

# Christopher K. Henderson

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CITIZENSHIP USA

## ACADEMIC POSITIONS

**University of Arizona**, Tucson, AZ USA 2019 - Present  
Assistant Professor, Department of Mathematics  
Affiliate member, Program in Applied Mathematics

**University of Chicago**, Chicago, IL USA 2016-2019  
LE Dickson Instructor, Department of Mathematics

**École Normale Supérieure de Lyon**, Lyon, France 2015-2016  
LabEx Milyon Postdoctoral Fellow, Unité de Mathématiques Pures et Appliquées

EDUCATION **Stanford University** Stanford, California USA

PhD, Mathematics, June 2015  
Advisor: Lenya Ryzhik  
Dissertation Title: Propagation Phenomena in Reaction-Advection-Diffusion Equations

**University of Chicago**, Chicago, Illinois USA

B.S. (Honors), Mathematics, June 2010  
Phi Beta Kappa

## GRANTS AND AWARDS

NSF DMS-1907853 2019-2022

## RESEARCH INTERESTS

Partial differential equations and applied analysis. More specifically: front propagation and long-time dynamics of solutions of PDEs that arise in biology, physics, engineering, and the social sciences, such as the Fisher-KPP equation (and various related reaction-diffusion or kinetic-reactive models) and stochastic and deterministic Hamilton-Jacobi equations; regularity, global well-posedness, and qualitative behavior of solutions to kinetic equations and conservation laws, such as the Landau equation.

## PUBLICATIONS

1. Y. Gu, C. Henderson, A PDE hierarchy for directed polymers in random environments. Submitted. [arxiv:2002.02799](https://arxiv.org/abs/2002.02799).
2. C. Henderson, S. Snelson, A. Tarfulea, Local well-posedness of the Boltzmann equation with polynomially decaying initial data. Submitted. [arxiv:1910.07138](https://arxiv.org/abs/1910.07138).
3. C. Henderson, S. Snelson, A. Tarfulea, Local solutions of the Landau equation with rough, slowly decaying initial data. *Kinet. Relat. Models*, to appear. [arxiv:1909.05914](https://arxiv.org/abs/1909.05914).
4. V. Calvez, C. Henderson, S. Mirrahimi, O. Turanova, Non-local competition slows down front acceleration during dispersal evolution. Submitted. [arxiv:1810.07634](https://arxiv.org/abs/1810.07634).

5. C. Henderson, P.E. Souganidis, Brownian fluctuations of flame fronts with small random advection. Submitted. [arxiv:1810.06161](https://arxiv.org/abs/1810.06161).
6. C. Henderson, S. Snelson, A. Tarfulea, Local existence, lower mass bounds, and a new continuation criterion for the Landau equation. *J. Differential Equations*, 266 (2019), no. 2-3, 1536-1577. DOI:10.1016/j.jde.2018.08.005
7. É. Bouin, C. Henderson, L. Ryzhik, The Bramson delay in the non-local Fisher-KPP equation. *Ann. Inst. H. Poincaré Anal. Non Linéaire*, 37 (2020), no. 1, 51-77. DOI:10.1016/j.anihpc.2019.07.001
8. F. Hamel, C. Henderson, Propagation in a Fisher-KPP equation with non-local advection. *J. Funct. Anal.*, 278 (2020), no. 7, 108426, 53 pp. DOI:10.1016/j.jfa.2019.108426
9. C. Henderson, S. Snelson,  $C^\infty$  smoothing for weak solutions of the inhomogeneous Landau equation. *Arch. Ration. Mech. Anal.*, 236 (2020), no. 1, 113-143. DOI:10.1007/s00205-019-01465-7
10. C. Henderson, P.E. Souganidis, The reactive-telegraph equation and a related kinetic model. *NoDEA Nonlinear Differential Equations Appl.*, 24 (2017), no. 6, Art. 66, 33 pp. DOI:10.1007/s00030-017-0488-0.
11. É. Bouin, J. Garnier, C. Henderson, F. Patout, Thin front limit of an integro-differential Fisher-KPP equation with fat-tailed kernels. *SIAM J. Math. Anal.*, 50 (2018), no. 3, 3365-3394. DOI:10.1137/17M1132501.
12. C. Henderson, B. Perthame, P.E. Souganidis, Super-linear propagation for a general, local cane toads model. *Interface Free Bound.*, 20 (2018), no. 4, 483-509. DOI: 10.4171/IFB/409
13. É. Bouin, M. Chan, C. Henderson, P. Kim, Influence of a mortality trade-off on the spreading rate of cane toads fronts. *Comm. Partial Differential Equations*, 43 (2018), no. 11, 1627-1671. DOI:10.1080/03605302.2018.1523190
14. É. Bouin, C. Henderson, L. Ryzhik, The Bramson logarithmic delay in the cane toads equation. *Q. Appl. Math.*, 75 (2017), no. 4, 599-634. DOI:10.1090/qam/1470.
15. É. Bouin, C. Henderson, Super-linear spreading for the local bistable cane toads equation. *Nonlinearity*, 30 (2017), no. 4, 1356-1375. DOI:10.1088/1361-6544/aa5d65.
16. M. Erbar, C. Henderson, G. Menz, P. Tetali, Ricci curvature bounds for weakly interacting Markov chains. *Electron. J. Probab.*, 22 (2017), Paper No. 40, 23 pp. DOI:10.1214/17-EJP49.
17. É. Bouin, C. Henderson, L. Ryzhik, Super-linear spreading in local and non-local cane toads equations. *J. Math. Pures Appl.*, (9) 108 (2017), no. 5, 724-750. DOI:10.1016/j.matpur.2017.05.015.
18. C. Henderson, Propagation of solutions to the Fisher-KPP equation with slowly decaying initial data. *Nonlinearity*, 29 (2016), no. 11, 3215-3240. DOI:10.1088/0951-7715/29/11/3215.
19. C. Henderson, G. Menz, Equivalence of decay of correlations, log-Sobolev inequalities, and Poincaré inequalities in spin systems with infinite range interactions. *Stochastic Process. Appl.*, 126 (2016), no. 10, 2877 - 2912. DOI:10.1016/j.spa.2016.03.005.
20. G.-M. Gie, C. Henderson, G. Iyer, L. Kavlie, J. Whitehead, Stability of vortex solutions to an extended Navier-Stokes system. *Commun. Math. Sci.*, 14 (2016), no. 7, 1773 - 1797. DOI:10.4310/CMS.2016.v14.n7.a1.
21. C. Henderson, Population stabilization in branching Brownian motion with drift and absorption. *Commun. Math. Sci.*, 14 (2016), no. 4, 973 - 985. DOI:10.4310/CMS.2016.v14.n4.a5.

22. C. Henderson, Pulsating fronts in a 2D reactive-Boussinesq system. *Comm. Partial Differential Equations*, Vol. 39, 1555-1595. 2014. DOI:10.1080/03605302.2013.850726.

## TALKS

*2020 SIAM Conference on Nonlinear Waves and Coherent Structures* - July 2020 - Special Session on “Discrete and continuous systems with nonlocal interactions” (canceled due to COVID19)  
*The 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications* - June 2020 - Special Session on “Stochastic Partial Differential Equations”. (canceled due to COVID19)  
*The 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications* - June 2020 - Special Session on “Stochastic Analysis and Large Scale Interacting Systems” (canceled due to COVID19)  
*CU Boulder* – April 2020 – Colloquium (Dept of Applied Math) (canceled due to COVID19)  
*Stanford University* – March 2020 – Applied Mathematics Seminar  
*Michigan State University* – February 2020 – Applied Mathematics Seminar  
*UCLA* – January 2020 – Analysis and PDE Seminar  
*UC San Diego* – December 2019 – Analysis Seminar  
*SUNY Stony Brook* – October 2019 – Analysis Seminar  
*University of Arizona* – September 2019 – Analysis and its Applications Seminar  
*Iowa State University* – February 2019 – Colloquium  
*University of Arizona* – January 2019 – Colloquium  
*Penn State University* – September 2018 – Probability and Financial Mathematics Seminar  
*Banff International Research Station* – August 2018 – Interacting Particle Systems and Parabolic PDEs  
*The 12th AIMS Conference on Dynamical Systems, Differential Equations and Applications* - July 2018 - Special Session on “Recent Advances in the Analysis of Nonlinear Phenomena”  
*Carnegie Mellon University* - May 2018 - CNA Seminar  
*University of Illinois, Chicago* - December 2017 - Analysis and Applied Mathematics Seminar  
*Ohio State University* - October 2017 - PDE Seminar  
*University of North Texas* - September 2017 - AMS Special Session on “Nonlocal PDEs in Fluid Dynamics”  
*University of Wisconsin* - April 2017 - Analysis/PDE Seminar  
*University of Chicago* - January 2017 - CAMP Seminar  
*Casa Matemático Oaxaca (BIRS)* - August 2016 - Stochastic and Deterministic Models for Evolutionary Biology  
*Centre International de Rencontres Mathématiques* - July 2016 - Summer School: PDE and Probability for Life Sciences  
*Université d’Aix-Marseille* - June 2016 - Séminaire Analyse Appliquée  
*Université de Paris 6* - May 2016 - Séminaire Itinérant de Mathématiques, Biologie et Applications des Doctorants  
*Universität Mannheim* - May 2016 - Applied Analysis Seminar  
*Université de Paris 7* - March 2016 - Workshop on Complex Systems of Reaction-Diffusion  
*University of Cambridge* - February 2016 - Geometric Analysis and Partial Differential Equations Seminar  
*University of Oxford* - January 2016 - Stochastic Analysis Seminar  
*Duke University* - November 2015 - Applied Math and Analysis Seminar  
*Université de Grenoble 1* - November 2015 - Séminaire Physique Mathématiques  
*UMPA (ENS de Lyon, Université Lyon 1)* - April 2015 - Séminaire équations aux dérivées partielles et applications  
*Columbia University* - January 2015 - Applied Math Colloquium  
*University of Alberta* - January 2015 – Special Seminar

## SERVICE

### **Organizer:**

- AIMS Conference on Dynamical Systems, Differential Equations and Applications 2020, special session on “Nonlinear models in kinetic theory, collective behavior, and fluid dynamics” (canceled due to COVID19)
- CIRM Research School “PDE and Probability for Biology” (February 2020)
- University of Arizona Colloquium (2019 - 2020)
- CAMP (Computational, Applied Math, and PDE) Seminar (2017-2018)
- AMS Fall Central Sectional Meeting 2018, special session on “Nonlocality in Models for Kinetic, Chemical, and Population Dynamics”

### **Referee:**

- Various journals including Journal of Functional Analysis; Annales de l’Institut Henri Poincaré C, Analyse Non Linéaire; Transactions of the AMS; Communications in Mathematical Physics; Journal de Mathématiques Pures et Appliquées; Analysis and PDE; SIAM Journal on Mathematical Analysis; Communications in Partial Differential Equations

## TEACHING

### **Department of Mathematics, University of Arizona**

*Instructor*

*Fall 2019 - Present*

Math 125 (Calc 1), 355 (Analysis of Ordinary Differential Equations)

### **Department of Mathematics, University of Chicago**

*Instructor*

*Fall 2016 - Present*

Math 16110, 16210, 16310 (‘Honors Calculus’ by the Moore Method); Math 27300 (‘Basic Theory of Ordinary Differential Equations’); Math 27200 (‘Basic Functional Analysis’)

### **Department of Mathematics, Stanford University**

*Teaching Assistant and Course Assistant, various courses*

*Fall 2011 - Spring 2015*

## STUDENT SUPERVISION AND OUTREACH

### **University of Chicago REU**

*Summer 2017, 2018*

Taught minicourses related to analysis, probability, and partial differential equations

### **Student mentoring**

*Spring 2016*

Assisted with the supervision of Florian Patout in the completion of an internship at ENS de Lyon and Université de Savoie.

### **Stanford Undergraduate Research Institute in Mathematics (REU)**

*Director*

*Summer 2014*

*Graduate Student Mentor*

*Summer 2012, 2013*

## CONFERENCES AND WORKSHOPS ATTENDED

2020 SIAM Conference on Nonlinear Waves and Coherent Structures; The 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications (2020); SIAM PDE (2019); Interacting Particle Systems and Parabolic PDEs, BIRS (2018); The 12th AIMS Conference on Dynamical Systems, Differential Equations and Applications, National Taiwan University (2018); 79/80th Midwest PDE Seminar, the University of Illinois at Chicago (2017); AMS Fall Central Sectional Meeting; Workshop on Stochastic Differential Equations, Mean Field Games, and Biology, Gran Sasso Institute (2017); 78th Midwest PDE Seminar, Loyola University of Chicago (2016); Madison Workshop in Analysis and PDE, University of Wisconsin (2016); Stochastic and Deterministic Models for Evolutionary Biology,

CMO-BIRS(2016); Mathematical Topics in Kinetic Theory, University of Cambridge (2016); Workshop on Complex Systems of Reaction-Diffusion, Université de Paris 7 (2016); Stanford Analysis and Computation in Kinetic Theory (2015); Workshop: Analysis in Lyon, ENS de Lyon, Université de Lyon 1 (2015); Oberwolfach Seminar: Stochastic Homogenization (2015); Rivière-Fabes Symposium on Analysis and PDE, University of Minnesota (2015); Front Propagation and Particle Systems, BIRS (2014); AIM Square (2014, 2015); Chicago Summer School in Analysis, University of Chicago (2014); Programme Mathématiques et Biologie, Systèmes de Particules et Réaction-Diffusion, Université Paul Sabatier (2014); Stanford Summer School and Workshop - Recent Advances in PDE (2013); Clifford Lectures (in honor of Peter Constantin), Tulane University (2013); AMS Mathematics Research Communities - Regularity Problems for Nonlinear Partial Differential Equations Modeling Fluids and Complex Fluids, Snowbird, Utah (2013); Advances in Nonlinear Science, University of Pittsburgh (2013); Recent Developments in Applied Mathematics, in Honor of George Papanicolaou's 70th Birthday, Stanford University (2013); Madison Autumn Analysis and PDE Workshop, University of Wisconsin-Madison (2012); Concentration Month on Nonlinear Elliptic PDE, University of Chicago (2012); Rivière-Fabes Symposium on Analysis and PDE, University of Minnesota (2012)

SIGNATURE

A handwritten signature in black ink, appearing to read 'C. K. Henderson', written in a cursive style.

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