

# Jared M Cregg, PhD

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## Research Interests

As a systems neuroscientist, my research aims to understand the functional organization of brainstem motor circuits. Behavior, while complex, coalesces into specific motor instructions transmitted to the spinal cord. The brainstem acts as a critical bottleneck for this process, integrating higher-order circuit information for motor execution. I use mouse behavior, calcium imaging, electrophysiology, optogenetics, and cell-type- and projection-specific targeting to reveal brainstem motor infrastructure in sophisticated detail. My long-term goal is to exploit a functional, neuroanatomical, and molecular map of brainstem motor circuits toward interventions for movement disorders observed clinically.

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## Education

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| 2018 | <b>PhD, Neuroscience</b><br>Case Western Reserve University<br><i>Cleveland, OH</i>            |
| 2010 | <b>BSE, Biomedical Engineering</b><br>Michigan Technological University<br><i>Houghton, MI</i> |
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## Research Positions

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| 2017 -      | <b>Postdoctoral Scholar</b><br>Laboratory of Prof. Ole Kiehn<br>Department of Neuroscience, University of Copenhagen<br><i>Copenhagen, Denmark</i>                      |
| 2010 - 2017 | <b>Graduate Student</b><br>Laboratories of Drs. Jerry Silver & Lynn T Landmesser<br>Department of Neuroscience, Case Western Reserve University<br><i>Cleveland, OH</i> |
| 2009 - 2010 | <b>Research Assistant</b><br>Laboratory of Dr. John W McDonald, III<br>Department of Neurology, Johns Hopkins University<br><i>Baltimore, MD</i>                        |
| 2007 - 2009 | <b>Research Assistant</b><br>Laboratory of Asst. Prof. Ryan J Gilbert<br>Department of Biomedical Engineering, Michigan Technological University<br><i>Houghton, MI</i> |
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## Publications & Manuscripts

### Postdoc

1. **Cregg JM<sup>†</sup>**, Sidhu SK, Leiras R, Kiehn O<sup>†</sup>. (2024) Basal ganglia-spinal cord pathway that commands locomotor gait asymmetries in mice. *In press, Nature Neuroscience*. <sup>†</sup>Co-corresponding authors.
2. **Cregg JM<sup>†</sup>**, Mirdamadi JL, Fortunato C, Okorokova EV, Kuper C, Nayeem R, Byun AJ, Avraham C, Buonocore A, Winner TS, Mildren RL. (2023) Highlights from the 31<sup>st</sup> Annual Meeting of the Society for the Neural Control of Movement. *Journal of Neurophysiology* 129:220-234. <sup>†</sup>Corresponding author. ([pdf](#))

3. Leiras R\*, **Cregg JM\***, Kiehn O. (2022) Brainstem circuits for locomotion. *Annual Review of Neuroscience* 45:63-85. \*Co-first authors. ([pdf](#))
4. **Cregg JM**, Leiras R, Montalant A, Wanken P, Wickersham IR, Kiehn O. (2020) Brainstem neurons that command mammalian locomotor asymmetries. *Nature Neuroscience* 23:730-740. ([pdf](#)) [Cover Article]

#### Graduate

5. Vagnozzi AN, Garg K, Dewitz C, Moore MT, **Cregg JM**, Jeannotte L, Zampieri N, Landmesser LT, Philippidou P. (2020) Phrenic-specific transcriptional programs shape respiratory motor output. *eLife* 9:e52859. ([pdf](#))
6. Lager AM, Corradin O, **Cregg JM**, Eliott MS, Shick E, Clayton BL, Allan KC, Olsen HE, Madhavan M, Tesar PJ. (2018) Rapid functional genetics of the oligodendrocyte lineage using pluripotent stem cells. *Nature Communications* 9:3708. ([pdf](#))
7. **Cregg JM**, Chu KA, Dick TE, Landmesser LT<sup>†</sup>, Silver J<sup>†</sup>. (2017) Phasic inhibition as a mechanism for generation of rapid respiratory rhythms. *Proceedings of the National Academy of Sciences USA* 114:12815-12820. <sup>†</sup>Co-corresponding authors. ([pdf](#))
8. **Cregg JM**, Chu KA, Hager LE, Maggard RS, Stoltz DR, Edmond M, Alilain WJ, Philippidou P, Landmesser LT, Silver J. (2017) A latent propriospinal network can restore diaphragm function after high cervical spinal cord injury. *Cell Reports* 21:654-665. ([pdf](#))
9. Niemi JP, DeFrancesco-Lisowitz A, **Cregg JM**, Howarth M, Zigmond RE. (2015) Overexpression of the monocyte chemokine CCL2 in dorsal root ganglion neurons causes a conditioning-like increase in neurite outgrowth and does so via a STAT3 dependent mechanism. *Experimental Neurology* 275:25-37. ([pdf](#))
10. Gardner RT, Wang L, Lang BT, **Cregg JM**, Dunbar CL, Woodward WR, Silver J, Ripplinger CM, Habecker BA. (2015) Targeting protein tyrosine phosphatase sigma after myocardial infarction restores cardiac sympathetic innervation and prevents arrhythmias. *Nature Communications* 6:6235. ([pdf](#))
11. Lang BT, **Cregg JM**, DePaul MA, Tran AP, Xu K, Dyck SM, Madalena KM, Brown BP, Weng YL, Li S, Karimi-Abdolrezaee S, Busch SA, Shen Y, Silver J. (2015) Modulation of the proteoglycan receptor PTP $\sigma$  promotes recovery after spinal cord injury. *Nature* 518:404-408. ([pdf](#))
12. **Cregg JM**, DePaul MA, Filous AR, Lang BT, Tran A, Silver J. (2014) Functional regeneration beyond the glial scar. *Experimental Neurology* 253:197-207. ([pdf](#))
13. Hilton BJ, Lang BT, **Cregg JM**. (2012) Keratan sulfate proteoglycans in plasticity and recovery after spinal cord injury. *Journal of Neuroscience* 32:4331-4333. ([pdf](#))

#### Undergraduate

14. Hurtado A\*, **Cregg JM\***, Wang HB, Wendell DF, Oudega M, Gilbert RJ, McDonald JW. (2011) Robust CNS regeneration after complete spinal cord transection using aligned poly-L-lactic acid microfibers. *Biomaterials* 32:6068-6079. \*Co-first authors. ([pdf](#))
15. Wang HB, Mullins ME, **Cregg JM**, McCarthy CM, Gilbert RJ. (2010) Varying the diameter of aligned electrospun fibers alters neurite outgrowth and Schwann cell migration. *Acta Biomaterialia* 6:2970-2978. ([pdf](#))
16. **Cregg JM**, Wiseman SL, Pietrzak-Goetze NM, Smith MR, Jaroch DB, Clupper DL, Gilbert RJ. (2010) A rapid, quantitative method for assessing axonal extension on biomaterial platforms. *Tissue Engineering Part C: Methods* 16:167-172. ([pdf](#)) [Cover Article]
17. Wang HB, Mullins ME, **Cregg JM**, Hurtado A, Oudega M, Trombley MT, Gilbert RJ. (2009) Creation of highly aligned electrospun poly-L-lactic acid fiber for nerve regeneration applications. *Journal of Neural Engineering* 6:016001. ([pdf](#)) [Cover Article]

#### Bibliometric Summary

Web of Science: >1800 citations, h-index 12 ([link](#))  
 Google Scholar: >2700 citations, h-index 15 ([link](#))

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## Funding

2021 - 2024	Postdoctoral Fellowship Lundbeck Foundation \$380,000 USD
2018 - 2020	Long-Term Fellowship European Molecular Biology Organization (EMBO) \$120,000 USD
2016 - 2017	Core Pilot Grant CTSC Case Western Reserve University \$7,100
2010 - 2013	Graduate Research Fellowship National Science Foundation (NSF) \$123,500 USD

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## Invited/Conference Talks

2024*	European Molecular Biology Laboratory: DANEMO Symposium ( <i>*planned</i> ) <i>Copenhagen, Denmark</i>
2024	New Horizons in Neuroscience Symposium, California Institute of Technology <i>Pasadena, CA</i>
2023	Neurology Grand Rounds, Department of Neurology, University of Wisconsin-Madison <i>Madison, WI</i>
2023	Benzon Symposium: Bringing Circuit for Movement Together <i>Copenhagen, Denmark</i>
2023	Department of Neuroscience, University of Minnesota <i>Minneapolis, MN</i>
2023	Motor Control: Spinal Circuits and Beyond <i>St Andrews, Scotland</i>
2023	XIV Meeting of the International Basal Ganglia Society <i>Stockholm, Sweden</i>
2023	Department of Neuroscience, Karolinska Institutet <i>Stockholm, Sweden</i>
2023	School of Psychology and Neuroscience, University of St Andrews <i>St Andrews, Scotland</i>
2023	Department of Neurobiology and Behavior, Stony Brook University <i>Stony Brook, NY</i>
2023	Department of Neuroscience, Yale University <i>New Haven, CT</i>
2022	Department of Neuroscience, Case Western Reserve University <i>Cleveland, OH</i>
2022	Annual Meeting of the Society for the Neural Control of Movement <i>Dublin, Ireland</i>
2022	Basal Ganglia Gordon Research Seminar <i>Ventura, CA</i>
2021	Brain States Meeting, Danish Society for Neuroscience <i>Copenhagen, Denmark</i>
2020	Emerging Neuroscientists Seminar Series, Sainsbury Wellcome Center <i>London, UK</i>
2020	International Online Spinal Cord Injury Research Seminars <i>Virtual seminar</i>
2019	Workshop on Neuronal Circuits in Motor Behavior, Okinawa Institute of Science & Technology <i>Okinawa, Japan</i>
2016	National Neurotrauma Society Annual Meeting <i>Lexington, KY</i>
2015	Department of Pulmonary, Critical Care, and Sleep Medicine, Case Western Reserve University <i>Cleveland, OH</i>

- 2010 Society for Biomaterials Annual Meeting  
Seattle, WA
- 2008 Biomedical Engineering Society Annual Meeting  
St. Louis, MO

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## Awards

- 2022 Scholarship Award, Society for the Neural Control of Movement
- 2021 Trainee Professional Development Award, Society for Neuroscience
- 2018 Best Poster Award, The Brain Prize Meeting, Middlefart, Denmark
- 2018 Doctoral Excellence Award in Neurosciences, Case Western Reserve University
- 2015 Travel Award, International Symposium on Neural Regeneration
- 2008 Summer Undergraduate Research Fellowship, NASA / Michigan Space Grant Consortium
- 2008 Summer Undergraduate Research Fellowship, Michigan Technological University
- 2008 Barry M. Goldwater Scholarship
- 2008 Grand Prize Winner, Graduate Research Forum Poster Competition, Michigan Technological University

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## Mentoring

- 2020 - 2023 Simrandeep K Sidhu  
Advisor: MS Thesis in Neuroscience, University of Copenhagen  
*Current PhD student in Neuroscience Academy Denmark*
- 2018 - 2020 Paulina Wanken  
Advisor: MS Thesis in Human Biology, University of Copenhagen  
*Current PhD student at Max Planck Institute*
- 2015 - 2017 Kevin A Chu  
Advisor: BS Thesis in Biology, Case Western Reserve University  
*Medical Graduate of NYIT College of Osteopathic Medicine*

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## Teaching

- 2024 PhD Course: Translational Neuroscience  
Lecture: 'Animal Models of Locomotor Control in Health and Disease'  
Neuroscience Academy Denmark
- 2023 - 2024 PhD Course: Open Neurophysiology – Analysis Tools & Datasets ([link](#))  
Lecture: 'Tracking Locomotion using DeepLabCut'  
Practicum: 'Kinematic Analysis using OpenAI'  
Faculty of Health and Medical Sciences, University of Copenhagen
- 2022 PhD Course: Animal Models of Disease and Behavior  
Lecture: 'In Vivo Calcium Recording' ([slides](#))  
Department of Neuroscience, University of Copenhagen
- 2021 Workshop on Animal Models  
Lecture: 'Measuring Mouse Behavior: Dissection of Circuits for Motor Control'  
Graduate Program in In Vivo Pharmacology, University of Copenhagen
- 2018 - 2022 MS Course: Neuronal Signaling/Neuroscience  
Lecture: 'In Vivo Optogenetics & Chemogenetics' ([slides](#))  
Department of Neuroscience, University of Copenhagen

- 2017 PHOL519: Cardiorespiratory Physiology  
Cardiovascular Control in Disease: Cardiac Arrhythmia ([syllabus](#)) ([slides](#))  
Department of Physiology & Biophysics, Case Western Reserve University
- 2017 PHOL466: Cell Signaling  
Neurotransmitter-Gated Ion Channels ([syllabus](#))  
Department of Physiology & Biophysics, Case Western Reserve University
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## Patents

1. Hurtado A, Gilbert RJ, Wang HB, **Cregg JM**, Mullins ME, Oudega M. Three-dimensional scaffolds, methods for fabricating the same, and methods of treating a peripheral nerve or spinal cord injury. US Patent 10,413,391.
  2. Silver J, Lang BT, **Cregg JM**, Weng YL, Li H, Wu W. Compositions and methods of treating root avulsion injury. US Patent 10,258,672.
  3. Lang BT, **Cregg JM**, Weng YL, Silver J. Compositions and methods for inhibiting the activity of lar family phosphatases. US Patent 9,937,242.
    - Licensed to NervGen Pharma as NVG-291 ([link](#))
    - Completed Phase Ia safety study (NCT05308953) ([link](#))
    - Enrolling Phase Ib/Ila (NCT05965700) ([link](#))
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## Conference Abstracts

- 2022 Cregg JM, Sidhu SK, Leiras R, Kiehn O. Basal ganglia-spinal cord pathway that commands locomotor gait asymmetries. Society for Neuroscience Annual Meeting  
*San Diego, CA*
- 2022 Cregg JM, Sidhu SK, Leiras R, Kiehn O. Basal ganglia-spinal cord pathway that commands locomotor asymmetries. Federation of European Neuroscience Societies Forum  
*Paris, France*
- 2022 Cregg JM, Leiras R, Kiehn O. Basal ganglia-spinal cord pathway that commands locomotor asymmetries. Basal Ganglia Gordon Research Conference  
*Ventura, CA*
- 2021 Cregg JM, Leiras R, Kiehn O. Basal ganglia-spinal cord pathway that mediates locomotor asymmetries. Society for Neuroscience Annual Meeting  
*Virtual meeting*
- 2019 Cregg JM, Leiras R, Kiehn O. Brainstem command neurons that specify locomotor direction. Society for Neuroscience Annual Meeting  
*Chicago, IL*
- 2018 Cregg JM, Leiras R, Kiehn O. Spinal projection neurons that control direction orientation during mammalian locomotion. The Brain Prize Meeting  
*Middelfart, Denmark*
- 2016 Cregg JM, Chu K, Dick T, Landmesser LT, Silver J. Optogenetic dissection reveals principles underlying respiratory frequency control. Society for Neuroscience Annual Meeting  
*San Diego, CA*
- 2016 Cregg JM, Chu K, Dick T, Landmesser LT, Silver J. Optogenetic dissection reveals principles underlying respiratory frequency control. Cell Symposium: Big Questions in Neuroscience  
*San Diego, CA*
- 2015 Cregg JM, Landmesser LT, Silver J. Control of diaphragm activity in the absence of supraspinal input: the contribution of interneurons. International Symposium on Neural Regeneration  
*Pacific Grove, CA*
- 2015 Cregg JM, Landmesser LT, Silver J. Control of diaphragm activity in the absence of supraspinal input: the contribution of interneurons. Society for Neuroscience Annual Meeting  
*Chicago, IL*
- 2009 Cregg JM, Wang HB, Gilbert RJ. The role of fiber density in axon motility on aligned topography. Biomedical Engineering Society Annual Meeting  
*Pittsburgh, PA*

- 2009 Cregg JM, Wang HB, Gilbert RJ. The role of aligned fiber density in axon motility. Midwest Biomedical Engineering Conference  
*Ann Arbor, MI*
- 2008 Cregg JM, Wang HB, Mullins ME, Gilbert RJ. Development of polymeric nerve guidance conduits that contain anisotropic cues including aligned microfibers and gradients of adsorbed laminin-1. Design of Medical Devices Conference  
*Minneapolis, MN*
- 2007 Cregg JM, Wang HB, Trombley MT, Gilbert RJ. Anisotropic micro-fibrous scaffolds for nerve regeneration applications. Biomedical Engineering Society Annual Meeting  
*Los Angeles, CA*

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### **Short Courses/Workshops (Attendee)**

- 2022 EMBO Course on Laboratory Leadership  
*Virtual course*
- 2020 EMBO Course on Negotiation for Scientists  
*Heidelberg, Germany*
- 2016 Brain Function: Development, Aging and Disease  
*Lexington, KY*
- 2010 Practical Training Course in Confocal Microscopy and Stereology  
*Chicago, IL*
- 2009 Tissue Engineering of the Nervous System  
*Pittsburgh, PA*
- 2008 Peripheral Nerve Regeneration, Georgia Institute of Technology  
*Atlanta, GA*

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### **Service**

#### *Leadership and Committees*

Nominations Committee – Student Invited Speaker, Department of Neuroscience, Case Western Reserve University (2015)  
 President – Michigan Technological University Chapter of the Biomedical Engineering Society (2008 - 2009)  
 President – Research Scholars Program, Michigan Technological University (2008 - 2009)  
 Social Committee Chairperson – Honors Institute, Michigan Technological University (2007 - 2008)

#### *Peer Review*

Reviewer for *Nature*, *Science*, *Experimental Neurology*, *Scientific Reports*  
 Co-reviewer for *Cell*, *Nature Neuroscience*, *Neuron*, *Nature Communications*, *Frontiers in Neuroscience*

#### *Society Membership*

Society for Neuroscience (2015 - present)  
 American Association for the Advancement of Science (2010 - present)

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