BARTHOLOMEW J. BACAK
CURRICULUM VITAE

EDUCATION

M.D. Drexel University College of Medicine (Expected 2018)

Ph.D. Drexel University, Biomedical Engineering (2016)
Advisor: Ilya Rybak, Ph.D.
Thesis: Multi-scale modeling of the neural control of respiration

M.S. Drexel University, Biomedical Engineering (2014)

B.S. University of Pittsburgh, Bioengineering (2009)

RESEARCH EXPERIENCE

Postdoctoral Researcher (2016). Laboratory for Theoretical and Computational Neuroscience, Department of Neurobiology and Anatomy, Drexel University College of Medicine, Philadelphia, PA.

Graduate Research Associate (2009-2011, 2013-2016). Laboratory for Theoretical and Computational Neuroscience, Department of Neurobiology and Anatomy, Drexel University College of Medicine, Philadelphia, PA.

Undergraduate Research Fellow (2008-2009). The Center for the Neural Basis of Cognition, University of Pittsburgh and Carnegie Mellon University. Pittsburgh, PA.

PUBLICATIONS

Refereed Journal Articles

1. **B. J. Bacak**, T. G. Kim, J. E. Rubin, J. C. Smith, I. A., Rybak. "Mixed-mode oscillations and population bursting in the pre-Bötzinger complex." *eLife.*, vol. 5, p. e13403, March 2016.

2. **B. J. Bacak**, J. Segaran, and Y. I. Molkov, "Modeling the effects of extracellular potassium on bursting properties in pre-Bötzinger complex neurons." *J. Comput. Neurosci.*, Feb. 2016.

3. Y. I. Molkov*, **B. J. Bacak***, A. E. Talpalar, and I. A. Rybak, "Mechanisms of left-right coordination in Mammalian locomotor pattern generation circuits: a mathematical modeling view." *PLoS Comput. Biol.*, vol. 11, no. 5, p. e1004270, May 2015. *Equal contribution

4. Y. I. Molkov, **B. J. Bacak**, T. E. Dick, and I. A. Rybak, "Control of breathing by interacting pontine and pulmonary feedback loops." *Front. Neural Circuits*, vol. 7, p. 16, Jan. 2013.

5. J. E. Rubin, **B. J. Bacak**, Y. I. Molkov, N. A. Shevtsova, J. C. Smith, and I. A. Rybak, "Interacting oscillations in neural control of breathing: modeling and qualitative analysis." *J. Comput. Neurosci.*, vol. 30, no. 3, pp. 607–32, Jun. 2011.

6. Y. I. Molkov, A. P. Abdala, **B. J. Bacak**, J. C. Smith, J. F. R. Paton, and I. A. Rybak, "Late-expiratory activity: emergence and interactions with the respiratory CpG.," *J. Neurophysiol.*, vol. 104, no. 5, pp. 2713–29, Nov. 2010.

Manuscripts in Preparation

7. **B. J. Bacak**, S. M. Danner. "The mechanism of hiccupping: insights from mathematics."

8. **B. J. Bacak,** D. Benito, R. T. Sataloff. "Detection of laryngopharyngeal reflux from laryngoscopic images using image analysis and a neural network-driven classification algorithm."

INVITED TALKS

1. **"**Mixed-mode oscillations and population bursting in the pre-Bötzinger complex." Society for Neuroscience pre-meeting on rhythmic motor circuits 2015. Chicago, IL

2. "Mixed-mode oscillations and development of population bursts in the pre-Bötzinger complex." Platform Presentation, Drexel Discovery Day 2015. Philadelphia, PA.

3. "Applied Mathematics, Neuroscience, and Hiccups." Drexel MD/PhD Seminar Series 2015, Philadelphia, PA.

CONFERENCE ABSTRACTS

1. Computational modeling and analysis of half center CPGs. Neuroscience 2016. San Diego, CA. (presented by collaborator)

2. Mixed-mode oscillations and population bursting in the pre-Bötzinger complex. Neuroscience 2015. Chicago,

3. Computational modeling and qualitative analysis of spinal circuits underlying locomotor pattern generation and frequency-dependent left-right coordination. Computational Motor Control Workshop 2015. Beersheba, Israel.

4. Extracellular potassium concentration defines neuronal bursting properties. Computational Neuroscience 2015. Prague, Czech Republic. (presented by collaborator)

5. Computational modeling and qualitative analysis of spinal circuits underlying locomotor pattern generation and frequency-dependent left-right coordination. Neuroscience 2014. Washington, DC.

6. Mathematical modeling and analysis of spinal circuits involved in locomotor pattern generation and frequency-dependent left-right coordination. Computational Neuroscience 2014. Québec City, Canada. (presented by collaborator)

7. Modeling spinal cord circuits defining the frequency-dependent left-right coordination. NE APSA Meeting 2013. Philadelphia, PA.

8. Control of breathing by interacting pontine and pulmonary feedback loops. Computational Neuroscience 2013. Paris, France. (presented by collaborator)

9. Generation of hypercapnia-evoked late-expiratory activity in a computational model of the respiratory pattern generator. Drexel University College of Medicine – Medical Student Research Day 2012. Philadelphia, PA.

10. Control of respiratory pattern by interacting pontine and pulmonary feedback loops. Neuroscience 2010. San Diego, CA. (presented by collaborator)

11. Generation of hypercapnia-evoked late-expiratory activity in a computational model of the respiratory pattern generator. Neuroscience 2009, Chicago, IL.

12. Engineering education in Taiwanese and US universities. INNOVATE 2009, Ho Chi Minh City, Vietnam & Taipei, Taiwan.

13. In silico and in vitro characterization of recurrent activity in patterned neural networks. Neuroscience 2008, Washington DC.

PAPERS IN CONFERENCE PROCEEDINGS

1. Y. I. Molkov, **B. J. Bacak**, J. Segaran, I. A. Rybak. "Extracellular potassium concentration defines neuronal bursting properties." *24th Annual Computational Neuroscience Meeting*. Published: BMC Neuroscience, vol. 15, supp. 1. Dec. 2015.

2. Y. I. Molkov, **B. J. Bacak**, I. A. Rybak. "Mathematical modeling and analysis of spinal circuits involved in locomotor pattern generation and frequency-dependent left-right coordination." *23rd Annual Computational Neuroscience Meeting*. Published: BMC Neuroscience, vol. 15, supp. 1. July 2014.

OTHER EXPERIENCE

Academic steering committee for junior MD/PhD students, Drexel University College of Medicine (July 2015-present)

Vice president of MD/PhD student government, Drexel University College of Medicine (March 2015-present)

MD/PhD admissions committee, Drexel University College of Medicine (2014-2015)

Research mentor for high school student, Joshua Segaran (2013-2015)

Tutor for pre-clinical medical students, Drexel University College of Medicine (2012-2016)

Tennis instructor, Arthur Ashe Youth Center (2012)

AWARDS

Student Travel Grant – Drexel University (2016)

Student Government Travel Award – Drexel University College of Medicine (2015)

Conference Travel Award – Ben Gurion University of the Negev (2015)

Graduate Student Excellence Award – Drexel University College of Medicine (2014)

Student Achievement Award for the highest score in immunology - Drexel University College of Medicine (2013)

Undergraduate Research Fellowship – Center for the Neural Basis of Cognition (2008-2009)

Honors College Scholarship - University of Pittsburgh (2005-2009)

Study Abroad Scholarship - University of Pittsburgh (2005)

HOBBIES

Travel, tennis, squash, powerlifting, guitar, piano, cooking