David T. Gay

Curriculum Vitae

Personal Information

Contact details, University of Georgia
- Department of Mathematics
  University of Georgia
  Athens GA 30602 USA
  dgay@uga.edu

Birthdate and place
- 8th March, 1968, Suacoco County, Liberia

Citizenship
- U.S.A.

Academic Degrees

PhD
- University of California, Berkeley, Mathematics, 1999. Advisor: Robion Kirby.

AB
- Magna cum laude, Harvard College, Mathematics, 1991. Advisor: Persi Diaconis.

Academic Interests

- Geometric and differential topology, especially generalizations of Morse theory, low-dimensional symplectic and contact topology and smooth 4–manifolds and their diffeomorphisms and decompositions.
- Mathematics outreach, especially mathematical illustration, mathematics research with undergraduate and high school students, and popularizing modern mathematics for the general public.

Professional Positions Held

2018-present	• Professor, University of Georgia
2019-2020	• Hirzebruch Research Chair, Max Planck Institute for Mathematics
2016-2017	• Mathematician in Residence, Ideas for Creative Exploration (ICE), University of Georgia
2013-2018	• Associate Professor, University of Georgia
2011-2013	• Assistant Professor, University of Georgia
2009-present	• Director, Euclid Lab
2010-2011	• Visiting Associate Professor, University of Iowa
2010	• Member, Mathematical Sciences Research Institute
2005-2010	• Senior Lecturer, University of Cape Town
2003-2005	• Research Postdoctorate, CRM/ISM, Montreal
2002-2003	• Visiting Assistant Professor, University of Arizona
1999-2002	• Teaching Postdoctorate, University of Arizona
2000-2001	• Visiting Lecturer, Nankai Institute of Mathematics, Nankai University, China
1994-1999	• Graduate Student Instructor, UC Berkeley
1996-1997	• Student Associate, Mathematical Sciences Research Institute
1995	• Research Associate, Plant Biology Dept, Louisiana State University
1992-1993	• Biological Technician, Sequoia and Kings Canyon National Parks, USA
1991-1992	• Research Assistant, Marine Environmental Monitoring Program, South Florida Research Center, Everglades National Park, USA
1990-1991	• Research Assistant, Harvard/Smithsonian Center for Astrophysics
1990	• Research Assistant under Prof. Persi Diaconis, Math Dept, Harvard
1988-1989	• Software Developer, Imagination Software, Cambridge, MA, USA

Publications

- "Pseudo-isotopies of simply connected 4-manifolds", with D. Gabai, D. Hartman, V. Krushkal, and M. Powell. arXiv:2311.11196, submitted for publication.
- "Constructing Lagrangians from triple grid diagrams", with S. Blackwell and P. Lambert-Cole. arXiv:2306.16404, submitted for publication.
- "From near-symplectic constructions to trisections of 4-manifolds", *Celebratio Mathematica*, Special Volume for Robion Kirby (2022).
- "Relations amongst twists along Montesinos twins in the 4-sphere", with D. Hartman, arXiv:2206.02265, to appear in *Algebr. Geom. Topol.* (2022).
- "Diffeomorphisms of the 4-sphere, Cerf theory and Montesinos twins", arXiv:2102.12890, submitted for publication.
- "From near-symplectic constructions to trisections of 4-manifolds", Celebratio Mathematica, *Special Volume for Robion Kirby* (2022).
- "Doubly pointed trisection diagrams and surgery on 2–knots", with J. Meier, Math. Proc. Cambridge Philos. Soc., 172(1):163–195, (2022).
- "From Heegaard splittings to trisections; porting 3-dimensional ideas to dimension 4", Winter Braids Lect. Notes 5 (2018), Winter Braids VIII (Marseille, 2018), 1–19.
- "Functions on surfaces and constructions of manifolds in dimensions three, four and five", *Breadth in contemporary topology*, 79–94, Proc. Sympos. Pure Math., 102, Amer. Math. Soc., Providence, RI, 2019.
- "Trisections of 4–manifolds with boundary", with N. Castro and J. Pinzón-Caicedo, Proc. Natl. Acad. Sci. USA 115 (2018), no. 43, 10861–10868.
- "Morse structures on open books", with J. Licata, Trans. Amer. Math. Soc. 370 (2018), 3771–3802.
- "Diagrams for Relative Trisections", with N. Castro and J. Pinzón-Caicedo, Pacific J. Math. 294 (2018) 275–305.
- "Group trisections and smooth 4–manifolds", with A. Abrams and R. Kirby, Geom. Topol. 22 (2018) 1537–1545.
- "Trisections of Lefschetz Pencils", Algebr. Geom. Topol. 16 (2016), no. 6, 3523–3531.
- "Trisecting 4–manifolds", with R. Kirby, Geom. Topol. 20 (2016), no. 6, 3097–3132.
- "Indefinite Morse 2–functions; broken fibrations and generalizations", with R. Kirby, Geom. Topol. 19-5 (2015), 2465–2534.
- "Convex plumbings and Lefschetz fibrations", with T. Mark, J. Symplectic Geom. 11 (2013), no. 3, 363—375.
- "Discretized configurations and partial partitions", with A. Abrams and V. Hower, Proc. Amer. Math. Soc. 141 (2013), 1093–1104.
- "Reconstructing 4–manifolds from Morse 2–functions", with R. Kirby, in Proceedings of the Freedman Fest, Geometry & Topology Monographs 18 (2012) 103–114.
- "On symplectic caps", with A. Stipsicz, in Perspectives in analysis, geometry, and topology, 199–212, Progr. Math., 296, Birkhäuser/Springer, New York, 2012.
- "Fiber-connected, indefinite Morse 2–functions on connected n–manifolds", with R. Kirby, Proc. Natl. Acad. Sci. USA 108 (2011), no. 20, 8122–8125.
- "Symplectic surgeries and normal surface singularities", with A. Stipsicz, Alg. Geom. Topol. 9:2203-2223, 2009.
- "Toric structures on near-symplectic 4-manifolds", with M. Symington, J. Eur. Math. Soc., 11(3):487-520, 2009.
- "Symplectic rational blow-down along Seifert fibered 3-manifolds", with A. Stipsicz, Int. Math. Res. Not., 2007:rnm084-20, 2007.
- "Constructing Lefschetz-type fibrations on four-manifolds", with R. Kirby, Geom. Topol., 11:2075-2115, 2007.
- "Four-dimensional symplectic cobordisms containing three-handles", Geom. Topol. 10:1749-1759, 2006.
- "Constructing symplectic forms on 4-manifolds which vanish on circles", with R. Kirby, Geom. Topol., 8:743-777, 2004.
- "Open books and configurations of symplectic surfaces", Algebr. Geom. Topol., 3:569-586, 2003.
- "Explicit concave fillings of contact three-manifolds", Math. Proc. Cambridge Philos. Soc. 133(2):431-441, 2002.
- "Symplectic 2-handles and transverse links", Trans. Amer. Math. Soc. 354:1027-1047, 2002.
- "Symplectic 4-dimensional 2-handles and contact surgery along transverse knots", PhD Thesis, UC Berkeley, 1999.
- "Basic results in the classical inversive plane", AB Thesis, Harvard College, 1991.
- "A Wiener filter version of blind iterative deconvolution", with P. Nisenson and C. Standley, in Proc. of the STScI Workshop on the Restoration of HST Images and Spectra, R.L. White and R.J. Allen, eds., 1990.

Funding

2023-2028	• Recipient of Simons Foundation Travel Support for Mathematicians grant ($42,000)
2020-2023	• Recipient of NSF Division of Mathematical Sciences research funding award for 3 years ($319,697)

Funding (continued)

2017-2021	• Recipient of NSF Focused Research Group award with 8 colleagues at 6 institutions (total UGA budget $547,077)
2015-2020	• Awarded Simons Foundation Collaboration Grant ($35,000)
2013-2017, 2019	• Secured funding each year from the AMS Epsilon Fund to support student scholarships for Euclid Lab's Camp Euclid (total $29,000).
2012-2015	• Recipient of NSF Division of Mathematical Sciences research funding award for 3 years ($162,926)
2011-2012	• Awarded Simons Foundation Collaboration Grant through Euclid Lab ($7,000)
2008	• Recipient of South African NRF Focus Areas research funding (ZAR 129,000)
2007	• Recipient of South African NRF funding (ZAR 352,100) under USA/South Africa Research Collaboration Programme
2007	• With A. Stipsicz, recipient of South African NRF funding (ZAR 169,288) under Hungary/South Africa Research Collaboration Programme

Honours and Awards

2021	• Awarded UGA Creative Research Medal in the Natural Sciences and Engineering
2020	• Awarded UGA Creative Teaching Award
2017	• Mathematics department nominee for UGA Creative Research Medal in the Natural Sciences and Engineering
2014	• Mathematics department nominee for UGA Richard B. Russell Award for Excellence in Undergraduate Teaching
2012	• Fellow in UGA Teaching Academy Fellows Program
2010	• Research membership, Mathematical Sciences Research Institute
2008	• South African National Research Foundation (NRF) C1 rated researcher
2007	• University of Cape Town Fellows' Award ("to encourage the continuation of outstanding scholarly work by a young academic")
2003-2006	• Membership in National Science Foundation funded Focused Research Group with Akbulut, Freedman, Kirby, Melvin, Walker
2001-2002	• Department Award for Excellence, teaching award for non-tenure eligible faculty, Mathematics Department, University of Arizona
1998	• Mathematics Department Fellowship, UC Berkeley
1996	• Outstanding Graduate Student Instructor Award, UC Berkeley
1991	• Math Department recommendation for high honors, Harvard
1990	• John Harvard Scholarship for Academic Excellence, Harvard

Professional and Community Service

- Co-organizer, Georgia Topology Conference 2023
- UGA Mathematics Department Graduate Coordinator, 2022-present.
- Co-organizer, Georgia Topology Conference 2022
- Co-organizer, Georgia Topology Conference 2021
- Co-organizer, Winter Trisectors Workshop, virtual, Dec 2020
- Co-organizer, Workshop on 4–manifolds, MPIM, September 2019
- Co-organizer, LMS-Durham Symposium: Pseudoholomorphic curves and gauge theory in low-dimensional topology, August 2019
- Co-organizer, ThompScharBy Fest: Topology in dimensions 3, 3.5 and 4, June 2018
- Co-editor, Proceedings of the 2017 Georgian International Topology Conference
- Co-organizer, Georgia International Topology Conference 2017
- Co-organizer, American Institute of Mathematics workshop on "Trisections and low-dimensional topology", 2017
- Co-organizer, Georgia Topology Conference 2016
- Member, UGA Mathematics Department Graduate Committee, 2016-present
- Poster session judge, Peach State Louis Stokes Alliance for Minority Participation annual conference, 2015
- Sponsor, Athens Area Recreational Math Club for 3rd through 5th graders, 2015-present
- Faculty, Navajo Nation Math Camp, Summer 2014
- Chair, UGA Mathematics Department Facilities Committee, 2013-2016
- Faculty Advisor, UGA Math Circle, 2012-2015

Professional and Community Service (continued)

- Mentor, Topology Student Workshop, Georgia Institute of Technology, 2012
- Co-organizer, Georgia Topology Conference 2012
- Liaison between UGA Mathematics Department and Peach State Louis Stokes Alliance for Minority Participation, 2011-2016
- Undergraduate research supervisor, University of Georgia, 2011-present
- Senior mentor, Camp Euclid online high school research program, 2009-present
- Co-founder, Euclid Lab, 2009
- Reviewer, Mathematical Reviews and Zentralblatt Math
- Referee for Geometry and Topology, Algebraic and Geometric Topology, International Mathematics Research Notices, Geometria Dedicata, Transactions of the American Mathematical Society and Proceedings of the American Mathematical Society
- UCT undergraduate Topology seminar organizer (aimed at first-year undergraduates), 2005-2009
- UCT Geometry seminar organizer, 2005-2009
- Regularly gave outreach lectures at local Cape Town high schools, 2005-2009
- Regularly supervised UCT undergraduate 3rd-year projects, 2005-2009
- Regularly supervised student essays at the African Institute of Mathematical Sciences, 2005-2009
- Speaker, UCT Mathematics Afternoons, 2005
- Speaker, le programme CEGEP-Université de l'ISM, giving public talks at junior colleges in Québec, Canada 2003-2005
- Undergraduate research supervisor, University of Arizona, 2000-2002
- Mathematics Awareness Week co-organizer, University of Arizona, 2000 and 2002
- Topology seminar organizer, Nankai University, 2000-2001
- Undergraduate Seminar on Low-Dimensional Topology, co-supervisor, UC Berkeley, 1997
- Graduate student topology seminar co-organizer, UC Berkeley, 1996-1999
- Mathematics Graduate Student Association President, UC Berkeley, 1994-1995
- Math Club Coach, Golden Gate Elementary School, Oakland CA, USA, 1994-1995
- Graduate student hyperbolic geometry seminar co-organizer, UC Berkeley, Summer 1994

Selected Research Talks

- "On the smooth mapping class group of the 4-sphere", Cornell Topology Festival, May 2023
- "Diagrams in smooth 4–dimensional topology", Colloquium, Cornell University, May 2023
- "Diagrams for contractible spaces of 4–manifolds", Mathematisches Forschungsinstitut Oberwolfach, January 2023
- "Smooth automorphisms of the 4-dimensional sphere", Colloquium, University of Alabama, March 2022
- "On the smooth mapping class group of the 4–sphere", Mathematical Institute, University of Oxford, Oxford, UK, November 2019
- "Open questions on trisections of 4–manifolds", Topology Seminar, Alfréd Rényi Mathematical Research Institute, Budapest, Hungary, October 2019
- "Two-dimensional shadows of four-dimensional topology", Colloquium, Alfréd Rényi Mathematical Research Institute, Budapest, Hungary, October 2019
- "Reflections on the combinatorics of trisection diagrams", Virginia Topology Conference, December 2018
- "Trisection diagrams for surgeries along embedded surfaces", American Mathematical Society sectional meeting, Boston, MA, April 2018
- "From Heegaard splittings to trisections, a mini-course", CIRM Luminy, February 2018
- "Basic questions about trisections of 4-manifolds", Texas Geometry and Topology Conference, UT Austin, November 2017
- "Functions on surfaces and constructions of 3-, 4- and 5-manifolds", Max Planck Institute for Mathematics, Bonn, Germany, October 2016
- "Mini course on trisections", IPM, Tehran, Iran, August 2016
- "Mini course on bridging classical 3– and 4–manifold theory", with M. Scharlemann, Dublin, August 2015
- "Trisections of 4–manifolds II", International Centre for Mathematical Sciences, Edinburgh, July 2015
- "Heegaard splittings for 4–manifolds", Oklahoma State University Mathematics Department Topology Seminar, November 2014
- "Trisections of 4–manifolds", Georgia Institute of Technology Mathematics Department Topology Seminar, September 2014
- "Trisecting 4–manifolds", Rice University Mathematics Department Colloquium, October 2013

Selected Research Talks (continued)

- "Trisections of 4–manifolds", at "Geometry and topology of smooth 4–manifolds" workshop, Max Planck, Bonn, June 2013
- "Trisections of 4–manifolds", American Mathematical Society sectional meeting, Boston, MA, April 2013
- "Morse 2–functions and trisections of 4–manifolds", Banff International Research Station, Canada, March 2013
- "Trisections of 4–manifolds", American Mathematical Society sectional meeting, New Orleans, LA, August 2012
- "Morse 2–functions on 4–manifolds", American Mathematical Society sectional meeting, Ithaca, NY, September 2011
- "Low-dimensional Morse 2–functions", UC Berkeley conference in honor of Michael Freedman, June 2011
- "Indefinite Morse 2–functions", Mathematical Sciences Research Institute, May 2010
- "Uniqueness for broken fibrations", Banff International Research Station, Canada, March 2009
- "Maps from 4-manifolds to the 2-sphere", Alfréd Rényi Institute of Mathematics, Hungary, November 2008
- "Casting Shadows of Smooth 4-Dimensional Topology On the 2-Sphere", Kansas State University Colloquium, October 2008
- "Convexity of negative definite symplectic plumbings", U.C. Davis, September 2008
- "Constructing singular Lefschetz fibrations and pencils", Mathematisches Forschungsinstitut Oberwolfach, August 2006
- "Using two-dimensional surfaces to probe the topology of four-dimensional spaces", Stellenbosch University, November 2005
- "Locally toric near-symplectic 4-manifolds", Harvard University, October 2004
- "Singular symplectic structures with torus actions", McMaster University, Canada, April 2004
- "Constructing symplectic forms which vanish along circles", Harvard University, February 2004
- "Constructing harmonic 2-forms in dimension 4", Banff International Research Station, Canada, November 2003
- "Constructing symplectic forms which vanish along circles", Gökova Topology Conference, Turkey, May 2003
- "Neighborhoods of configurations of symplectic surfaces in symplectic 4-manifolds", Special session on contact and symplectic topology, AMS sectional meeting, New York, NY, April 2003
- "Controlling symplectic constructions using open books", Georgia Topology Conference, University of Georgia, May 2002
- "Symplectic cobordisms and open book decompositions", Special session on symplectic and contact topology, AMS sectional meeting, Georgia Institute of Technology, March 2002
- "Germs of 4-dimensional symplectic structures along 3-manifolds", Workshop on Symplectic and Contact Topology, Leiden University, the Netherlands, August 2001
- "Concave fillings of contact 3-manifolds", International Conference on Symplectic Geometry and Topology, Chengdu-Tianjin-Beijing, China, June 2001
- "Explicit constructions of concave fillings of contact 3-manifolds", Mathematics Colloquium, Beijing University, China, March 2001
- "From mapping class groups of surfaces to symplectic cobordisms", Mathematics Colloquium, Nankai Institute of Mathematics, Nankai University, China, February 2001
- "Fibered transverse links and symplectic constructions", Workshop in Geometric Topology, Colorado College, June 2000
- "Attaching 4-dimensional symplectic 2-handles along transverse knots", Conference on Symplectic Geometry, Instituto Superior Tecnico, Lisboa, Portugal, June 1999
- "New 4-dimensional symplectic bordisms", Berkeley, Davis, Santa Cruz, Stanford Joint Symplectic Geometry Seminar, Stanford University, October 1998
- "Existence and uniqueness questions for symplectic structures on S^1 cross a 3-manifold", Joint Meeting of the American Mathematical Society and the South African Mathematical Society, Pretoria, South Africa, June 1997

Selected Educational, Outreach and Interdisciplinary activities

- Co-organizer, Athens Clarke Country Public Library Math Circle, 2023-present.
- "GROVI: Geometry Research, Outreach and Visualization Initiative", launched 2021 with undergraduate research and illustration project on the monkey saddle.
- "The 24–cell and the 4–dimensional torus", Budapest Semesters in Mathematics, Budapest, Hungary, October 2019.
- Contributed artwork, collaboration with Moon Jang, at SuperSurfaces Exhibition, Doosung Paper Co., Ltd., Seoul, Korea, January 2019.
- "Slicing and dicing in dimension four", Mercer University Math Honors Day keynote speaker, March 2017.
- "Smooth 4–dimensional topology", UGA VIGRE graduate student seminar, January 2014.
- "Visualizing families of functions on surfaces", UGA math club talk, March 2012.
- "Things to do with 120 dodecahedra", UGA math club talk, November 2011.
- "Mathematics and knots, a slice of life as a mathematician and some unsolved problems", UCT Open Day, May 2009.

Selected Educational, Outreach and Interdisciplinary activities (continued)

- "What is the fourth dimension?", COSAT High School, Cape Town, September 2007.
- "Polyhedra and maps of (imaginary) planetary surfaces", LEAP High School, Cape Town, July 2007.
- "Boy's surface, the projective plane, and everting the 2-sphere", with R. Kirby, African Institute of Mathematical Sciences, December 2006.
- "What is the fourth dimension?", LEAP and COSAT High Schools, Cape Town, August 2006.
- "Mathematical mystery", radio interview on the Poincaré conjecture, Lisa Chait show, 567 Capetalk Radio, August 2006.
- "What is the fourth dimension?", Heathfield High School, Cape Town, July 2006.
- "How to draw pictures of four-dimensional spaces", African Institute of Mathematical Sciences, January 2006
- "Radical polyhedra", UCT Mathematics Afternoons, University of Cape Town, August 2005
- "Tying knots in the fourth dimension", Heritage College, Hull, Québec, March 2004
- "Mapping class groups of surfaces", a three week lecture series in the Undergraduate Research Opportunities Seminar, U of Arizona, April 2002
- "Knots in theory and in reality; a window into mathematical research", with A. Goriely, Mathematics Awareness Week Theme Lecture, U of Arizona, May 2000

Courses Taught

- Math Outreach Design Lab (collaborative with Lamar Dodd School of Art), U of Georgia
- Freshan Odyssey Seminar, U of Georgia
- College Algebra, U of Arizona
- Trigonometry, U of Arizona
- Precalculus, UC Berkeley, U of Arizona
- Differential Calculus, UC Berkeley, U of Arizona and U of Georgia
- Integral Calculus, UC Berkeley, U of Arizona and U of Georgia
- Differential Equations, U of Georgia
- First-year mathematics for engineers, U of Cape Town
- First-year mathematics for science students (course convenor), U of Cape Town
- Multivariable Calculus, U of Arizona, U of Iowa, U of Georgia
- Linear Algebra, U of Arizona
- Undergraduate Topology (point-set and algebraic), U of Arizona
- Elementary Mathematics (for primary school teachers), U of Arizona
- Topics in Geometry (undergraduate), U of Arizona
- A Second Course in Geometry (undergraduate and graduate), U of Arizona
- Foundations of Geometry I and II (undergraduate and graduate), U of Georgia
- Differential Topology (undergraduate), Nankai U, China
- Differential Topology (graduate), Nankai U, U of Iowa, U of Georgia
- Algebraic Topology (honours), U of Cape Town
- Algebraic Topology (graduate), U of Georgia
- Topics in Low-Dimensional Topology (graduate), Nankai U
- La Théorie des Noeuds (Knot theory), l'Université du Québec à Montréal
- Morse and Cerf Theory, U of Georgia
- Knots, 3–manifolds and 4–manifolds, U of Georgia
- Mathematical English, Nankai U

Undergraduate student research supervision

- Branton Dearmoun, 2021
- Leonid Shalman, 2021
- Evan Short, 2021
- Winston Hayes Way, 2021
- Patrick Brothers, 2019
- Jessica Smith, 2017
- Jadzia Dax Hutchings, 2015
- Fred Hohman, 2014-15

Undergraduate student research supervision (continued)

- John Stroud, 2014-15
- Karla Carreño, 2014
- Amanda Muteteke, 2013
- Faraad Armwood, 2013
- Eddie Beck, 2012
- Trevor Hohorst, 2012
- Tyler Johnson, 2011
- Guanyu Wang (U. Iowa), 2010

Graduate student supervision

- Isnayni Hadi (PhD student, current)
- Alexander Tepper (PhD student, current)
- Devashi Gulati (PhD student, current)
- Geunyoung Kim (PhD student, current)
- Daniel Hartman (PhD student, current)
- Terrin Warren (PhD student, current)
- Swapnanil Bannerjee (UGA PhD, 2023)
- Sarah Blackwell (UGA PhD, 2022)
- Jason Joseph (UGA PhD 2020)
- William Olsen (UGA PhD 2020)
- Nicholas Castro (UGA PhD 2016)
- Huygens Ravelomanana (UCT MSc 2010)
- Audry Ayivor (UCT MSc 2010)

Postdoctoral supervision

- Feride Ceren Kose (2022-present)
- Eduardo Fernández Fuertes (2022-present)
- Melissa Zhang (2019-2022)
- Jeffrey Meier (2017-2019)
- Adam Saltz (2016-2019)
- Huygens Ravelomanana (2015-2018)
- Bo-Hyun Kwon (2015-2016)
- Juanitz Pinzón-Caicedo (2014-2017)