

Curriculum Vitae – Martin Kruse, Ph.D.

Contact Information

Department of Biology & Program in Neuroscience
Bates College
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EDUCATION

Philosophiae Doctor, Chemistry
University of Hamburg, Germany February 2009
THESIS - "Regulation of cardiac KCNQ1 and TRPM4b ion channel activity" with highest honors (summa cum laude)

Diploma (equivalent to B.S. and M.S.), Biochemistry and Molecular Biology
University of Hamburg, Germany July 2004
with highest honors (summa cum laude)

RESEARCH POSITIONS HELD AND POSTGRADUATE TRAINING

Bates College since August 2017
Department of Biology & Program in Neuroscience
• Assistant Professor

University of Washington May 2016 – July 2017
Department of Physiology & Biophysics
• Acting Instructor in the Department of Physiology & Biophysics

University of Washington October 2010 – July 2017
Department of Physiology & Biophysics
• Postdoctoral fellow in the laboratory of Bertil Hille

University of Hamburg, Germany March 2009 – September 2010
Center for Molecular Neurobiology
• Postdoctoral fellow in the laboratory of Olaf Pongs

University of Hamburg, Germany February 2005 – February 2009
Department of Chemistry
• Ph.D. student in the laboratory of Olaf Pongs

University of Hamburg, Germany August 2004 – January 2005
Bernhard-Nocht-Institute for Tropical Medicine
• Scientific assistant in the laboratory of Martin Wiese

PEER-REVIEWED PUBLICATIONS

1. Jensen J, Falkenburger BH, Dickson EJ, de la Cruz L, Dai G, Myeong J, Jung SR, **Kruse M**, Vivas O, Suh BC, and Hille B (2022). Biophysical physiology of phosphoinositide rapid dynamics and regulation in living cells. *J Gen Physiol* 154(6): e:202113074.
2. de la Cruz L, Kushmerick C, Sullivan JM, **Kruse M***, and Vivas O* (2022). Hippocampal neurons maintain a large PtdIns(4)P pool that results in faster PtdIns(4,5)P₂ synthesis. *J Gen Physiol* 154(3): e:202113001. * Oscar Vivas and Martin Kruse are shared senior authors of this publication.
3. Flenner F, Jungen C, K pker N, Ibel A, **Kruse M**, Koivum ki JT, Rinas A, Zech ATL, Rhoden A, Wijnker PJM, Lemoine MD, Steenpass A, Girdauskas E, Eschenhagen T, Meyer C, van der Velden J, Patten-Hamel M, Christ T, and Carrier L (2021). Translational investigation of electrophysiology in hypertrophic cardiomyopathy. *J Mol Cell Cardiol* 157: 77-89.
4. **Kruse M**, and Whitten RJ# (2021). Control of neuronal excitability by cell surface receptor density and phosphoinositide metabolism. *Front Pharmacol* 12: 663840. # Undergraduate student mentored by M. Kruse.
5. Chua GNL, Wassarman KL, Sun H, Alp JA, Jarczyk EI, Kuzio NJ, Bennett MJ, Malachowsky BG, **Kruse M**, and Kennedy AJ (2019). Cytosine-based TET enzyme inhibitors. *ACS Med Chem Lett* 10: 180-185.
6. **Kruse M**, Kohout SC, and Hille B (2019). Reinterpretation of the substrate specificity of the voltage-sensitive phosphatase during dimerization. *J Gen Physiol* 151: 258-263.
7. Walter AM, Mueller R, Tawfik B, Wierda KD, Pinheiro PS, Nadler A, McCarthy AW, Ziomkiewicz I, **Kruse M**, Reither G, Rettig J, Lehmann M, Haucke V, Hille B, Schultz C, and Sorensen JB (2017). Phosphatidylinositol 4,5-bisphosphate optical uncaging potentiates exocytosis. *eLIFE* e30203.
8. Traynor-Kaplan A, **Kruse M**, Dickson EJ, Dai G, Vivas O, Yu H, Whittington D, and Hille B (2017). Fatty-acyl chain profiles of cellular phosphoinositides. *Biochim Biophys Acta - Molecular and Cell Biology of Lipids* 1862: 513-522.
9. Dai G, Yu H, **Kruse M**, Traynor-Kaplan A, and Hille B (2016). Osmoregulatory inositol transporter SMIT1 modulates electrical activity by adjusting PI(4,5)P₂ levels. *Proc Natl Acad Sci USA* 113: E3290- 9.
10. Keum D*, **Kruse M***, Kim DI, Hille B, and Suh BC (2016). Phosphoinositide 5- and 3- phosphatase activities of a voltage-sensing phosphatase in living cells show identical voltage dependence. *Proc Natl Acad Sci USA* 113: E3686-95. * These authors contributed equally to this work.
11. Yu H, Benitez SG, Jung SR, Altamirano LE, **Kruse M**, Seo JB, Koh DS, Mu oz EM, and Hille B (2016). GABAergic signaling in the rat pineal gland. *J Pineal Res* 61: 69-81.
12. Dickson EJ, Jensen JB, Vivas O, **Kruse M**, Traynor-Kaplan A, and Hille B (2016). Rapid formation of ER-PM junctions recruits a lipid phosphatase and regulates phosphoinositide metabolism. *JCB* 213: 33-48.
13. **Kruse M***, Vivas O*, Traynor-Kaplan A, and Hille B (2016). Dynamics of phosphoinositide-dependent signaling in sympathetic neurons. *J Neurosci* 36: 1386-400. * These authors contributed equally to this work. (Recommended in Faculty of 1000)
14. Hille B, Dickson EJ, **Kruse M**, Vivas O, Suh BC (2015). Phosphoinositides regulate ion channels. *Biochim Biophys Acta* 1851: 844-56.
15. Vivas O*, **Kruse M***, Hille B (2014). Nerve growth factor sensitizes adult sympathetic neurons to the proinflammatory peptide bradykinin. *J Neurosci* 34: 11959-71. * These authors contributed equally to this work.
16. **Kruse M**, Pongs O (2014). TRPM4 channels in the cardiovascular system. *Curr Opin Pharmacol* 15: 68-73.

17. Hille B, Dickson E, **Kruse M**, Falkenburger B (2014). Dynamic metabolic control of an ion channel. *Prog Mol Biol Transl Sci* 123: 219-47.
18. **Kruse M**, Hille B (2013). The phosphoinositide sensitivity of the K_v channel family. *Channels* 7: 530- 6.
19. Schattling B, Steinbach K, Thies E, **Kruse M**, Menigoz A, Ufer F, Flockerzi V, Brück W, Pongs O, Vennekens R, Kneussel M, Freichel M, Merkler D, Friese MA (2012). TRPM4 cation channel mediates axonal and neuronal degeneration in experimental autoimmune encephalomyelitis and multiple sclerosis. *Nat Med* 18: 1805-11. (Recommended in Faculty of 1000)
20. Mandal G, Sharma M, **Kruse M**, Sander-Juelch C, Munro LA, Wang Y, Vilg JV, Tamás MJ, Bhattacharjee H, Wiese M, Mukhopadhyay R (2012). Modulation of Leishmania major aquaglyceroporin activity by a mitogen-activated protein kinase. *Mol Microbiol* 85: 1204-18.
21. **Kruse M**, Hammond GR, Hille B (2012). Regulation of voltage-gated potassium channels by PI(4,5)P₂. *J Gen Physiol* 140: 189-205.
22. Klaiber M*, Dankworth B*, **Kruse M***, Hartmann M, Nikolaev VO, Yang RB, Völker K, Gassner B, Oberwinkler H, Feil R, Freichel M, Groschner K, Skryabin BV, Frantz S, Birnbaumer L, Pongs O, Kuhn M (2011). A cardiac pathway of cyclic GMP-independent signaling of guanylyl cyclase A, the receptor for atrial natriuretic peptide. *Proc Natl Acad Sci USA* 108: 18500-5. * These authors contributed equally to this work.
23. Sachse G, **Kruse M**, Pongs O (2011). Genetically Modified Mice: Useful Models to Study Cause and Effect of Cardiac Arrhythmias? *Heart Rate and Rhythm*, 473-84.
24. Klaiber M, **Kruse M**, Völker K, Schröter J, Feil R, Freichel M, Baba HA, Pongs O, Penninger JM, and Kuhn M (2010). Novel insights into the mechanisms mediating the local antihypertrophic effects of cardiac atrial natriuretic peptide: role of cGMP-dependent protein kinase and RGS2. *Basic Res Cardiol* 105: 583-95. (Recommended in Faculty of 1000)
25. Liu H*, El Zein L*, **Kruse M***, Guinamard R, Beckmann A, Bozio A, Kurtbay G#, Mégarbané A, Ohmert I, Blaysat G, Vilain E, Pongs O, and Bouvagnet P (2009). Gain- of-function mutations in TRPM4 cause autosomal dominant isolated cardiac conduction disease. *Circ Cardiovasc Genet* 3: 374-85. * These authors contributed equally to this work. # Undergraduate student mentored by M. Kruse.
26. **Kruse M***, Schulze-Bahr E*, Corfield V*, Beckmann A, Stallmeyer B, Kurtbay G#, Ohmert I, Schulze-Bahr EI, Brink P, and Pongs O (2009). Impaired endocytosis of the ion channel TRPM4 is associated with human progressive familial heart block type I. *JCI* 119: 2737-44. * These authors contributed equally to this work. # Undergraduate student mentored by M. Kruse. (Recommended in Faculty of 1000)
27. Wang Q, Melzer IM, **Kruse M**, Sander-Juelch C, and Wiese M (2005). LmxMPK4, a mitogen- activated protein (MAP) kinase homologue essential for promastigotes and amastigotes of *Leishmania mexicana*. *Kinetoplastid Biol Dis* 4: 6.
28. Cross FR, Schroeder L, **Kruse M**, and Chen KC (2005). Quantitative characterization of a mitotic cyclin threshold regulating exit from mitosis. *Mol Biol Cell* 16: 2129-38.

TEACHING AND MENTORING EXPERIENCE

Bates College

2017 – 2022

Assistant Professor of Biology and Neuroscience. List of courses: BI/NS 308, "Neurobiology", Bio 321, "Cellular Biochemistry", Bio 473, "Seminar and Research in Cell Biology", Bio 242 / Bio 202, "Cellular and Molecular Biology", Bio 195, "Lab-Based Biological Inquiry: Cellular Neuroscience", Bio 460, "Junior Seminar", BI/NS 305, "Gene Editing in Biology and Neuroscience", FYS 497, "Community Science of Brain Injury in Sports".

University of Washington Bothell 2015 – 2016
Lecturer in the University of Washington's Science Teaching Experience for Postdocs (STEP) program at the University of Washington Bothell. Topic of course: BBio 485, Advanced Seminar in Biology, "Brain Gain: Frontiers in Neurogenesis".

University of Washington and University of Hamburg, Germany 2005 – 2016
Mentor of several graduate (*Ph.D.*) and Diploma (*B.S. + M.S.*) students while being a graduate student and postdoctoral fellow.

University of Washington 2015
Attendant of workshop "Helping Students Learn from Student Peers", Center for Teaching and Learning, University of Washington.

University of Washington 2013 – 2014
Organization of a seminar series focused on lipids and membrane proteins for the Departments of Physiology & Biophysics, Chemistry, Biochemistry and Pharmacology.

University of Hamburg, Germany 2009 – 2010
Lecturer in graduate program "Graduate studies in Molecular Biology" at the Center for Molecular Neurobiology Hamburg. Topic of course: "Ion channel regulation in mammalian cells".

SPECIFIC TRAINING IN BIOINFORMATICS

University of Michigan 2020
Participant in "Applied Data Science with Python Specialization" program offered by the University of Michigan: This five-month long program trains participants in the concepts of data cleaning, analysis, and machine learning in the programming language Python.

University of Washington 2016
Participant in "Machine Learning Specialization" program offered by the University of Washington: This eight-month long program trains participants in the concepts of machine learning algorithms in the programming language Python.

Johns Hopkins University 2015 – 2016
Graduation with distinction from "Data Science Specialization" program offered by the Department of Biostatistics at Johns Hopkins University: This one-year long program covers concepts of obtaining and cleaning data, processing data, performing statistical analysis, and building machine learning algorithms with the programming language R.

University of Connecticut 2012
Training in the Virtual Cell Simulation Environment (<https://core.uconn.edu/resources/vcell>) developed by the University of Connecticut: This three-day workshop focused on using the Virtual Cell Environment for simulations of cellular signaling networks.

HONORS, SCHOLARSHIPS AND AWARDS

- Recipient of a Maine INBRE Investigator Award for the characterization of regulation of neuronal activity by phosphoinositides. Start date: 05/01/2019. End date: 04/30/2022. Total amount of award: \$270,000. Funding source: National Institute of General Medical Sciences (NIGMS).
- Recipient of a Feodor Lynen Research Fellowship of the Alexander von Humboldt-Foundation (Germany) for research project in the laboratory of Bertil Hille, August 2011 - July 2013.
- Award for the best poster presentation at the "Frontiers in Cardiovascular Biology" Congress of the European Society of Cardiology, Berlin, Germany, July 2010.

- Award for the best PhD-thesis of the Department of Chemistry at the University of Hamburg (Hamburg, Germany), July 2009.
- Scholarship of the Studienstiftung des deutschen Volkes (Germany), October 1999 - July 2004.

PROFESSIONAL AND SERVICE ACTIVITIES AND SPECIAL RESPONSIBILITIES

- Ad-hoc reviewer for the Journal of General Physiology, the Proceedings of the National Academy of Sciences, for ACS Chemical Neuroscience, and for Biochimica et Biophysica Acta – Molecular and Cell Biology of Lipids as well as for grant applications to the National Science Foundation
- Member of Bates College's Institutional Animal Care and Use Committee (IACUC), since July 2019, chair of IACUC, July 2019 – December 2019
- Member of Bates College's Medical Studies Committee, September 2018 – July 2022
- Member of Bates College's Library and Information Services Committee, since September 2021
- Member of Bates College's Student Affairs Committee, since September 2022
- Postdoctoral representative on the Committee for Science, Training and Education of the Center for Molecular Neurobiology Hamburg, Germany, March 2009 - September 2010.

PROFESSIONAL MEMBERSHIPS

- Member, American Society for Cell Biology, since 2019.
- Member, Society for Neuroscience, 2014-2017.
- Member, Biophysical Society, since 2010.

PRESENTATIONS

- Poster presentation, "Mathematical modeling as a tool to characterize the role of phosphoinositide metabolism for regulation of neuronal action potential firing", 66th Annual meeting of the Biophysical Society in San Francisco, CA, February 2022. * Co-authored by undergraduate thesis student (Rayne J. Whitten)
- # Invited speaker, "Mathematical modeling as a tool to characterize the role of phosphoinositide metabolism for regulation of neuronal action potential firing", Dartmouth College, February 2022. # Seminar included data from several undergraduate thesis students
- # Invited speaker, "Regulation of neuronal activity by phosphoinositide metabolism – Can one phospholipid family really control our brain?", Bowdoin College, October 2021. # Seminar included data from several undergraduate thesis students
- # Invited speaker, "Control of neuronal activity via surface density of muscarinic acetylcholine receptors and lipid kinase activities in sympathetic neurons", 47th Maine Biological and Medical Sciences Symposium (MBMSS), Mount Desert Island Biological Laboratory (virtual conference), April 2020. # Seminar included data from undergraduate thesis student (Rayne J. Whitten)
- # Invited speaker, "Control of neuronal activity via surface density of muscarinic acetylcholine receptors and lipid kinase activities in sympathetic neurons", Department of Pharmacology, University of Washington, February 2020. # Seminar included data from several undergraduate thesis students

- Poster presentation, "Control of circadian rhythm via surface density of muscarinic acetylcholine receptors and cytoplasmic lipid kinases in sympathetic neurons", Annual Meeting of the Society for Cell Biology in Washington, DC, December 2019. * Co-authored by undergraduate thesis student (Rayne J. Whitten)
- Poster presentation, "Phosphoinositide-dependent regulation of action potential firing in sympathetic neurons", Northeast Regional IDeA Conference in Bretton Woods, NH, August 2019.
- Poster presentation, "Analysis of phosphoinositide-dependence of action potential firing in sympathetic neurons by electrophysiological recordings and mathematical modeling", 63rd Annual meeting of the Biophysical Society in Baltimore, MD, March 2019. * Co-authored by undergraduate thesis student (Rayne J. Whitten)
- Poster presentation, "Analysis of Ca₂₊ signaling after activation of muscarinic acetylcholine receptors in sympathetic neurons by measurements and mathematical modeling", Annual meeting of the Society for Neuroscience in Chicago, IL, October 2015.
- Poster presentation, "Analysis of Ca₂₊ signaling after activation of muscarinic acetylcholine receptors in sympathetic neurons by measurements and mathematical modeling", Annual meeting of the Society for Neuroscience in Chicago, IL, October 2015.
- Invited speaker, "Comparison of muscarinic modulation of KCNQ2/3 channel activity and phosphoinositide metabolism between superior cervical ganglion neurons and tsA201-cells", Kobe University, Kobe, Japan, December 2014.
- Poster presentation, "Phosphoinositide metabolism and signaling in a neuron: data and model", Annual meeting of the Society for Neuroscience in Washington, DC, November 2014.
- Poster presentation, "Nerve growth factor sensitizes superior cervical ganglion neurons to bradykinin", 58th meeting of the Biophysical Society in San Francisco, CA, February 2014.
- Poster presentation, "Does PI(4,5)P₂ regulate voltage-gated potassium channels?", 56th meeting of the Biophysical Society in San Diego, CA, February 2012.
- Poster presentation, "Altered surface density of TRPM4 channel associated with cardiac conduction disorders", "Frontiers in Cardiovascular Biology" Congress of the European Society of Cardiology, Berlin, Germany, July 2010.
- Poster presentation, "Impaired Endocytosis of TRPM4 Channel Associated With Progressive Familial Heart Block Type I", Scientific Sessions of the American Heart Association in Orlando, FL, November 2009.
- Invited speaker, "Regulation of cardiac TRPM4 ion channel activity", Department of Chemistry, University of Hamburg, Germany, December 2009.
- Oral presentation, "Impaired endocytosis of TRPM4 channel associated with isolated cardiac conduction disorders", 20th Ion Channel Meeting of the French Association of Ion Channel Research in Hyres, France, September 2009.