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Laura Fredrickson

Personal Information

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Department of Mathematics
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Research Interests

Gauge theory, Higgs bundles, Hitchin moduli space, geometric analysis, complex geometry, differential geometry, hyperkähler geometry

Employment

University of Oregon

Assistant Professor, September 2019-
(on leave with child #2, 18 weeks starting September 2023)
(on leave with child #1, 18 weeks starting October 2021)
(on leave at Stanford and MSRI, September 2019- August 2020)

MSRI

Della Pietra Endowed Postdoctoral Fellowship, August-December 2019
(Program: *Holomorphic Differentials in Mathematics and Physics*)

Stanford University

Szegő Assistant Professor, September 2016-August 2020

Education

University of Texas at Austin

Ph.D. in Mathematics, May 2016

- Dissertation title: "Asymptotic limits in the Hitchin moduli space"
- Advisor: Andy Neitzke

University of California, Irvine

B.S. in Mathematics, summa cum laude, June 2010

- Advisor: Vladimir Mandelshtam, Theoretical Physical Chemistry
- Undergraduate thesis: "Gaussian Molecular Dynamics"

Preprints

L. Fredrickson, R. Mazzeo, J. Swoboda, H. Weiss ALG gravitational instantons and Hitchin moduli spaces, I: Torelli Parameters arXiv:2603.17020

L. Fredrickson, A. Yae Hyperkähler degenerations from parabolic $SL(2,\mathbb{C})$-Higgs bundles on the punctured sphere to hyperpolygon spaces arXiv:2601.10656

L. Fredrickson, M. Zimet. Hyper-Kähler manifolds from Riemann-Hilbert problems I: Ooguri-Vafa-like model geometries arXiv:2501.01675

L. Fredrickson, M. Zimet. A Concrete Variant of the Twistor Theorem arXiv:2501.00505

B. Collier, L. Fredrickson, R. Wentworth. Conformal limits for parabolic $SL(n,\mathbb{C})$-Higgs bundles arXiv:2407.16798

L. Fredrickson. Generic ends of the moduli space of $SL(n,\mathbb{C})$-Higgs bundles arXiv:1810.01556

Publications

L. Fredrickson, R. Mazzeo, J. Swoboda, H. Weiss. Asymptotic geometry of the moduli space of parabolic $SL(2,\mathbb{C})$-Higgs bundles *J. London Math. Soc.*, **106**, Issue 2, pp. 590-661 (2022) arXiv:2001.03682

M. Alim, F. Beck, L. Fredrickson. Parabolic Higgs bundles, tt^* connections and opers *Asian Journal of Mathematics*, **26**, No. 4 (2022), pp. 455-506 arXiv:1911.06652

L. Fredrickson. Exponential decay for the asymptotic geometry of the Hitchin metric *Communications in Mathematical Physics* **375** 1393-1436 (2020) arXiv:1810.01554

L. Fredrickson. Perspectives on the asymptotic geometry of the Hitchin moduli space *SIGMA* **15** (2019), 018, arXiv:1809.05735

L. Anderson, M. Esole, L. Fredrickson, L. Schaposnik. Singular geometry and Higgs bundles in string theory *SIGMA* **14** (2018), 03, arXiv:1710.08453

L. Fredrickson, A. Neitzke. Moduli of wild Higgs bundles on $\mathbb{C}P^1$ with $\mathbb{C}^\times$-actions (2021), *Mathematical Proceedings of the Cambridge Philosophical Society* 171(3), 623-656. arXiv:1709.06142

L. Fredrickson, D. Pei, W. Yan, K. Ye. Argyres-Douglas Theories, Chiral Algebras and Wild Hitchin Characters, *Journal of High Energy Physics* (2018) 150, arXiv:1701.08782

O. Dumitrescu, L. Fredrickson, G. Kydonakis, R. Mazzeo, M. Mulase, A. Neitzke. From the Hitchin section to opers through Nonabelian Hodge *Journal of Differential Geometry*, Vol. 117, No. 2 (2021), pp. 223-253. arXiv:1607.02172

I. Georgescu, J. Deckman, L. Fredrickson, V. Mandelshtam. Thermal Gaussian molecular dynamics for quantum dynamics simulations of many-body systems: Application to liquid parahydrogen, *Journal of Chemical Physics* 134 174109 (2011).

Fellowships and Awards

Faculty Mentor of AWM Student Chapter winning "Award for Scientific Excellence" **2025**

NSF-DMS grant #2005258 **July 2020-June 2026**

AWM-NSF travel grant **May 2019**

GEAR Short-Term travel grant **May 2019**
August 2017
July 2017

Geometry & Topology Research and Training Grant (RTG) Fellowship (University of Texas at Austin) **Summer 2015**
Spring & Summer 2014
Spring & Summer 2013
Spring & Summer 2012
Spring & Summer 2011
Fall 2010

Frank Gerth III Graduate Excellence Award (University of Texas at Austin) **2012**

Phi Beta Kappa **2010**

Howard Tucker Award (University of California, Irvine) **2010**

Outstanding Senior in Mathematics (University of California, Irvine) **2010**

Teaching

University of Oregon:

Instructor: Multivariable Calculus I (Math 281) (×2) **Fall 2025**

Instructor: Multivariable Calculus II (Math 282)	**Spring 2025**
Instructor: Multivariable Calculus I (Math 281)	**Winter 2025**
Instructor: Intro to Analysis II (Math 414/514)	**Spring 2025**
Instructor: Intro to Topology III: Manifolds (Math 434/534)	**Spring 2023**
Instructor: Intro to Topology II: De Rham Cohomology (Math 432/532)	**Winter 2023**
Instructor: Intro to Differential Equations (Math 256)	**Winter 2023**
Instructor: Intro to Analysis III (Math 415/515)	**Spring 2022**
Instructor: Intro to Analysis II (Math 414/514)	**Winter 2021**
Instructor: Intro to Analysis I (Math 413/513)	**Fall 2020**
Instructor: Calculus I (Math 251)	**Fall 2020**

Stanford University:

Instructor: Honors Real Analysis (Math 171)	**Spring 2020**
Instructor: Partial Differential Equations (Math 173)	**Winter 2020**
Instructor: Partial Differential Equations (for physicists) (Math 131P)	**Winter 2020**
Instructor: Honors Real Analysis (Math 171)	**Spring 2019**
Instructor: Differential Geometry—Curves & Surfaces (Math 143)	**Spring 2019**
Co-Instructor: Proofs and Modern Math [Freshman Seminar] (Math 83N)	**Fall 2018**
Instructor: Ordinary Differential Equations (Math 53)	**Fall 2018**
Instructor: Honors Multivariable Calculus (Math 62CM)	**Winter 2018**
Instructor: Honors Real Analysis (Math 171)	**Fall 2017**
Instructor: Differential Geometry—Curves & Surfaces (Math 143)	**Fall 2017**
Instructor: Partial Differential Equations (for physicists) (Math 131P)	**Winter 2017**
Instructor: Ordinary Differential Equations (Math 53) (×2)	**Fall 2016**

Invited Mini-courses

(upcoming) Higher structures, moduli spaces and integrability **September 2026**
(Hamburg, Germany)
Title: *Gaiotto–Moore–Neitzke's Conjecture & Progress* (3 hours)

PCMI Undergraduate Summer Program (Park City, UT) **July 2019**
Taught the first half of a 3-week course *Gauge Theory, Gravitation, and Geometry* with daily problem sessions. (Co-instructor: Lara Anderson)

Higgs bundles in Mathematics and Physics (Hamburg, Germany) **September 2018**
Title: *The asymptotic geometry of the Hitchin moduli space* (3 hours)

Workshop on the geometry and physics of Higgs bundles II **November 2017**
Title: *An introduction to limits in the moduli space of Higgs bundles* (3 hours + 2 problem sessions)

Fields Institute **November 2015**
Title: *Constructing solutions of Hitchin's equations near the ends of the moduli space* (4 hours)

Invited Talks

80. (upcoming) Contact Geometry, Cluster Algebras and Skein Theory, IPAM, Los Angeles **October 2026**

79. (upcoming) Hitchin's 80th Birthday Conference, Oxford **September 2026**
78. (upcoming) Gauge Theory, Low-Dimensional Topology a and Geometric Analysis Conference, Rutgers **July 2026**
77. (upcoming) New developments in Kobayashi–Hitchin correspondence, Osaka **June 2026**
76. (upcoming) UC Davis **May 2026**
75. (upcoming) Gauge Theory, Rutgers+ (online) **April 2026**
74. (upcoming) OSU **April 2026**
73. (upcoming) USTC (online) **April 2026**
72. (upcoming) Reed College (Colloquium) **April 2026**
71. University of York (online) **March 2026**
70. Lewis & Clark (Colloquium) **March 2026**
69. Boise State (online) **February 2026**
68. Joint Japan/US collaborative workshop on geometric analysis, Kyoto **September 2025**
67. Pacific Northwest Geometry Seminar, Vancouver **May 2025**
66. UC Santa Cruz **April 2025**
65. JMM, Seattle **January 2025**
64. SLMath: Program workshop for *Special structure on manifolds* **November 2024**
63. Morningside Center of Mathematics, China (online) **September 2024**
62. UC Santa Barbara–Geometry **January 2024**
61. Oregon State University (Colloquium) **April 2023**
60. Oregon State University (Geometry & Topology Seminar) **April 2023**
59. Imperial College, London **March 2023**
58. Brussels-London Geometry Seminar (UCL, Brussels, etc.) **March 2023**
57. King's College London **March 2023**
56. Oxford **March 2023**
55. UBC (online) **November 2022**
54. MSRI: Program workshop for *Analytic Aspects of Gauge Theory* **October 2022**
53. MSRI: Connections workshop for *Analytic Aspects of Gauge Theory* **August 2022**
52. UO Topology Seminar **May 2022**
52. UMass Amherst (online) **September 2021**
51. Rice (online) **September 2021**
50. University of Oregon (online) **September 2021**
49. Brussels, Oxford, Warwick and London (BOWL) Geometry Seminar (online) **June 2021**
48. Oberwolfach: Analysis, Geometry and Topology of Singular PDE **June 2021**
47. Strasbourg: Geometric and analytic aspects of moduli spaces of Higgs bundles **June 2021**
46. UC Riverside (online) **May 2021**
45. UC Davis (online) **March 2021**
44. Rutgers (online) **February 2021**
43. BIRS: Geometry, Analysis, and Quantum Physics of Monopoles (online) **February 2021**
42. UCSB Geometric Analysis (online) **January 2021**
41. Toronto (Geometric Representation Theory) (online) **December 2020**
40. Northeastern University (online) **November 2020**

39. "Gauge Theory Seminar" KSU (online) **November 2020**
38. University of Texas at Austin (online) **November 2020**
37. Boston University (online) **November 2020**
36. AIM: Special Holonomy and Branes (online) **November 2020**
35. University of Oregon (online) **November 2020**
34. Western Hemisphere Colloquium on Geometry and Physics (online) **August 2020**
33. Minisymposium on Gauge Theory and PDE (La Quinta, CA) **December 2019**
32. UC Davis **November 2019**
31. MSRI: Introductory workshop for *Holomorphic Differentials* **August 2019**
30. Bonn: Geometry, integrability, and moduli **July 2019**
(In honor of Motohico Mulase's 65^{th} Birthday)
29. Hanover: Geometric and analytic aspects of moduli spaces **July 2019**
28. Oberwolfach: Geometry and Physics of Higgs **May 2019**
27. Simons Center: Holomorphic Differentials in Math and Physics **March 2019**
26. Duke **October 2018**
25. BIRS Oaxaca: Higgs Bundles and Harmonic Maps of Riemann Surfaces **July 2018**
24. CIRM Luminy/VBAC: Gauge Theory and Complex Geometry **June 2018**
23. UC Santa Cruz **January 2018**
22. UC Davis **January 2018**
21. UIC: Current trends on spectral data for Higgs bundles III **November 2017**
20. AIM: Singular geometry and Higgs bundles in string theory **November 2017**
19. BIRS: The Analysis of Gauge-Theoretic Moduli Spaces **August 2017**
18. MCA: Geometry and Physics of Higgs Bundles **July 2017**
17. London: The Sen Conjecture and Beyond **June 2017**
16. GEAR Workshop on compactifications of moduli spaces of representations **June 2017**
15. Aarhus: Hitchin 70 **September 2016**
14. AMS von Neumann Symposium: Topological Recursion **July 2016**
and Its Influence in Analysis, Geometry, and Topology (Plenary)
13. Simons Center: New perspectives on Higgs bundles, branes **June 2016**
and quantization
12. Simons Center: Current trends on spectral data for Higgs bundles II **June 2016**
11. University of California, Davis **May 2016**
10. CalTech: Surface Group Representations **March 2016**
9. Heidelberg: Higgs Bundles in Geometry and Physics **March 2016**
8. Stanford University **December 2015**
7. Brown University **November 2015**
6. University of Illinois at Urbana-Champaign **November 2015**
5. University of Illinois at Chicago **November 2015**
4. AIM: Current trends in spectral data for Higgs bundles **September 2015**
3. Rice University **September 2015**
2. Isaac Newton Institute: Metric and Analytic Aspects of Moduli Spaces **August 2015**
1. GEAR Higgs Bundles & Harmonic Maps Workshop **January 2015**

Expository UO Talks	4. *Geometric Analysis* Introduction to Gauge Theory	**April 2025**
	3. *Basic Notions* Gauge Theory	**November 2024**
	2. *Undergraduate Math Major Meeting* Curvature & Gauss–Bonnet	**October 2024**
	1. *Math Slam (for early grads)* Eguchi–Hanson space	**April 2021**
Extended Research Visits	SLMath: *Special Geometric Structures and Analysis* program member (1 week)	**2024**
	Oxford (2.5 weeks)	**2023**
	MSRI/SLMath: *Analytic & Geometric Aspects of Gauge Theory* program member (10 weeks)	**2022**
PhD Students	**Arya Yae** (expected graduation June 2026)	
	Yongmin Park (expected graduation June 2027)	
Mentoring Experience	**Supervisor** of reading course on gauge theory for Christina Dorofeev	**Winter 2025**
	Postdoc Mentor at UO for Max Zimet	**2023-2024**
	Supervisor of reading course for Ben Buran	**Winter 2022**
	Postdoc Mentor at MSRI for Maximillian Holdt	**Fall 2022**
	Supervisor of reading course for Yongmin Park	**Fall 2022**
	Supervisor of reading course & summer project for Arya Yae	**Summer 2021** **Spring 2021**
	Supervisor of reading course in Algebraic Topology Met weekly with three Stanford sophomores.	**Spring 2018**
	Mentor in UT Austin's Directed Reading Program Reading program pairing undergraduate students with graduate student mentors. Supervised four bright students at University of Texas at Austin in: (1) Riemannian geometry (2) solitons (3) group theory (4) Lie groups	**2013-2015**
Honors Thesis Committee Service at UO	**Member of Committee** for David Schmidt [Advisor: Peng Lu]	**Spring 2024**
PhD Committee Service at UO	**Member of PhD Committee** for Oliver Miller [Advisor: Allcock (Physics)]	
	Member of PhD Committee for Asif Ashraf [Advisor: Hooft (Earth Sciences)]	
	Member of PhD Committee for Ben Homan [Advisor: Proudfoot]	
	Member of PhD Committee for Tom Gorordo [Advisor: Kribs (Physics)]	
	Member of PhD Committee for Ivan Juarez-Reyes [Advisor: Farr (Physics)]	
	Member of PhD Committee for Duca Delfin [Advisor: Addington]	
	Member of PhD Committee for Siavash Jafarizadeh [Advisor: Lipshitz]	**Summer 2025**
	Member of PhD Committee for Emily Windes [Advisor: Botvinnik]	**Spring 2025**
	Member of PhD Committee for Abhijeet Melkani [Advisor: Paulose (Physics)]	**Spring 2024**
	Member of PhD Committee for Gary Guth [Advisor: Lipshitz]	**Spring 2023**
Conferences & Workshops Organized	**Co-organizer** of MSRI Program Program title: "Analytic and Geometric Aspects of Gauge Theory"	**Fall 2022**

Co-organizer of MSRI Workshop **August 2022**
Introductory Workshop: Analytic and Geometric Aspects of Gauge Theory'

Co-organizer of AIM Workshop **August 2022**
Workshop title: "Geometry and physics of ALX metrics in gauge theory"

Co-organizer of MSRI Workshop **August 2019**
Connections for Women: Holomorphic Differentials in Mathematics and Physics.

Co-organizer of AIM Workshop **October 2017**
Workshop title: "Singular geometry and Higgs bundles in string theory"

Co-organizer of the Graduate Student Topology and Geometry Conference **April 2014**
Conference for over 170 graduate students, featuring invited faculty talks and graduate student talks in a broad range of topics in geometry and topology, supported by the National Science Foundation through grant #1361929 and the University of Texas at Austin.

Service and Outreach

Reviewer

Faculty Advisor of UO's AWM chapter **2024-**

Volunteer at UO's annual K-8 Math Festival **2026-**

Organizer of Geometric Analysis Seminar at UO **2021-2023**

NSF Panelist **2023**

NSF Panelist **2021**

Co-organizer of Geometry Seminar at Stanford University **2016-2019**

Co-organizer of Stanford University's women in mathematics program **2016-2019**

Panelist at Stanford's math graduate school panel **May 2020**
April 2018

Presenter at Stanford's PUWMAS (Physics Undergrad) Faculty Lunch **May 2020**

Panelist at Stanford prospective math major dinner **February 2020**
February 2019
February 2018

Guest lecturer at Stanford Undergrad Research in Math Program (SURIM) **August 2019**
July 2018
June 2017

Presenter at teaching training for Stanford postdocs **September 2019**
September 2017

Panelist at Stanford Women in STEM Faculty Panel **September 2018**

Guest lecturer at Stanford University Math Camp (SUMaC) **July 2018**
Gave interactive lecture to a group of talented high school students. **July 2017**

Guest lecturer at Stanford's Undergraduate Math Organization (SUMO) **May 2017**

Head organizer of UT Austin's Distinguished Women in Mathematics Program **2014-2016**
Co-organizer of UT Austin's Distinguished Women in Mathematics Program **2010-2014**

Program and lecture series bringing accomplished female mathematicians to the University of Texas at Austin

Committee Work	**Member** of PhD Committee	**2024-2026**
	Pre-PhD Advisor	**2024-2026**
	Walk-in Advisor for UO undergraduate math majors	**2023-2025**
	Member of UO Math Executive Committee	**2021-2023, 2024-2026**
	Member of TTF Policy Documents Subcommittee	**2022-2023**
	Member of Departmental Head Search Committee	**Winter 2024**
	Member of UO 400-Level Course Reform Committee	**Winter 2023**
	Chair of UO Math Scholarships and Awards Committee	**2021-2023**
	Member of UO Math Scholarships and Awards Committee	**2020-2021**