Haotian Wu

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Academic Appointments

The University of Sydney
Senior Lecturer, January 2023–present.
Academic Fellow, January–December 2022.
ARC DECRA Fellow, July 2018–June 2021.
Lecturer, July 2016–June 2018, July–December 2021.

University of Oregon
Paul Olum Visiting Assistant Professor, December 2013–June 2016.

Mathematical Sciences Research Institute
Cha-Chern Postdoctoral Fellow, August–December 2013.

Education

The University of Texas at Austin
PhD in Mathematics, May 2013.
Advisor: Dan Knopf.

Lafayette College
BS in Mathematics and BS in Physics, *summa cum laude*, May 2007.
Advisor: Justin Corvino.

UWC Mahindra College
International Baccalaureate Diploma, May 2003.

Research Interests

Geometric Analysis, Differential Geometry, Nonlinear Partial Differential Equations.

Grants

- Australian Research Council (ARC) Discovery Early Career Researcher Award (DECRA) DE180101348, 328,075.00 AUD, 2018–2021.

- The University of Sydney Centre in China Conference Funding, 9,500 AUD, 2017.

- AMS-Simons Travel Grant, 4,000 USD, 2013–2016.

Publications

- On the precise asymptotics of Type-IIb solutions to mean curvature flow. **Transactions of the American Mathematical Society. Series B** 9 (2022), 564–585. (Joint with J. Isenberg and Z. Zhang)

- A numerical stability analysis of mean curvature flow of noncompact hypersurfaces with Type-II curvature blowup. **Nonlinearity** 34 (2021), 6539–6560. (Joint with D. Garfinkle, J. Isenberg and D. Knopf)

- A quantitative Bucur-Henrot inequality. **Mathematische Nachrichten**, 295 (2022), 2436–2451. (Joint with K. Wang)

- Type-II singularities in mean curvature flow. **Surveys in Geometric Analysis 2019**, edited by Gang Tian, Qing Han and Zhenlei Zhang. (Joint with Z. Zhang)

- Mean curvature flow of noncompact hypersurfaces with Type-II curvature blow-up. II. **Advances in Mathematics** 367 (2020), 107111. (Joint with J. Isenberg and Z. Zhang)

- Mean curvature flow of noncompact hypersurfaces with Type-II curvature blow-up. **Journal für die Reine und Angewandte Mathematik** 754 (2019), 225–251. (Joint with J. Isenberg)

- Metrics with non-negative Ricci curvature on convex three-manifolds. **Geometry & Topology** 20 (2016), no.5, 2905–2922. (Joint with A. Aché and D. Maximo)
- Dynamical stability of algebraic Ricci solitons. **Journal für die Reine und Angewandte Mathematik** 713 (2016), 225–243. (Joint with M. B. Williams)
- On Type-II singularities in Ricci flow on $\mathbb{R}^N$. **Communications in Partial Differential Equations** 39 (2014), no. 11, 2064–2090.
- Stability of complex hyperbolic space under curvature-normalized Ricci flow. **Geometriae Dedicata** 164 (2013), 231–258.
- On isoperimetric surfaces in general relativity. II. **Journal of Geometry and Physics** 59 (2009), no. 11, 1453–1460. (Joint with F. Abedin, J. Corvino, and S. Kapita)
- On the center of mass of isolated systems. **Classical and Quantum Gravity** 25 (2008), no. 8, 085008, 18 pp. (Joint with J. Corvino)

Preprints

- Asymptotic analysis of Type-IIb solutions to Ricci flow on $\mathbb{R}^{n+1}$. *Submitted*.
- An upper bound for the first nonzero Steklov eigenvalue. *Submitted*. (Joint with X. Li and K. Wang)
- On the second Robin eigenvalue of the Laplacian. *Submitted*. (Joint with X. Li and K. Wang)
- A numerical stability analysis of mean curvature flow of noncompact hypersurfaces with Type-II curvature blowup: II. *Submitted*.(Joint with D. Garfinkle, J. Isenberg and D. Knopf)
- The second Robin eigenvalue in non-compact rank-1 symmetric spaces. *Submitted*. (Joint with X. Li and K. Wang)
- The modified Kähler-Ricci flow, II. *Submitted*. (Joint with Z. Zhang)

Invited Talks

- Minimal surfaces and geometric flows: interaction between the local and the nonlocal worlds, MATRIX, Australia, January–February 2023.
- Geometry with Symmetries Session at AustMS 2022—The 66th Annual Meeting of the Australian Mathematical Society, Sydney, Australia, December 2022.
- PDE Geometric Analysis Seminar, University of Wisconsin–Madison, USA, September 2022.
- Geometric Analysis Seminar, University of Oregon, USA, September 2022.
- PDE Seminar, Central China Normal University, China, June 2022. (Online)
- 45 minute lecture at The 9th International Congress of Chinese Mathematicians, Beijing, China, June–July 2022. (Postponed)
- Geometric Analysis Seminar, University of Oregon, April 2022. (Online)
- Geometry with Symmetries Session at AustMS 2021—The 65th Annual Meeting of the Australian Mathematical Society (hybrid), New Castle, Australia, December 2021.
- The 3rd Geometric Analysis Festival, Jeonbuk National University, Korea, July 2021. (Online)
- Geometry Seminar, Nankai University, China, May 2021. (Online)
- Geometric Analysis Seminar, Zhejiang University, China, December 2020. (Online)
- Young Differential Geometers' Forum, Shenzhen, China, December 2020. (Online)
- Geometric Analysis Seminar, Shandong University, China, September 2020. (Online)
- Workshop on Nonlinear PDEs and Applications, Sanya, China, September 2020. (Postponed)
- PDE Workshop, Central China Normal University, China, August 2019.
- Second China-Australia Joint Conference on Geometric Analysis and Differential Geometry, Changchun, China, July 2019.
- Pure Maths Seminar, The University of New South Wales, Australia, July 2019.

- Workshop on Geometric Analysis and Homogeneous Geometry, Brisbane, Australia, June 2019.

- Geometric Analysis Seminar, Hunan University, China, May 2019.

- Differential Geometry Seminar, Beijing Normal University, China, April 2019.

- Geometry Seminar, University of Pennsylvania, USA, December 2018.

- Geometric Analysis Seminar, CUNY, USA, November 2018.

- 2018 Australia-China Joint Conference on Geometric Analysis and Differential Geometry, Gold Coast, Australia, August 2018.

- International Conference on Differential Geometry in Honour of Professor Gang Tian's 60th Birthday, Week 1 Workshop, Sydney, Australia, January 2018.

- Differential Geometry Thematic Session of the 31st Colóquio Brasileiro de Matemática, Instituto Nacional de Matemática Pura e Aplicada (IMPA), Rio de Janeiro, Brazil, July–August 2017.

- Symposium in Geometry and Differential Equations, Chinese Academy of Science, Beijing, China, July 2017.

- ECNU Summer Workshop, East China Normal University (ECNU), China, July 2017.

- China-Australia Joint Conference on Partial Differential Equations, Mission Beach, Australia, May 2017.

- Colloquium, Shanghai Jiao Tong University, China, April 2017.

- Geometry Seminar, Soochow University, China, April 2017.

- PDE and Analysis Seminar, Australian National University, Australia, February 2017.

- Nonlinear and Geometric Partial Differential Equations, Australian National University, Australia, December 2016.

- Geometric Analysis Session at AustMS 2016—The 60th Annual Meeting of the Australian Mathematical Society, Canberra, Australia, December 2016.

- Analysis, PDE and Geometry Seminar, Monash University, Australia, September 2016.

- PDE Seminar, The University of Sydney, Australia, August 2016.

- Geometry & Topology Seminar, The University of Sydney, Australia, August 2016.

- Perspectives in Geometric Analysis–Joint event of ANU-BICMR-PIMS-UW, Beijing International Center for Mathematical Research, China, June 2016.

- The Global Scientist Forum, South University of Science and Technology of China, China, March, 2016.

- Special Session "PDE Methods in Geometric Flows" at the AMS Spring Eastern Sectional Meeting, State University of New York at Stony Brook, USA, March 2016 (declined).

- Colloquium, University of Puget Sound, USA, February 2016.

- Geometric Analysis Seminar, Beijing Normal University, China, December 2015.

- Colloquium, American University of Beirut, Lebanon, December 2015.

- Differential Geometry & Geometric Analysis Seminar, Princeton University, USA, December 2015.

- Geometric Analysis Seminar, University of Oregon, USA, November 2015.

- Research Member, Mathematical Sciences Research Institute, USA, invited for April 1–May 20, 2016 (declined).

- PDE Seminar, Shanghai Center for Mathematical Sciences, Fudan University, China, April 2015.

- Young Geometric Analysts' Forum, Tsinghua Sanya International Mathematics Forum, China, January 2015.

- Geometric Analysis Seminar, University of Oregon, USA, December 2014.

- Special Session "Recent Progress in Geometric Analysis" at the AMS Fall Western Sectional Meeting, San Francisco State University, USA, October 2014.

- Geometric Analysis and Relativity, University of Science and Technology of China, China, July 2014.

- Geometry-Topology Seminar, Oregon State University, USA, June 2014.

- Group Actions in Riemannian Geometry, University of North Carolina, Chapel Hill, USA, May 2014.
- Geometric Analysis Seminar, University of Oregon, USA, April 2014.
- Geometric Analysis Seminar, University of Oregon, USA, January 2014.
- MSRI Postdoc and Evans PDE Joint Seminar, University of California, Berkeley, USA, October 2013.

Teaching Experience

The University of Sydney (Lecturer and Tutor)
- MATH1023 Multivariable Calculus and Modelling: Semester 1, 2022.[1]
  (Year 1; around 420; unit coordinator; online.)
- MATH2061 Linear Mathematics and Vector Calculus: Semester 1, 2022
  (Year 2; 270; unit coordinator; online.)
- MATH1014 Introduction to Linear Algebra: Intensive January Term, 2022.
  (Year 1; 79; online.)
- MATH1023 Multivariable Calculus and Modelling: Semester 2, 2021.
  (Year 1; 1,350; unit coordinator; online.)
- MATH1023 Multivariable Calculus and Modelling: Semester 2, 2020.
  (Year 1; 1,340; online.)
- MATH1021 Calculus of One Variable: Semester 1, 2018.
  (Year 1; 500; unit coordinator, total unit enrolment $\approx 1,500$.)
- MATH3968 Differential Geometry: Semester 2, 2017.
  (Year 3; 23; unit coordinator.)
- MATH1001 Differential Calculus: Semester 1, 2017.
  (Year 1; 500; unit coordinator, total unit enrolment $\approx 2,000$.)
- MATH1003 Integral Calculus and Modelling: Semester 2, 2016.
  (Year 1; 300.)

University of Oregon (Lecturer)
- MATH282 Several-Variable Calculus II: Spring 2016.
  (Year 2; 40.)
- MATH281 Several-Variable Calculus I: Winter 2016.
  (Year 2; 40.)
- MATH253 Sequences and Series: Spring 2016, Winter 2015.
  (Year 1; 40.)
- MATH252 Integral Calculus: Winter 2016, Winter 2015, Fall 2014, Spring 2014
  (Year 1; 40.)
- MATH251 Differential Calculus: Winter 2014.
  (Year 1; 40.)

The University of Texas at Austin (Teaching Assistant)
- M427L Advanced Calculus for Applications II (Multivariable Calculus): Fall 2012.
  (Year 2; 120.)
- M341 Linear Algebra and Matrix Theory: Spring 2012.
  (Year 1; 120.)
- M427K Advanced Calculus for Applications I (Differential Equations): Spring 2011, Fall 2010, Fall 2009, Summer 2009.
  (Year 2; 120.)
- M340L Matrices and Matrix Calculations: Spring 2010.
  (Year 1; 120.)
- M365C Real Analysis: Spring 2009.
  (Year 3; 40.)

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[1]Comments: (Year X; approximate class size; unit coordinator, if applicable; delivery mode.)

– M408L Integral Calculus: Fall 2008, Spring 2008.
  (Year 1; 120.)
– M408K Differential Calculus: Fall 2007.
  (Year 1; 120.)

Other (Lecturer)

– Introduction to Mean Curvature Flow: December 2019.
  (Postgraduate; 20; four 2-hour lectures at Hunan University.)
– Riemannian Geometry: August 2019.
  (Postgraduate; 20; summer school course at Soochow University.)
– Introduction to Mean Curvature Flow: March 2019.
  (Postgraduate; 20; four 1-hour lectures at Capital Normal University.)

Student Supervision

The University of Sydney

– PhD student: Hosea Wondo, since 2020 (joint supervision with Zhou Zhang).
– SCDL3991 Science Dalyell Individual Research Project: Tiernan Cartwright, Semester 2, 2022.
– Pure maths honours student: Tomas Lasic Latimer, First Class Honours, 2018.

Leadership and Service

School Roles

– Deputy Director, First Year Studies, January 2021–present.
  (I carry out the administration of first year units while the Director of First Year Studies is away. I am also a member of the team in the School of Mathematics and Statistics responsible for hiring tutors and allocating tutorials for all units and teaching staff members in our School.)

Events

– Co-organiser of the Geometric Analysis Session at the AustMS Annual Meeting 2020, Armidale, Australia, December 8–11, 2020.
– Co-organiser of the Early Career Researchers Workshop on Geometric Analysis and PDEs, MATRIX, Australia, January 13–24, 2020.
– Co-organiser of the Differential Geometry Seminar Series, The University of Sydney, August 2019–present.
– Co-organiser of the International Conference on Geometric and Nonlinear PDEs, Suzhou, China, July 2–6, 2018.
– Local organising committee for the International Conference on Differential Geometry in Honour of Professor Gang Tian's 60th Birthday, Sydney, Australia, January 22–February 2, 2018.
– Co-organiser of the Geometric Analysis Session at the AustMS Annual Meeting 2017, Sydney, Australia, December 12–15, 2017.
– Co-organiser of the Geometry & Topology Seminar at The University of Sydney, August 2016–present.
– Co-organizer of the Pacific Northwest Geometry Seminar 2014 Spring Meeting, University of Oregon, May 3–4, 2014.

Committees

– Member of the working party to reorganise 3 credit point first year units into 6 credit point units, Semester 1, 2022.
– Chair of the Hiring Committee (for post-docs supported on Leo Tzou's ARC Discovery Projects grants), School of Mathematics and Statistics, The University of Sydney, Semester 1, 2019.
– Representing the School of Mathematics and Statistics at the Faculty Committee Meeting on Bachelor of Advanced Studies, The University of Sydney, Semester 2, 2018.
– Member of the Committee for the New Unit of Study MATH1021, School of Mathematics and Statistics, The University of Sydney, 2018–2019.

Outreach and Volunteer

– Mentor for CHOOSEMATHS, August–September 2018.
– Volunteer at The University of Sydney: Info Day 2017, Open Day 2016, 2022.

Professional Service

– Referee for Communications in Partial Differential Equations, Journal of Differential Geometry, Journal of Geometric Analysis, International Mathematics Research Notices IMRN, Memoirs of the American Mathematical Society.
– Reviewer for Mathematical Reviews by the American Mathematical Society.
– Reviewer for the Australian Research Council.

Professional Development

– Foundations of Research Supervision, The University of Sydney, April 2020.
– Principles and Practice of University Teaching and Learning, The University of Sydney, November 2016–November 2017.

Affliation and Membership

– American Mathematical Society.
– Australian Mathematical Society.
– Sydney Mathematical Research Institute.
– The University of Sydney China Studies Centre.

Conferences and Workshops

– Australian Curriculum, Assessment and Reporting Authority Mathematicians Workshop, Sydney, Australia, June 2019.
– Workshop on Geometry Analysis 2019, Hunan University, China, May 2019.
– Australian-German Workshop on Differential Geometry in the Large, MATRIX, Australia, February 2019.
– Workshop on Mean Curvature and Regularity, Institute for Advanced Studies, USA, November 2018.
– Workshop on Geometry Analysis 2017, Capital Normal University, Beijing, China, May 2017.
– Geometric Flows in Riemannian and Complex Geometry, Mathematical Sciences Research Institute, USA, May 2–6, 2016.
– Joint Mathematics Meetings, Seattle, USA, January 6–9, 2016.
– Pacific Northwest Geometry Seminar 2015 Fall Meeting, University of Washington, USA, October 17–18, 2015.
– Workshop on Ricci Curvature, Northwestern University, USA, May 28-31, 2015.
– Bay Area Differential Geometry Seminar, Stanford University, USA, February 21, 2015.
– The 22nd Southern California Geometric Analysis Seminar, University of California, San Diego, USA, February 7–8, 2015.
– Young Geometric Analysts' Forum, Tsinghua Sanya International Mathematics Forum, China, January 26–30, 2015.
– AMS Fall Western Sectional Meeting, San Francisco State University, USA, October 25–26, 2014.
– JDG Conference on Geometry and Topology, Harvard University, USA, September 13–14, 2014.
– Geometric Analysis and Relativity, University of Science and Technology of China, China, July 6–10, 2014.
– Group Actions in Riemannian Geometry—Conference In Honor of Patrick Eberlein, University of North Carolina, Chapel Hill, USA, May 15–18, 2014.
– Pacific Northwest Geometry Seminar 2014 Spring Meeting, University of Oregon, USA, May 3–4, 2014.
– Lafayette-Lehigh Geometry-Topology Seminar, Lafayette College, USA, March 15, 2014.

– Pacific Northwest Geometry Seminar 2014 Winter Meeting (joint with the Bay Area Differential Geometry Seminar), Stanford University, USA, February 8–9, 2014.

– Park City Mathematics Institute 2013 Research Program in Geometric Analysis, Park City Mathematics Institute, USA, June 30 – July 20, 2013.

– Conformal and Kähler Geometry, Institut Henri Poincaré, France, October 5–29, 2012.

– 47th Texas Geometry and Topology Conference, University of Houston, USA, February 17–19, 2012.

– Conference on Geometric Analysis—in honor of Peter Li's Research, University of California, Irvine, USA, January 14–17, 2012.

– SAGE Workshop: Mean curvature flow and its stationary solutions, The University of Texas at Austin, USA, January 11–12, 2012.

– Chern Centennial Conference, Mathematical Sciences Research Institute, USA, October 30–November 4, 2011.

– Beijing Summer Program in Mathematical Relativity 2011, Beijing International Center for Mathematical Research, China, June 5–25, 2011.

– 44th Texas Geometry and Topology Conference, Texas A&M University, USA, November 12–14, 2010.

– SAGE Workshop: Optimal Transport and Riemannian Geometry, The University of Texas at Austin, USA, September 1–3, 2010.

– PRIMA Conference on Geometric Analysis, Pacific Institute for the Mathematical Sciences, University of British Columbia, Canada, July 20–30, 2010.

– Nonlinear Analysis and PDEs, The University of Texas at Austin, USA, April 16–17, 2010.

– 33rd Annual Texas Partial Differential Equations Conference, The University of Texas at Austin, USA, April 10–11, 2010.

– AMS Fall Central Section Meeting, Baylor University, USA, October 16–18, 2009.

– Mathematical Aspects of Imaging, Modeling and Visualization in Multiscale Biology, The University of Texas at Austin, USA, March 31–April 04, 2009.

– International Conference on Nonlinear Partial Differential Equations and Geometric Analysis, Harbin Institute of Technology, China, June 30–July 4, 2008.

– Lafayette-Lehigh Geometry-Topology Seminar, Lafayette College, USA, Spring 2007.

– Lehigh Geometry/Topology Conference, Lehigh University, USA, June 8–10, 2006.

Awards and Honors

– Valedictorian (4.0 GPA), Lafayette College, Class of 2007.

– Wesley S. Mitman Prize, Lafayette College, 2007.

– Carnegie Endowment for International Peace Junior Fellows Program, National Finalist, 2007.

– Eugene P. Chase Phi Beta Kappa Prize, Lafayette College, 2005.

– Benjamin F. Barge Mathematical Prize, Lafayette College, 2005.

– Phi Beta Kappa, Pi Mu Epsilon, Sigma Pi Sigma, Sigma Xi.

– Mathematical Contest in Modeling: Successful Participant (2007), Meritorious Winner (2005).

– McKelvy Scholar, Lafayette College, 2005–2007.

– EXCEL Scholar in mathematics, physics, and history, resp., Lafayette College, various terms.

Language and Technology Skills

– Chinese (native), English (fluent[2]).

– LaTeX, *Mathematica*, HTML.

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[2]IELTS overall band score 8.5 (tested in January 2018), equivalent to CEFR Level C2.

References for Research

Ben Andrews
Mathematical Sciences Institute, Australian National University, Canberra, ACT 2601, Australia.
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Sigurd Angenent
Department of Mathematics, University of Wisconsin-Wisconsin, Madison, WI 53760, USA.
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James Isenberg
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Dan Knopf
Department of Mathematics, The University of Texas at Austin, Austin, TX 78712, USA.
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Zhou Zhang
School of Mathematics and Statistics, The University of Sydney, NSW 2006, Australia.
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References for Teaching and Service

Ding-Xuan Zhou (Head of School)
School of Mathematics and Statistics, The University of Sydney, NSW 2006, Australia.
`dingxuan.zhou@sydney.edu.au`

Sharon Stephen (Teaching)
School of Mathematics and Statistics, The University of Sydney, NSW 2006, Australia.
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