

CURRICULUM VITAE OF NICK SALTER

MAY 7, 2024

Department of Mathematics, University of Notre Dame
255 Hurley Hall, Notre Dame, IN 46556

RESEARCH INTERESTS

Topology and geometry, with an emphasis on families of Riemann surfaces (key words: mapping class groups, braid groups, monodromy problems, moduli spaces of Riemann surfaces, configuration spaces, strata of abelian differentials/translation surfaces).

EDUCATION

- Ph.D in Mathematics, University of Chicago, June 2017 (advisor: Benson Farb)
- M.S. in Mathematics, University of Chicago, June 2013
- B.A. in Mathematics, Reed College, May 2011

EMPLOYMENT

- Assistant Professor, Department of Mathematics, University of Notre Dame
July 2021 - present
- Ritt Assistant Professor, Department of Mathematics, Columbia University
July 2018 - July 2021
- NSF MSPRF postdoc, Department of Mathematics, Columbia University
July 2018 - July 2020 (sponsoring scientist: Walter Neumann)
- NSF MSPRF postdoc, Department of Mathematics, Harvard University
July 2017 - July 2018 (sponsoring scientist: Joe Harris)

RESEARCH PAPERS

SUBMITTED PUBLICATIONS

- (28) *Monodromy of stratified braid groups, II*, 2024.
- (27) *Families of elliptic curves over the four-pointed configuration space and a sequence of Dyer-Formanek-Grossman*, 2023 (with Will Chen).
- (26) *Connected components of the topological surgery graph of a unicellular collection*, 2023 (with Abdoul Karim Sane).
- (25) *Stratified braid groups: monodromy*, 2023.
- (24) *Holomorphic maps between configuration spaces of Riemann surfaces*, 2023 (with Lei Chen).

(23) *On the monodromy group of the family of smooth plane curves*, 2016.

ACCEPTED PUBLICATIONS

- (22) *Generating the homology of covers of surfaces*, 2024, Bull. Lond. Math. Soc., to appear (with Marco Boggi and Andrew Putman).
- (21) *Ropes, fractions, and moduli spaces*, 2023, Math. Intelligencer, to appear.
- (20) *Totally symmetric sets in the general linear group*, 2023, Michigan Math. J., to appear (with Noah Caplinger).

REFEREED PUBLICATIONS

- (19) *Framed mapping class groups and the monodromy of strata of Abelian differentials*, J. Eur. Math. Soc., 25(2023), no.12, 4719–4790 (with Aaron Calderon).
- (18) *Simple closed curves in stable covers of surfaces*, Trans. Amer. Math. Soc. 376 (2023), no. 9, 6447–6473.
- (17) *Surface bundles and the section conjecture*, Math. Ann. 386 (2023), no. 1-2, 877–942 (with Wanlin Li, Daniel Litt, and Padmavathi Srinivasan).
- (16) *Global fixed points of mapping class group actions and a theorem of Markovic*, J. Topol. 15 (2022), no. 3, 1311–1324 (with Lei Chen).
- (15) *Vanishing cycles, plane curve singularities, and framed mapping class groups*, Geom. Topol. 25 (2021), no. 6, 3179–3228 (with Pablo Portilla Cuadrado).
- (14) *Higher spin mapping class groups and strata of Abelian differentials over Teichmüller space*, Adv. Math. 389 (2021), Paper No. 107926, 56 pp. (with Aaron Calderon).
- (13) *The Birman exact sequence does not virtually split*, Math. Res. Lett. 28 (2021), no. 2, 383–413 (with Lei Chen).
- (12) *Linear-central filtrations and the image of the Burau representation*, Geom. Dedicata 211, 145–163 (2021).
- (11) *Relative homological representations of framed mapping class groups*, Bull. Lond. Math. Soc., 53 (2021) no. 1 204–219 (with Aaron Calderon).
- (10) *Section problems for configurations of points on the Riemann sphere*, Algebr. Geom. Topol. 20-6 (2020), 3047–3082 (with Lei Chen).
- (9) *Arithmeticity of the monodromy of some Kodaira fibrations*, Compos. Math. 156 (2020), no. 1, 114–157 (with Bena Tshishiku).
- (8) *Surface bundles in topology, algebraic geometry, and group theory*, Notices Amer. Math. Soc. 67 (2020), no. 2, 146–154 (with Bena Tshishiku).
- (7) *Monodromy and vanishing cycles in toric surfaces*, Invent. Math (2019) 216:153-213.
- (6) *Cup products in surface bundles, higher Johnson invariants, and MMM classes*, Math. Z. 288 (2018), no. 3-4, 1377–1394.
- (5) *On the non-realizability of braid groups by diffeomorphisms*, Bull. Lond. Math. Soc. 48 (2016), no. 3, 457–471 (with Bena Tshishiku).
- (4) *Surface bundles over surfaces with arbitrarily many fiberings*, Geom. Topol. 19-5 (2015), 2901–2923.
Correction published in Geom. Topol. 25 (2021), no. 5, 2707–2711.
- (3) *Cup products, the Johnson homomorphism, and surface bundles over surfaces with multiple fiberings*, Algebr. Geom. Topol. 15-6 (2015), 3613–3652.
- (2) *Sandpiles and dominos*, Electron. J. Comb, Volume 22, Issue 1 (2015) (with Laura Florescu, Daniela Morar, David Perkinson and Tianyuan Xu).

- (1) *A note on the critical group of a line graph*, Electron. J. Comb, Volume 18, Issue 1 (2011) (with David Perkinson and Tianyuan Xu).

HONORS AND AWARDS

- Kamil Duszenko Award, May 2023
- University of Chicago McCormick Fellowship, September 2011
- Phi Beta Kappa, inducted May 2011.

GRANTS AND FELLOWSHIPS

Pending

- Principal investigator, NSF Division of Mathematical Sciences (Topology)
CAREER: Moduli spaces, fundamental groups, and asphericity
July 2024-June 2029
\$ 489,489

Current

- Principal investigator, NSF Division of Mathematical Sciences (Topology)
Monodromy in topology and geometric group theory, grants no. DMS-2003984 and DMS-2153879
Panel rating: Highly Recommended (top 10% of all submissions)
July 2020-June 2024
\$ 161,760

Previous

- Mathematical Sciences Postdoctoral Research Fellowship, NSF Division of Mathematical Sciences (Topology)
Grant no. DMS-1703181
July 2017-June 2020
\$ 150,000

INVITED RESEARCH PRESENTATIONS (SINCE 2020)

Summer/winter school lecture series

- Cuernavaca winter school (Cuernavaca, Mexico), January 6-10 2020.
“Higher spin mapping class groups in algebraic and flat geometry” minicourse (4 lectures).

Colloquia

- University of Wisconsin Milwaukee, September 29, 2023.
“Ropes, fractions, and moduli spaces”.
- Purdue University (virtual), January 29, 2021.
“Families of Riemann surfaces and higher spin structures”.
- UC Santa Cruz (virtual), January 22, 2021.
“Families of Riemann surfaces and higher spin structures”.
- SUNY Stonybrook (virtual), January 15, 2021.
“Families of Riemann surfaces and higher spin structures”.
- U. Texas (virtual), January 12, 2021.
“Families of Riemann surfaces and higher spin structures”.
- Columbia University Michael Zhao memorial colloquium (virtual), October 8, 2020.
“Framed mapping class groups, or the topology of families of translation surfaces”.

Conference presentations

- Joint Mathematical Meetings 2024, Special session on modern developments in the theory of configuration spaces (San Francisco, CA), January 6, 2024.
“The equicritical stratification and stratified braid groups”.
- 8th Ibero-American Congress on Geometry (Pucón, Chile), December 14, 2023.
“The equicritical stratification and stratified braid groups”.
- Artal-Melle conference (Jaca, Spain), June 12, 2023.
“Stratified braid groups”.
- AMS Southeastern sectional (Atlanta, GA), March 18, 2023.
“Stratified braid groups”.
- Spring Topology & Dynamics Conference (virtual), March 16, 2023.
“Holomorphic maps between configuration spaces”.
- Low dimensional topology and homeomorphism groups workshop, Brin MRC (College Park, MD), September 7, 2022.
“What do we know about the topology of strata?”
- AMS Midwest sectional (virtual), March 27, 2022.
“Totally symmetric sets and the representation theory of mapping class groups”
- Braids in symplectic and algebraic geometry workshop, ICERM (Providence, RI), March 25, 2022.

“Geometric monodromy of families of framed Riemann surfaces”

- Spring Topology & Dynamics Conference (Waco, TX), March 11, 2022.
“Totally symmetric sets and the representation theory of mapping class groups”
- AMS Midwest sectional (virtual), October 4, 2020.
“Plane curve singularities and mapping class groups”
- NCNGT conference (virtual), June 7, 2020.
“The ‘what’ and ‘why’ of framed mapping class groups”
- Cornell Topology Festival, (Ithaca, NY), May 21, 2021.
“Topology of strata of translation surfaces: an unfortunately comprehensive survey”
- Spring Topology and Dynamics Conference 2021 (virtual), May 13, 2021.
“Simple closed curves in covers of surfaces and unitary K-theory”

Seminar talks

- University of Chicago Geometry/Topology seminar (Chicago, IL), October 19, 2023.
“The equicritical stratification and stratified braid groups”
- University of California, Santa Barbara Topology seminar (Santa Barbara, CA), October 17, 2023.
“The equicritical stratification and stratified braid groups”
- University of Wisconsin, Milwaukee Geometry/Topology seminar (Milwaukee, WI), September 28, 2023.
“The equicritical stratification and stratified braid groups”
- Purdue University Geometry and Geometric Analysis seminar (West Lafayette, IN), August 21, 2023.
“The equicritical stratification and stratified braid groups”
- CUNY Complex Analysis and Dynamics seminar (New York City), October 21, 2022.
“What do we know about the topology of strata?”
- Indiana University geometry seminar (Bloomington, IN), March 31, 2022.
“Totally symmetric sets and the representation theory of braid and mapping class groups”
- University of Michigan topology seminar (virtual), March 25, 2021.
“Framed mapping class groups and strata of Abelian differentials”
- Tufts geometry/topology seminar (virtual), February 16, 2021.

“Topology of strata of translation surfaces: an unfortunately comprehensive survey”

- University of Regensburg (Germany) topology seminar (virtual), February 16, 2021.
“r-spin structures and applications”
- Northeastern U. topology seminar (virtual), December 8, 2020.
“r-spin structures and applications”
- U. Toronto topology seminar (virtual), October 19, 2020.
“Framed mapping class groups and strata of Abelian differentials”
- BiSTRO seminar (virtual), June 25, 2020.
“Framed mapping class groups and strata of abelian differentials”
- Harvard University informal geometry and dynamics seminar (virtual), April 15, 2020.
“Framed mapping class groups and strata of Abelian differentials”
- UNAM Morelia geometry/topology seminar (Morelia, Mexico), January 15, 2020.
“Framed mapping class groups and strata of Abelian differentials”
- CIMAT geometry/topology seminar (Guanajuato, Mexico), January 13, 2020.
“Framed mapping class groups and strata of Abelian differentials”

Talks at Notre Dame

- Department Colloquium, Department of Mathematics, November 8, 2023
“Ropes, fractions, and moduli spaces”
- Admitted students visit days, Department of Mathematics, March 28, 2023
“Braids: mathematical cubism”
- Notre Dame undergraduate math workshop, August 3, 2022.
“What is the shape of the space of flat surfaces?”
- Admitted students visit days, Department of Mathematics, March 19, 2022
“Braids: mathematical cubism”
- Graduate student seminar, Department of Mathematics, October 11, 2021
“Life after Galois”
- Topology seminar, Department of Mathematics, August 24, 2021
“Simple closed curves in stable covers of surfaces”
- Departmental colloquium, Department of Mathematics, January 5, 2021 (virtual)

“Families of Riemann surfaces and higher spin structures”

SERVICE

Professional service

- Referee or quick opinion for the following journals: *Algebr. Geom. Topol.*, *Ann. Henri Lebesgue*, *Bull. London Math. Soc.*, *Commentarii*, *Crelle*, *Forum Math. Sigma*, *Geom. Topol.*, *Geom. Topol. Monogr.*, *Invent. Math.*, *J. Algebra*, *J. Inst. Math. Jussieu*, *J. Knot Theory Ramif.*, *J. London Math. Soc.*, *J. Math. Phys.*, *J. Pure Appl. Algebra*, *J. Topol. Anal.*, *Math. Annalen*, *Math. Z.*, *Manuscripta Math.*, *Michigan Math. J.*, *New York J. Math*, *Proc. Amer. Math. Soc.*, *RIMS*, *Rocky Mountain J. Math.*, *Selecta Math.*
- Author of 35 Mathscinet reviews.
- Conference organizer, “(Discrete) groups in (algebraic) geometry”, Center for Mathematics, Notre Dame, June 2 - 20, 2025
- Conference organizer, “Groups, Geometry and Dynamics”, IUPUI, April 27, 2024
- Conference organizer, “Groups, Geometry and Dynamics”, IUPUI, April 9, 2022
- NSF panelist, 2023.
- Editor and contributor, $K3$ problem list in low-dimensional topology.

Departmental service, University of Notre Dame

- Graduate admissions committee
Spring 2022-present
- Departmental library liaison
Fall 2022-present

Departmental service, Columbia University

- Organizer, Columbia University Geometry/Topology seminar
Fall 2018 - Spring 2021

TEACHING

University of Notre Dame

- Math 80440 (Topics in Topology - “Topics in the braid group”)
Spring 2024
- Math 10560 (Calculus II)
Fall 2023

- Math 40480 (Complex Variables)
Spring 2023
- Math 10560 (Calculus II)
Spring 2023
- Math 60330 (Basic Geometry/Topology, graduate course)
Fall 2022
- Math 40480 (Complex Variables)
Spring 2022
- Math 10560 (Calculus II)
Fall 2021

Columbia University

- Math UN1102 (Calculus II)
Spring 2021 (two sections)
- Math UN3007 (Complex Variables)
Fall 2020
- Math UN2010 (Linear Algebra)
Spring 2019 (two sections)
- Math UN1101 (Calculus I)
Fall 2018

University of Chicago

- Math 196 (Linear algebra)
Winter 2017
- Math 195 (Multivariable calculus)
Fall 2016
- Math 196 (Linear algebra)
Winter 2016
- Math 195 (Multivariable calculus)
Fall 2015
- Math 196 (Linear algebra)
Spring 2015
- Math 195 (Multivariable calculus)
Winter 2015
- Math 153 (Calculus III)
Fall 2014
- Math 153 (Calculus III)
Spring 2014
- Math 152 (Calculus II)
Winter 2014
- Math 151 (Calculus I)
Fall 2013

MENTORING

University of Notre Dame

- Graduate advisor to Joshua Lehman.
May 2024 - present
- Supervised undergraduate honors thesis of Julian Kauffman.
March 2024 - present
- First-year graduate advisor to Joshua Lehman and Clara Huggins.
August 2023 - May 2024
- Mentored Harvey Mudd undergraduate Tomás Aguilar-Fraga in Notre Dame's Summer Research Opportunities Program.
Summer 2022
- Mentored Georgia Tech undergraduate Noah Caplinger/ collaborated on research project "Totally symmetric sets in the general linear group" (published in Michigan Math. J.)
Spring 2022

Columbia University

- Project director, Columbia University REU. Supervised Columbia undergraduates Destine Lee, Iris Rosenblum-Sellers, Jakwanul Safin, Anda Tenie in a research project in geometry/topology. Resulting peer-reviewed publication: *Graph coverings and (im)primitive homology: examples of low degree*, Exp. Math.32(2023), no.2, 313–320.
Summer 2020
- Mentored local high school student Merrick Cai. Supervised research project on the subject of representations of Artin groups.
Spring 2019 - Spring 2020
- Mentored Columbia undergrad Destine Lee. Conducted reading course on differential topology via the book of Guillemin–Pollack.
Summer 2019

University of Chicago

- Mentor, Directed Reading Program
4 quarters total from 2012-2017
- Instructor, Math Circles of Chicago
2014-2017
- Mentor/instructor - independent study course on mapping class groups

Spring 2016

- Mentor, University of Chicago REU
Summer 2015, Summer 2013