

Matthew T. Clay

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> mattclay@uark.edu http://mattclay.hosted.uark.edu
CITIZENSHIP	USA	
RESEARCH INTERESTS	Geometric group theory, automorphisms of free groups, mapping class groups, group actions on trees AMS MCS2010: 20E, 20F, 57M	
EDUCATION	The University of Utah , Salt Lake City, Utah Ph.D, Mathematics, May 2006 <ul style="list-style-type: none">• Thesis: <i>Deformation spaces of G-trees</i>• Adviser: Mladen Bestvina• Area of Study: Geometric group theory M.S., Mathematics, May 2003 The University of Oregon , Eugene, Oregon B.S., Mathematics, June 2001 <ul style="list-style-type: none">• <i>Summa cum laude</i>, with honors• 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>• Minor in Physics	
ACADEMIC EXPERIENCE	University of Arkansas , Fayetteville, Arkansas <i>Professor</i> <i>Associate Professor</i> <i>Assistant Professor</i>	August 2021 to present August 2015 to July 2021 August 2012 to July 2015 <ul style="list-style-type: none">• <i>Teaching:</i> ODEs and Laplace Transforms (2584), Discrete Mathematics (2603), Transition to Advanced Mathematics Laboratory (2801L), Transition to Advanced Mathematics (2803), Combinatorics (3013), Introduction to Abstract Algebra I (3113), Introduction to Point-Set Topology (4703), Mathematics Major Seminar (4933), Topology I & II (5703 & 5713), Differential Topology (5723), Topics in Topology (679V)• <i>Department Service:</i> Library liaison (Spring 2013 – Spring 2015), Undergraduate Programs Coordinator (Spring 2015 – Spring 2017; Fall 2020 – present), Curriculum Committee member (Fall 2017 – present), Promotion & Tenure Committee member (Spring 2019 – Spring 2022)

- *University Service*: Honors Council member (Fall 2017 – present), Personnel Committee member (Fall 2021 – present)

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, 2022, \$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

- October 22, 2022, University of Arkansas, Fayetteville, Arkansas
- Spring 2022, University of Arkansas, Fayetteville, Arkansas (virtual seminar)
- Fall 2021, University of Arkansas, Fayetteville, Arkansas (virtual seminar)
- 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

Chain flaring and L^2 -torsion of free-by-cyclic groups, to appear in Journal of Topology and Analysis.

Thermodynamic metrics on outer space (with Tarik Aougab and Yo'av Rieck) Ergodic Theory and Dynamical Systems 43 (2023), 729–793.

Geometric group theory Notice of the AMS 69 no. 10 (2022), 1689–1699.

Hyperbolic quotients of projection complexes (with Johanna Mangahas) Groups, Geometry and Dynamics 16 (2022), 225–246.

Minimal volume entropy of free-by-cyclic groups and 2-dimensional right-angled Artin groups (with Corey Bregman) Mathematische Annalen 381 (2021), 1253–1281.

Right-angled Artin groups as normal subgroups of mapping class groups (with Johanna Mangahas and Dan Margalit) Compositio Mathematica 157 (2021), 1807–1852.

Atoroidal dynamics of subgroups of $\text{Out}(F_N)$ (with Caglar Uyanik) Journal of the London Mathematical Society (2) 102 (2020), 818–845.

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.

ℓ^2 -homology of the free group, Expositiones Mathematicae 35 (2017), 133–148.

ℓ^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 London Mathematical Society* 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*

Minimal volume entropy for free-by-cyclic groups, Spring 2022, Mapping class groups and $\text{Out}(\text{Fn})$, Paris, France

Chain flaring and L^2 -torsion of free-by-cyclic groups, Fall 2021, Topology Seminar, Baton Rouge, Louisiana (via Zoom)

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

Thermodynamics metrics in outer space, Spring 2020, UB Geometry and Topology Seminar, Buffalo, New York

Windmills in projection complexes, Spring 2020, Max Dehn Seminar, Salt Lake City, Utah

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

ℓ^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