Jennifer Crodelle, PhD

Current position:	**Assistant Professor of Mathematics** at Middlebury College
Address:	14 Old Chapel Rd, Middlebury, VT, 05753
Email:	jcrodelle@middlebury.edu
Website:	http://sites.middlebury.edu/jcrodelle/

Past positions

2017-2020	NSF Mathematical Sciences Postdoctoral Research Fellow at the Courant Institute of Mathematical Sciences, NYU

Research Interests

Computational biology	I am interested in dynamics of neuronal networks during development and mechanisms underlying pain processing in the spinal cord.

Education

Aug 2017	Doctor of Philosophy in Mathematics, **Rensselaer Polytechnic Institute** Thesis: *The role of electrotonic coupling between pyramidal cells in the cortex* Advisor: Prof. Gregor Kovacic
May 2012	Bachelor of Science in Applied Mathematics, **Marist College** Graduated with honors in the major.

Current grant awards

2023 - 2025	*Vermont Biomedical Research Network Project Award*, $150,000.

Peer-Reviewed Journal Articles

J. Crodelle, C. Vanty*, and V. Booth. *Modeling homeostatic and circadian modulation of human pain sensitivity*, Front. Neurosci. 17, 1166203 (2023).

J. M. Epstein, E. Hatna, **J. Crodelle**. *Triple contagion: a two-fears epidemic model* J. R. Soc. Interface.18(181):20210186 (2021).

J. Crodelle and D. W. McLaughlin. *Modeling the role of gap junctions between excitatory neurons in the developing visual cortex*. PLoS Computational Biology, 17(7):e1007915 (2021).

J. Crodelle, C. Vallejo, M. Schmidtchen, C. Topaz, and M.R. D'Orsogna . *Impacts of California Proposition 47 on crime trends in Santa Monica, CA*, PLoS One, 16(5):e0251199 (2021).

J. Crodelle and P. Maia. *A Computational model for pain processing in the dorsal horn following axonal damage to receptor fibers*, Brain Sciences, 11(4):505 (2021).

J. Crodelle, D. Zhou, G. Kovacic, and D. Cai. *A computational model of electrotonic coupling between pyramidal cells in the cortex*, Journal of Computational Neuroscience, 48(4):387–407, (2020).

Zq.K. Tian, **J. Crodelle**, and D. Zhou. *A Combined Offline-Online Algorithm for Hodgkin-Huxley Neuronal Networks*. Journal of Scientific Computing, 84(1):10 (2020)

* *indicates undergraduate students.*

J. Crodelle, K.A. Newhall, P.B. Pyzza, and G. Kovacic. *Coarse-grained descriptions of oscillations in neuronal network models.* Communications in Mathematical Sciences, 1437:1458, (2019).

J. Crodelle, M. Hagenauer, S. Piltz, and V. Booth. *Modeling the daily rhythm of human pain processing in the dorsal horn.* PLoS Computational Biology, 15(7): e1007106, (2019).

J. Crodelle, D. Zhou, G. Kovacic, D. Cai. *A role for electrotonic coupling between cortical pyramidal cells,* Frontiers in Computational Neuroscience, 13:33, (2019).

Z.Q. Xu, **J. Crodelle**, D. Zhou, D. Cai. *Maximum entropy principle analysis in network systems with short-time recordings,* Physical Review E, 99:022409, (2019).

J. Crodelle, M. Hagenauer, S. Piltz, and V. Booth. *A neural circuit model for pain processing in the spinal cord.* Proceedings of A Research Collaboration Workshop for Women in Mathematical Biology, Springer, (2016).

M.Hagenauer, **J. Crodelle**, S. Piltz, N. Toporikova, P. Ferguson, and V. Booth. *The Modulation of Pain by Circadian and Sleep-Dependent Processes: A Review of the Experimental Evidence.* Proceedings of A Research Collaboration Workshop for Women in Mathematical Biology, Springer, (2016).

Journal Articles in progress

J. Crodelle & W. Dai. *Activity-dependent effect of cholinergic waves on LGN to V1 synapse formation* In prep for Journal of Computational Neuroscience

A. Hattori, A. Byrne, and **J. Crodelle**. *Mathematical approach to understanding gap junctions and seizure-induced activity.* In prep for PLoS Computational Biology.

Selected Invited Seminars

Oct 2022 | *Exploring synchrony in the brain through mathematical modeling,*
Pi Mu Epsilon Induction Ceremony, Saint Michael's College, Colchester, VT

Apr 2022 | *Development of orientation preference in mice: a mathematical model,*
RWTH Aachen University EDDy Seminar, (Virtual)

Oct 2020 | *A simple mathematical model of synapse formation in the developing visual cortex of mice,*
Applied Mathematics Seminar, UNC Chapel Hill, NC (Virtual)

Nov 2019 | *Modeling visual circuit development of mice through synaptic plasticity,*
Simons Collaboration on the Global Brain Postdoc Meeting, New York, NY

Oct 2019 | *Do mice and cats see eye-to-eye?,*
Mathematics Colloquium, Williams College, Williamstown, MA

Jun 2019 | *Introduction to computational neuroscience,*
Undergraduate Summer Research Seminar, Courant Institute, NY

Apr 2019 | *Gap junctions in the developing mouse visual cortex,* Applied Math Days, Rensselaer, NY

Feb 2018 | *Circadian rhythmicity of pain sensitivity: A firing-rate model of dorsal horn circuitry*
Computational Biology Seminar, Courant Institute, NY

Selected Invited Conference talks

Jan 2023	*Mathematical modeling in the brain: investigating the formation of network connections*, Joint Mathematics Meetings (JMM), Boston, MA
June 2021	*Firing-rate models for analyzing spinal circuit motifs underlying chronic pain*, Society for Mathematical Biology (SMB) Annual Meeting, (Virtual)
Jul 2019	*Modeling visual circuit development of mice through synaptic plasticity*, Society for Mathematical Biology (SMB) Annual Meeting, Montreal, CAN
May 2019	*Modeling gap junctions in the cortex*, SIAM Conference on Applications of Dynamical Systems, Salt Lake City, UT
Aug 2018	*Gap junctions between pyramidal cells in cortical neuronal networks*, SIAM Conference on the Life Sciences, Minneapolis, MN
Jun 2017	*Synchrony among synaptically and electrically connected neurons in the cortex* Third International Conference on Mathematical Neuroscience, Boulder, CO

Contributed Talks & Poster Presentations

Nov 2022	*Mathematical modeling approach to investigating inhibitory plasticity in the visual cortex (poster)*, Society for Neuroscience (SFN) Annual Meeting, San Diego, CA
Aug 2022	*Plasticity among neurons in the visual cortex during development: a mathematical modeling approach (poster)*, MathFest, Philadelphia, PA
Oct 2021	*Mathematical modeling of neuronal networks*, Fall Faculty Forum, Middlebury, VT
Nov 2018	*A mathematical model for the circadian rhythmicity of pain sensitivity in the dorsal horn (poster)*, Society for Neuroscience (SFN) Annual Meeting, San Diego, CA
Jan 2017	*The role of electrotonic junctions between excitatory neurons in the cortex*, Joint Mathematical Meetings, Atlanta, GA

Awards & Honors

May 2023	*Perkins Award for teaching*, $5,000.
Jun 2022	*Vermont Biomedical Research Network Pilot Award*, $34,000.
Fall 2021	*Middlebury CTLR Pedagogy Enrichment Funds*.
2017 - 2020	*National Science Foundation, Mathematical Sciences Postdoctoral Fellowship*, $150,000, DMS-1703761.
May 2017	*Joaquin B. Diaz Thesis Prize* at Rensselaer for showing curiosity in new questions, an inquiring mind, a love to understand things, and the patience for systematic inquiry.

Teaching Experience

Spring 2022	Partial Differential Equations (MATH 0326 – new course) Calculus II (MATH 0122)
Winter 2022	Data Science Across Disciplines (NSCI/MATH 1230 – new course)
Fall 2021	Differential Equations (MATH 0226 – new name/number) Calculus II (MATH 0122)
Spring 2021	Differential Equations (MATH 0225) Mathematical Modeling (MATH 0315 – new course)
Fall 2020	Differential Equations (MATH 0225) Multivariable Calculus (MATH 0223)
Spring 2019-2020	Linear Algebra x3 (Courant)
Fall 2018	Ordinary Differential Equations (Courant)
Fall 2016	Multivariable Calculus (Russell Sage College)

Mentoring Experience

Research Mentor/Advisor to:

2021 - 2023	(Alex Ginsberg, University of Michigan) A PhD student at UMich advised by Victoria Booth. I served as a mentor and committee member for his thesis, defended in July 2023.
Summer 2022	(Ai Hattori, Class of 2024, Middlebury College) A summer undergraduate research student at Midd focused on modeling the effect of gap junctions on epileptic seizure activity.
Summer 2022	(Daniel Ellison, Class of 2023, Middlebury College) A summer undergraduate research student at Midd focused on investigating the difference between two plasticity rules.
2021 - 2022	(Carrie Vanty, Class of 2023.5, Middlebury College) An undergraduate research student at Midd focused on formulating a mathematical model to explore the interaction of sleep and pain.
Summer 2021	(Bryan Currie, Class of 2022, Middlebury College) A summer undergraduate research student at Midd focused on modeling the synchronization properties of neurons coupled by a gap junction.
Summer 2021	(Ben Elstner, Class of 2022.5, Middlebury College) A summer undergraduate research student at Midd focused on understanding and characterizing inhibitory STDP.
Summer 2019	(Paulina Czarnecki, Class of 2020, University of Michigan) A summer undergraduate research student at Courant focused on modeling the electrophysiological properties of a Merkel cell.
Summer 2018	(Taylor Meredith, Class of 2020, Courant) An undergraduate student focused on modeling the neuromuscular disease Myasthenia Gravis and its treatment.

Workshops

Jun 2021	*SIMIODE Developer's Workshop: Differential Equations Model and Resource Creators* SIMIODE, (Virtual)
Mar 2021	*Mathematical and computational approaches to social justice* ICERM at Brown University, Providence, RI (Virtual)
Sep 2019	*Statistical model fitting* NYU Center for Neural Science, New York, NY
Jul 2018	*Crime in Santa Monica* AMS-MRC: Agent-based modeling in Biological and Social Systems, Whispering Pines, RI
Aug 2015	*Understanding neuromechanical processes in locomotion with physical modeling and network analysis* SAMSI: Challenges in Computational Neuroscience (CCNS)
Jun 2015	*Sleep, circadian rhythms and pain* A Research Collaboration Workshop for Women in Mathematical Biology, NIMBioS, Knoxville TN
May 2015	SIAM Workshop on Network Sciences, Salt Lake City, UT

Organizing Activities

May 2021	Co-organizer of a minisymposium *New dynamical systems frameworks for investigating neuronal network computations*, SIAM conference on Applications of Dynamical Systems, virtual
Jul 2019	Co-organizer of a minisymposium *Mathematical modeling of neuronal networks*, SMB Annual Meeting, Montreal, CAN
May 2019	Co-organizer of a minisymposium *Neuronal Computations in Brain Networks*, SIAM Conference on Applications of Dynamical Systems, Salt Lake City, UT
Aug 2018	Co-organizer of a minisymposium *Information Processing in Neuronal Networks*, SIAM Conference on the Life Sciences, Minneapolis, MN
May 2017	Co-organizer of a minisymposium *Computational models of neuronal connectivity in the brain*, SIAM Conference on Applications of Dynamical Systems, Salt Lake City, UT

Journals refereed: PLoS Computational Biology, Physical Review E, Cognitive Neurodynamics, PLoS One, SIAM Journal on Applied Dynamical Systems .

Professional Development

2022-2023	*MAA Project NExT Fellow*
Summer 2022	*WRP Anti-Racist Pedagogy Fellow*
Fall 2021	*National Center for Faculty Development and Diversity Faculty Success Program*
Aug 2021	*CTLR Annual Teaching and Writing Retreat.*
Jan 2021	*CTLR Contemporary Teaching in the Liberal Arts Series, Pandemic Teaching.*
Jul 2020	*DLINQ Camp Design Online.*