

## Matthew T. Clay

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CONTACT INFORMATION	Department of Mathematical Sciences University of Arkansas Fayetteville, AR 72701	<i>Voice:</i> (479) 575-5195 <i>Fax:</i> (479) 575-8630 <i>E-mail:</i> <a href="mailto:mattclay@uark.edu">mattclay@uark.edu</a> <a href="http://mattclay.hosted.uark.edu">http://mattclay.hosted.uark.edu</a>
CITIZENSHIP	USA	
RESEARCH INTERESTS	Geometric group theory, automorphisms of free groups, mapping class groups, group actions on trees AMS MCS2010: 20E, 20F, 57M	
EDUCATION	<b>The University of Utah</b> , Salt Lake City, Utah  Ph.D, Mathematics, May 2006 <ul style="list-style-type: none"><li>• Thesis: <i>Deformation spaces of <math>G</math>-trees</i></li><li>• Adviser: Mladen Bestvina</li><li>• Area of Study: Geometric group theory</li></ul> M.S., Mathematics, May 2003  <b>The University of Oregon</b> , Eugene, Oregon  B.S., Mathematics, June 2001 <ul style="list-style-type: none"><li>• <i>Summa cum laude</i>, with honors</li><li>• Thesis: <i>A comparison of a direct and an iterative method for solving the linear systems arising from the finite element method for use in electrical impedance tomography</i></li><li>• Minor in Physics</li></ul>	
ACADEMIC EXPERIENCE	<b>University of Arkansas</b> , Fayetteville, Arkansas  <i>Associate Professor</i> <i>Assistant Professor</i>	<b>August 2015 to present</b> <b>August 2012 to July 2015</b> <ul style="list-style-type: none"><li>• <i>Teaching:</i> ODEs and Laplace Transforms (2584), Discrete Mathematics (2603), Combinatorics and Discrete Mathematics (3013), Introduction to Abstract Algebra I (3113), Introduction to Point-Set Topology (4703), Mathematics Major Seminar (4933), Topology I &amp; II (5703 &amp; 5713), Topics in Topology (679V)</li><li>• <i>Service:</i> Library liaison (Spring 2013 – Spring 2015), Undergraduate Programs Coordinator (Spring 2015 – Spring 2017; Fall 2020 – present), Curriculum Committee member (Fall 2017 – Spring 2020), Honors Council member (Fall 2017 – present), Promotion &amp; Tenure Committee member (Spring 2019 – present)</li></ul>

**Allegheny College**, Meadville, Pennsylvania

*Assistant Professor*

**August 2009 to July 2012**

- *Teaching:* Calculus, Foundations of Mathematics, Introduction to Analysis, Introduction to Topology, FSMAT 201: Who Wants To Be a Millionaire

**The University of Oklahoma**, Norman, Oklahoma

*Visiting Assistant Professor*

**August 2006 to July 2009**

- *Teaching:* Linear Algebra, Introduction to ODEs, Calculus

**The University of Utah**, Salt Lake City, Utah

*Graduate Student*

**August 2001 to June 2006**

- *Teaching:* Introduction to ODEs, Calculus, College Algebra, Introduction to Quantitative Thinking

OTHER  
PROFESSIONAL  
EXPERIENCE

**Electrical Geodesics Incorporated (EGI)**, Eugene, Oregon

*Research Assistant*

**December 1999 to June 2001**

- Researched feasibility of electrical impedance tomography for stroke detection
- Implemented both analytic and numerical solutions to inverse problems using C, C++ and Matlab

PHD STUDENTS

Jean Pierre Mutanguha, *Hyperbolic endomorphisms of free groups*, May 2020

GRANTS AND  
AWARDS

**American Institute of Mathematics**

- SQuaRE: Subgroups of  $\text{Out}(F_n)$  and their action on Outer space, three trips to AIM to meet with collaborators, 2011 – 2014

**Centre National de la Recherche Scientifique**

- 3 month scholarship to visit Laboratoire d'Analyse, Topologie, Probabilités (LATP), September 1, 2012 – November 30, 2012

**National Science Foundation**

- 2020 Redbud Geometry/Topology Conference (DMS-1953775) January 1, 2020 – December 31, 2020, \$24,999
- 2017 Redbud Geometry/Topology Conference (DMS-1702102) February 1, 2017 – January 31, 2018, \$27,606
- Conference Travel: Automorphisms of Free Groups: Algorithms, Geometry and Dynamics (DMS-1207738) July 1, 2012 – June 30, 2013 (with Mladen Bestvina and Alexandra Pettet), \$33,600
- RUI: Geometry and dynamics of Outer space (DMS-1006898) August 1, 2010 – July 31, 2012, \$94,317
- VIGRE Fellowship, 2002 & 2004

Simons Foundation

- Geometric aspects of infinite groups (Collaboration Grants for Mathematicians) September 1, 2014 – August 31, 2020, \$35,000

The University of Oregon

- DeCou Prize (Department of Mathematics), 2001

The University of Utah

- Outstanding Graduate Student Award (Department of Mathematics), 2004 & 2006
- Graduate Student Travel Assistance Award (Graduate School), 2005

CONFERENCES  
ORGANIZED

**Redbud Topology/Geometry Conference**

- March 6 to March 8, 2020, University of Arkansas, Fayetteville, Arkansas
- April 27 to April 29, 2017, University of Arkansas, Fayetteville, Arkansas
- October 3, 2015, University of Arkansas, Fayetteville, Arkansas
- November 1, 2014, University of Arkansas, Fayetteville, Arkansas

**Special Session on Groups in Low-dimensional Topology and Dynamics** (as part of Fall Southeastern Sectional Meeting of the AMS)

- November 3 to November 4, 2018, Fayetteville, Arkansas

**$G^3$  Geometric Groups on the Gulf Coast Conference**

- March 23 to March 25, 2017, Pensacola, Florida

**MAA Invited Paper Session on Office Hours With a Geometric Group Theorist** (as part of the Joint Meetings of the AMS and MAA)

- January 4, 2017, Atlanta, Georgia

**Automorphisms of free groups: algorithms, geometry and dynamics**

- November 12 to November 16, 2012, Centre de Recerca Matemàtica, Barcelona, Spain

**Summer school on automorphisms of free groups**

- September 25 to September 29, 2012, Centre de Recerca Matemàtica, Barcelona, Spain

**The geometry of the outer automorphism group of a free group**

- October 25 to October 29, 2010, American Institute of Mathematics (AIM), Palo Alto, California

PUBLICATIONS & Available at <http://mattclay.hosted.uark.edu>

PREPRINTS

*Minimal volume entropy of free-by-cyclic groups and 2-dimensional right-angled Artin groups* (with Corey Bregman), Preprint.

*Hyperbolic quotients of projection complexes* (with Johanna Mangahas), Preprint.

*Right-angled Artin groups as normal subgroups of mapping class groups* (with Johanna Mangahas and Dan Margalit), Preprint.

*Atoroidal dynamics of subgroups of  $\text{Out}(F_N)$*  (with Caglar Uyanik), to appear in the Journal of the London Mathematical Society.

*Simultaneous construction of hyperbolic isometries* (with Caglar Uyanik) Pacific Journal of Mathematics 294 (2018), 71–88.

*Uniform fellow traveling between surgery paths in the sphere graph* (with Yulan Qing and Kasra Rafi) Algebraic & Geometric Topology 17 (2017), 3751–3778.

*$\ell^2$ -homology of the free group*, Expositiones Mathematicae 35 (2017), 133–148.

*$\ell^2$ -torsion of free-by-cyclic groups*, The Quarterly Journal of Mathematics 68 (2017), 617–634.

*Stable commutator length in Baumslag–Solitar groups and quasimorphisms for tree actions* (with Max Forester and Joel Louwsma), Transactions of the American Mathematical Society 368 (2016), 4751–4785.

*An algorithm to detect full irreducibility by bounding the volume of periodic free factors* (with Johanna Mangahas and Alexandra Pettet), Michigan Mathematics Journal 64 (2015), 279–292.

*When does a right-angled Artin group split over  $\mathbb{Z}$ ?*, International Journal of Algebra and Computation 24 (2014), 815–825.

*Abstract commensurators of right-angled Artin groups and mapping class groups* (with Chris Leininger and Dan Margalit), Mathematical Research Letters 21 (2014), 461–467.

*Uniform hyperbolicity of the curve graph via surgery sequences*, (with Kasra Rafi and Saul Schleimer), Algebraic & Geometric Topology 14 (2014), 3325–3344.

*Whitehead graphs and separability in rank two*, (with John Conant\* and Nivetha Ramasubramanian\*) Involve 7 (2014), 431–452.

*Relative twisting in Outer space*, (with Alexandra Pettet) Journal of Topology and Analysis 4 (2012), 173–201.

*The geometry of right-angled Artin subgroups of the mapping class group*, (with Chris Leininger and Johanna Mangahas) Groups, Geometry and Dynamics 6 (2012), 249–278.

*Current twisting and nonsingular matrices*, (with Alexandra Pettet) Commentarii Mathematici Helvetici 87 (2012), 385–407.

“Turn graphs and extremal surfaces in free groups,” (with Max Forester and Noel Brady) *Topology and Geometry in Dimension Three*, Contemporary Mathematics 560 (2011), 171–178.

*Twisting out fully irreducible automorphisms*, (with Alexandra Pettet) *Geometric and Functional Analysis* 20 (2010), 657–689.

*Morse theory and conjugacy classes of finite subgroups II*, (with Noel Brady and Pallavi Dani) *Geometriae Dedicata* 147 (2010) 1–14.

*Growth of intersection numbers for free group automorphisms*, (with Jason Behrstock and Mladen Bestvina) *Journal of Topology* 3 (2010) 280–310.

*Whitehead moves for  $G$ -trees*, (with Max Forester) *Bulletin of the LMS* 41 (2009) 205–212.

*Deformation spaces of  $G$ -trees and automorphisms of Baumslag–Solitar groups*, *Groups, Geometry and Dynamics* 3 (2009) 39–69.

*On the isomorphism problem for generalized Baumslag–Solitar groups*, (with Max Forester) *Algebraic & Geometric Topology* 8 (2008) 2289–2322.

*Morse theory and conjugacy classes of finite subgroups*, (with Noel Brady and Pallavi Dani) *Geometriae Dedicata* 135 (2008), 15–22.

*A fixed point theorem for deformation spaces of  $G$ -trees*, *Commentarii Mathematici Helvetici* 82 (2007), 237–246.

*Contractibility of deformation spaces of  $G$ -trees*, *Algebraic & Geometric Topology* 5 (2005), 1481–1503.

*Written at* Electrical Geodesics Incorporated (EGI)

*Weighted regularization in electrical impedance tomography with applications to acute cerebral stroke*, (with Tom Ferree) *IEEE Transactions on Medical Imaging* 21(6) (2002), 629–637.

*The spatial resolution of scalp EEG*, (with Tom Ferree and Don Tucker) *Neurocomputing* 38–40 (2001), 1209–1216.

\* undergraduate co-author

## BOOKS

*Office Hours With a Geometric Group Theorist*, (co-edited with Dan Margalit), Princeton University Press, Princeton, 2017.

author or co-author of the following chapters in *Office Hours With a Geometric Group Theorist*:

- “Groups” with Dan Margalit, 3–20.
- “... and Spaces” with Dan Margalit, 21–42.
- “Free Groups and Folding”, 66–84.
- “Automorphisms of Free Groups”, 106–122.
- “Right-angled Artin Groups” with Robert W. Bell, 291–309.

*Instructor’s Guide with Solutions for Linear Algebra with Applications by Jeffery Holt* (2nd edition), W. H. Freeman and Company, New York, 2017.

## SOFTWARE

*sage-train-track* (with Thierry Coulbois) Free group automorphisms and train-track representatives (GitHub Repository)

*bsscl* Stable commutator length in Baumslag–Solitar groups (GitHub Repository)

*Primitive elements in the free group of rank two* Mathematica Demonstration Project

*Whitehead graphs and separability* Mathematica Demonstration Project

*Teichmüller space of a torus* Mathematica Demonstration Project

*Bounding partial sum of the harmonic series* Mathematica Demonstration Project

## INVITED TALKS *Previous 5 years*

*McMullen’s approach to minimal volume entropy of graphs*, Summer 2020, Hyperbolic Lunch, Toronto, Canada (via Zoom)

*Right-angled Artin groups as normal subgroups of mapping class groups*, Summer 2019, Aspects of Non-positive Curvature in Group Theory, Marseille, France

*Thermodynamics metrics in outer space*, Spring 2019, Spring Topology and Dynamics Conference, Birmingham, Alabama

*Right-angled Artin groups as normal subgroups of mapping class groups*, Spring 2019, Geometry & Topology Seminar, New Haven, Connecticut

*Right-angled Artin groups as normal subgroups of mapping class groups*, Summer 2018, Wasatch Topology Conference, Midway, Utah

*$\ell^2$ -torsion of free-by-cyclic groups*, Summer 2018,  $L^2$ -invariants and their analogues in positive characteristic, Madrid, Spain

*Thermodynamics metrics in outer space*, Spring 2018, Geometry of Teichmüller space and mapping class groups, Warwick, England

*Thermodynamic metrics in outer space*, Fall 2017, Geometry and Topology Seminar, Norman, Oklahoma

*Thermodynamic metrics in outer space*, Fall 2017, Topology & Group Theory Seminar, Nashville, Tennessee

*Geometric group theory*, Fall 2017, MAA-UP Regional Meeting at NMU, Marquette, Michigan

*$\ell^2$ -torsion of free-by-cyclic groups*, Summer 2017, Groups Actions and Cohomology in Non-positive Curvature, Cambridge, England

*$\ell^2$ -torsion of free-by-cyclic groups*, Fall 2016, Tech Topology Conference, Atlanta, Georgia

*$\ell^2$ -torsion of free-by-cyclic groups*, Fall 2016, Geometry of mapping class groups and  $\text{Out}(\text{Fn})$ , Berkeley, California

*$\ell^2$ -torsion of free-by-cyclic groups*, Spring 2016, Effective and Algorithmic Methods in Hyperbolic Geometry and Free Groups, Providence, Rhode Island

*$\ell^2$ -torsion of free-by-cyclic groups*, Spring 2016, Spring Topology and Dynamics Conference, Waco, Texas

*$\ell^2$ -torsion of free-by-cyclic groups*, Spring 2016, Groups, Geometry and Dynamics/GEAR Seminar, University of Illinois at Urbana-Champaign