.*
17. *SIAM J. of Discrete Math.*
18. *Analysis and PDE*
19. *Journal of Integer Sequences*
20. *American Math Monthly*
21. *International J. of Number Theory*
22. *Duke Math. Journal*
23. *Geom. and Funct. Anal.*
24. *Int. Math. Res. Notices*

I was co-editor of the problems list for a workshop at AIM (American Institute of Mathematics) on additive combinatorics in 2004, as well as the co-editor of the problems list at the special semester on additive combinatorics held at Universite de Montreal in 2005. I was also a panelist for Algorithmic Number Theory Symposium (2007). Most recently I was made associate editor of *SIAM J. of Discrete Math.*

I have been asked to serve as a grant panelist for the National Science Foundation.

Outreach: I have twice given talks, and helped supervise for three years, a statewide math tournament held at Georgia Tech. I am a member of, and regularly attend, the Atlanta Science Tavern.

## **VII. Teaching Experience.**

Here I list the courses I have taught (or TA'ed) and the times I taught them:

At Georgia Institute of Technology I taught (or am teaching) the following courses:

1. Honors Probability and Statistics, Math 3225 (Fall 2003, Fall 2004, Fall 2005, Fall 2010).
2. Arithmetic Combinatorics (Spring 2004, Spring 2007, Spring 2011).
3. Calculus I (Fall 2004).
4. Abstract Algebra I, Math 4107 (Fall 2005, Spring 2008, Fall 2009, Spring 2011).
5. Abstract Algebra II, Math 4108 (Spring 2010).
6. Caculus II (Fall, 2006).
7. Abstract Vector Spaces, Math 2406 (Fall 2006, Spring 2009, Spring 2012).
8. Complex Analysis, Math 4320 (Fall 2008, Fall 2011).
9. Probability and Statistics for Engineers and Scientists, Math 3770 (Fall 2008).
10. Probability and Statistics, Math 3215 (Half of Summer 2009, Fall 2011).
11. Linear Algebra (Spring 2005).
12. Applied Combinatorics, Math 3012 (Spring 2005, Fall 2009, Summer 2010)

At U. C. Berkeley I taught the following courses:

1. Linear Algebra (Spring 2003).
2. Complex Analysis (undergrad), Spring 2001 and Fall 2002.
3. Abstract Algebra (undergrad), Spring 2002.
4. Number Theory (undergrad), Fall 2001.
5. Number Theory (graduate), Spring 2001.

At The University of Georgia I taught the following courses (Fall 1994-Spring 2000). I do not have specific dates for any of these:

1. Calculus I.



2. Calculus II.
3. Calculus III.
4. Pre-Calculus.
5. Calculus labs for Calculus I and Calculus II.
6. Math for All Practical Purposes (A math course for Humanities Majors, rated as lower than Pre-Calculus)

### **VIII. Grad Students Supervised.**

1. Evan Borenstein (ph.d. student – graduated 2009), 2004-2009.
2. Kai Huang (Master's Student – didn't seek degree in math, graduated ph.d. ISYE), 2005.
3. Albert Bush (ph.d. student), 2009-present.
4. Spencer Backman (ACO ph.d. student), summer 2009.
5. Chris Pryby, beginning Fall 2011.
6. Gagik Amirkhanyan, beginning Fall 2011, co-supervised with M. Lacey.

### **IX. Undergraduates Supervised.**

1. Henry Yeh (reading course), summer research U. C. Berkeley.
2. Matthew Powell (senior thesis), 2004 senior thesis.
3. Brian Williams (undergrad REU), summer 2005.
4. Brian Swanagan (undergrad REU), summer 2005.
5. Eldon Stegall (reading course), Fall 2005, Spring 2006.
6. James Anderson (reading course), Fall 2005.
7. Matthew Peterson (reading course), Fall 2005.
8. Hai Dang (reading course), Spring 2006.
9. Randy Heaton (reading course), Spring 2006.
10. Alexander Block (PURA award, undergrad), Fall 2006.
11. Julian Dawson (reading course), Fall 2006.

12. Brian Benson (undergrad, informally supervised).
13. Adam Tart (reading course), Spring 2007.
14. Jon Eisen (REU), Summer 2007.
15. Aisha Arroyo (REU), Summer 2007.
16. Xian Su (reading course), Spring 2008.
17. William Drobny (REU), Summer 2009.
18. Nathaniel Chen (REU), Summer 2009.
19. Meenasha Reyes (reading course), Fall 2009.
20. David Hollis (REU), Summer 2010.
21. David Lowry (REU), Summer 2010.
22. Sean Murphy (REU), Summer 2011.
23. Benjamin Reames (reading course/senior thesis), Spring 2012.

And I have assisted several more undergrads and grad students over the years on their projects informally (e.g. Josh Fergusson and Ander Steele).