Juan Du, Ph.D.
Professor, Departments of Molecular Biosciences and Pharmacology
Northwestern University

Research Focus

I am broadly interested in how the human body senses external stimuli, conveys this signal to the brain and generates responses via neuronal ion channels, such as how we detect and respond to different temperatures. To address these fundamental questions, our lab uses a diverse set of biophysical approaches to study the structure and function of these important ion channels, including cryo-electron microscopy (Cryo-EM) and patch-clamp electrophysiology. Our long-term goals include understanding temperature sensation and regulation in the human body and structure-guided drug design relevant to mental illness, pain therapy, and temperature-related pathological conditions.

Contact

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Education

2008-2011	Ph.D.	University of Freiburg (Chemistry), Germany
		Mentor: Prof. Dr. Oliver Einsle
2003-2008	B.A. & M.A.(Diplom)	University of Göttingen (Chemistry), Germany

Postgraduate Training

2012/04-2015/10	Postdoctoral Research Fellow, HHMI & Vollum Institute, Oregon Health & Science University, Portland, Oregon, USA
	Mentor: Dr. Eric Gouaux
2016/05-2017/10	Postdoctoral Research Fellow, HHMI & Vollum Institute, Oregon Health & Science University, Portland, Oregon, USA
	Mentor: Dr. Eric Gouaux

Professional Experience

2024/09-	Professor of Molecular Biosciences, Weinberg College of Arts and Sciences, Northwestern University, Evanston, Illinois, USA
2024/11-	Professor of Pharmacology (secondary appointment), Northwestern University Feinberg School of Medicine, Chicago, Illinois, USA
2024/01-2024/08	Adjunct Professor of Molecular Biosciences, Weinberg College of Arts and Sciences, Northwestern University, Evanston, Illinois, USA
2021/05-2024/08	Associate Professor, Department of Structural Biology, Van Andel Institute, Grand Rapids, Michigan, USA
2017/10-2021/05	Assistant Professor, Department of Structural Biology, Van Andel Institute, Grand Rapids, Michigan, USA

2015/11-2016/05 Scientist, Amgen Pharmaceutical Company, Cambridge, MA, USA

Honors and Awards

2020 Pew Biomedical Scholar Award
2020 Alfred P. Sloan Research Fellow in Neuroscience
2019 Klingenstein-Simons Award in the Neurosciences
2019 McKnight Scholar Award for neuroscience
2018 Van Andel Institute Employee Impact Fund
2012 Arthur Lüttringhaus Prize *(doctoral prize)*
2011 Chinese Government Award for Outstanding Self-financed Students Abroad
2011 Ph.D. in Chemistry, awarded *Summa Cum Laude*

Active and Pending Research Support:

NIH NINDS R01NS129804, J. Du (PI)
Structural Basis of Nociceptor Channel TRPM3 gating and pharmacology
09/01/2023 – 06/30/2028

NIH NINDS R01NS128180, J. Du (Multi-PI)
Activation and Inhibition Mechanisms of Calcium-Activated Nonselective Cation Channels
06/01/2022 – 05/31/2027

Pew Biomedical Scholar Award, J. Du (PI)
07/01/2020 – 06/30/2025 (NCE)

Completed Research Support:

Klingenstein-Simons Fellowship Award in the Neurosciences, J. Du (PI)
07/01/2019 – 06/30/2024

NIH NINDS R01NS111031, J. Du (PI)
Structural and Functional Studies of TRPM2 channel
04/01/2019 – 03/31/2025

McKnight Scholar Award for neuroscience, J. Du (PI)
07/01/2019 – 06/30/2025

Alfred P. Sloan Research Fellow in Neuroscience, J. Du (PI)
06/01/2020 – 07/31/2025

Service

Peer Review Grants

2024 – 2028 Standing member of NIH Biochemistry and Biophysics of Membranes (BBM)
2024 Ad hoc reviewer, NIH Macromolecular Structure and Function C (MSFC)
2023 Ad hoc reviewer, NIH Biochemistry and Biophysics of Membranes (BBM)
2021 Ad hoc reviewer, NIH R03 ZRG1 BCMB G55
2021 Ad hoc reviewer, NIH Biophysics of Neural Systems (BPNS)
2021 Reviewer, Chan Zuckerberg Biohub Investigator Award
2020 Ad hoc reviewer, NIH Metformin and Aging R01 Review Panel
2019 – present Review Board for Pacific Northwest National Laboratory for Cryo-EM Project Proposals

Peer Review Journals

Nature, *Science*, *Cell*, *eLife*, *Journal of General Physiology*, *Nature Structural & Molecular Biology*, *Nature Chemistry&Molecular Biology*, *PNAS*, *Angewandte Chemie*, *JMB*

Scientific Society Memberships and Leadership

2026 Chair of the Channels, Receptors & Transporters Subgroup of the 70th bps in SF
2025 Chair-Elect of the Channels, Receptors & Transporters Subgroup of the 69th bps in LA
2025 Co-Chair of cryo-EM sessions of ACA meeting in Lombard IL
2024 Chair of the inaugural Gateway Ion Channel Symposium in Grand Rapids MI
2023 Co-Chair of the 9th International Ion Channel Conference in China
2019-present Biophysical Society
2019-present American Heart Association
2019-present Review Board for Pacific Northwest National Laboratory for Cryo-EM Project Proposals

Invited Seminars as a Faculty Member:

2026 Ion Channel Gordon Research Conference, South Hadley, MA, July 12-17
2026 The 43rd International School of Biophysics in Erice, Silily, May 13-19
2026 UCSD seminar in Biology, San Diego, CA, April 22
2025 The 2nd Annual Nanoscale Imaging Sciences Conference, Houston, TX, November 17-18
2025 University of South Florida, Tempa, FL, November 21
2025 TRP Channel Meeting (fifth edition), Leuven, Belgium, September 17-19
2025 The 2nd gateway ion channel symposium (keynote speaker), Chicago, IL, July 8-10
2025 Caltech Biochemistry Seminar Series, Pasadena, CA, May 28-30
2025 Westlake University, Hangzhou, China, April 24
2025 Beijing University, Beijing, China, April 21
2025 Cold Spring Harbor Asia Conference on Membrane Proteins, Suzhou, China, April 14-18
2025 Fred Hutch Basic Sciences Seminar, Seattle, WA, April 8
2025 BPS Channels, Receptors and Transporters Subgroup Symposium, February 15
2024 ASCB/EMBO meeting, San Diego, CA, December 14
2024 Washington University in St. Louis, CIMED seminar, St. Louis, MO, December 2
2024 Weill Cornell Medicine, 2024-2025 PBSB Seminar Series, September 18
2024 EMBO Practical Course lecture, Hamburg, Germany, September 9-16
2024 International Conference on Life Science, Guiyang, China, July 25-30
2024 University of Texas at Austin, Molecular Biology, Austin, TX, April 28
2024 GRC Ligand Recognition and Molecular Gating, Ventura, March 24-29
2024 Pew Biomedical Scholar Annual Meeting, Tucson, AZ, March 17-22
2024 Duke University, Biochemistry, Durham, NC, March 1
2023 UMass at Amherst, MCB, Amherst, MA, November 7
2023 Northwestern University, Molecular Biosciences, Evanston, IL, March 9
2022 Neurocrine, December 7, virtual
2022 GRC Ion Channels, Mount Holyoke College, July 10-15
2022 GRC Calcium Signaling, Ventura, CA, June
2022 FASEB Science Research Conferences (SRC) on NAD+ Metabolism and Signaling, Steamboat, CO, June
2022 McKnight Neuroscience Foundation Meeting, Aspen, CO, June
2022 Klingenstein-Simons Neuroscience Foundation Meeting, New York, May
2022 Vollum Institute, Oregon Health & Science University, Portland, OR, April 29th
2022 NIH Neuroscience Seminar, March 14th, virtual
2022 BPS Channel Receptors & Transporters Subgroup, San Francisco, CA, February 19-23
2021 FMP Institute, Germany, November 03, virtual
2021 Society of General Physiologist (SGP) annual meeting, September 8-12, virtual
2021 The 8th International Ion Channel Conference, China, August 03, virtual
2021 FASEB Science Research Conferences (SRC) on the understudied druggable genome, June, virtual

2021 FASEB Science Research Conferences (SRC) NAD+ Metabolism and Signaling, June, virtual (keynote speaker)
2020 University of Washington, Seattle, WA, January
2019 Shanghai institute of Neuroscience, Shanghai, China, July
2019 Shanghai Institute of Materia Medica, Shanghai, China, July
2019 The 7th International Ion Channel Conference, Zhejiang University, Hangzhou, China, June
2019 Hamburg Eppendorf Klinikum, Hamburg, Germany, May
2019 University of Freiburg, Freiburg, Germany, May

Peer-Reviewed Publications:

*: co-corresponding author; #: co-first author

26. Kumar S#, Jin F#, Park SJ, Choi W, Keuning S, Massimino R, Vu S, Lü W* & **Du J***. Convergent Agonist and Heat Activation of Nociceptor TRPM3. *Nat Struct Mol Biol*, in press (2025).

25. Huang Y, Kumar S, Lee J, Lü W* & **Du J***. Coupling enzymatic activity and gating in an ancient TRPM chanzyme and its molecular evolution. *Nat Struct Mol Biol*, **31**, 1509-1521 (2024).

24. Hu J, Park SJ, Walter T, Orozco I, O'Dea G, Ye X, **Du J*** & Lü W*. Physiological temperature drives TRPM4 ligand recognition and gating. *Nature,* **630**:509-515 (2024).

23. Ruan Z, Lee J, Li Y & **Du J* &** Lü W*. Human Pannexin 1 Channel is NOT phosphorylated by Src Tyrosine Kinase at Tyr199 and Tyr309. *eLife* (2024).

22. Muller C#, Zhang L#, Zipfel S, Topitsch A, Lutz M, Eckert J, Prasser B, Chami M, Lü W, **Du J*** & Einsle O*. Molecular interplay of an assembly machinery for nitrous oxide reductase. *Nature* **608**, 626-631 (2022).

21. Ruan Z#, Haley E#, Orozco IJ#, Sabat M, Myers R, **Du J***, Lü W*. Structures of TRPM5 channel elucidate mechanism of activation and inhibition. *Nat Struct Mol Biol* **28**, 604-613 (2021).

20. Yu J#, Zhu HT#, Lape R, Greiner T, **Du J**, Lü W, Sivilotti L*, Gouaux E*. Mechanism of gating and partial agonist action in the glycine receptor. *Cell* 184(4):957-968.e21 (2021).

19. Ruan Z#, Osei-Owusu J#, **Du J**, Qiu Z*, Lü W*. Structures and pH sensing mechanism of proton-activated chloride channel. *Nature* **588**, 350-354 (2020).

18. Ruan Z, Orozco I. J., **Du J***, Lü W*. Structures of human Pannexin 1 reveal ion pathways and mechanism of gating. *Nature* **584**, 646-651 (2020).

17. Lü W* & **Du J***. The N-terminal domain in TRPM2 channel is a conserved nucleotide binding site. *Journal of General Physiology* 152(5):e20192555 (2020).

16. Huang Y, Fliegert R, Guse A. H, Lü W*, **Du J***. A structural overview of the ion channel of the TRPM family. *Cell Calcium* 85(102111) (2020).

15. Choi W#, Clemente N#, Sun W, **Du J***, Lü W*. The structures and gating mechanism of calcium homeostasis modulator2. *Nature* **576**, 163-167 (2019).

14. Huang Y, Roth B, Sun W, Lü W*, **Du J***. Ligand recognition and gating mechanism through three ligand-binding sites of human TRPM2 channel. *eLife* 8:e50175 (2019).

13. Haley E#, Choi W#, Fan C, Sun W, **Du J***, Lü W*. Expression and purification of the human lipid-sensitive cation channel TRPC3 for structural determination by single-particle cryo-electron microscopy. *J. Vis. Exp*. (143), e58754 (2019).

12. Huang Y, Winkler PA, Sun W, Lü W*, **Du J***. Architecture of the TRPM2 channel and its activation mechanism by ADP-ribose and calcium. *Nature* **562**, 145-149 (2018).

11. Fan C#, Choi W#, Sun W, **Du J***, Lü W*. Structure of the human lipid-gated cation channel TRPC3. *Elife* 7:e36852 (2018).

10. Winkler PA#, Huang Y#, Sun W#, **Du J**, Lü W. Electron cryo-microscopy structure of a human TRPM4 channel. *Nature* **552**, 200-204 (2017).

9. Lü W#, **Du J#**, Goehring A, Gouaux E. Cryo-EM structures of the triheteromeric NMDA receptor and its allosteric modulation. *Science* 355(6331)3729 (2017).

8. **Du J**[#], Lü W[#], Wu S, Cheng Y, Gouaux E. Glycine receptor mechanism elucidated by electron cryo-microscopy. *Nature* **526**, 224-229 (2015).

7. Lee CH[#], Lü W[#], Michel JC, Goehring A, **Du J**, Song X, Gouaux E. NMDA receptor structures reveal subunit arrangement and pore architecture. *Nature* **511**, 191-197 (2014).

6. Lü W, **Du J**, Schwarzer NJ, Wacker T, Andrade SL, Einsle O. The formate/nitrite transporter family of anion channels. *Biol Chem*, 394(6)715-727 (2013).

5. Lü W, Schwarzer NJ, **Du J**, Gerbig-Smentek E, Andrade SL, Einsle O. Structural and functional characterization of the nitrite channel NirC from Salmonella typhimurium. *Proc Natl Acad Sci USA* 109(45)18395-18400 (2012).

4. Lü W, **Du J**, Schwarzer NJ, Gerbig-Smentek E, Einsle O, Andrade SL. The formate channel FocA exports the products of mixed-acid fermentation. *Proc Natl Acad Sci USA* 109(33)13254-13259 (2012).

3. **Du J**[#], Say RF[#], Lü W, Fuchs G, Einsle O. Active-site remodelling in the bifunctional fructose-1,6-bisphosphate aldolase/phosphatase. *Nature* **478**, 534-537 (2011).

2. Lü W, **Du J**, Wacker T, Gerbig-Smentek E, Andrade SL, Einsle O. pH-dependent gating in a FocA formate channel. *Science* 332(6027)352-354 (2011).

1. Lü W, **Du J**, Stahl M, Tzivelekidis T, Belyi Y, Gerhardt S, Aktories K, Einsle O. Structural basis of the action of glucosyltransferase Lgt1 from Legionella pneumophila. *J Mol Biol* 396(1)321-331 (2010).