BARTHOLOMEW J. BACAK
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EDUCATION

M.D.   Drexel University College of Medicine (Expected May 2018)
        Passed USMLE Step 1 with a score of 259 in June 2013

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

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

B.S.   Bioengineering, University of Pittsburgh (2009)
        Minor: Chemistry

RESEARCH EXPERIENCE

Ph.D. Candidate (2013-present). Laboratory for Theoretical and Computational Neuroscience, Department of Neurobiology and Anatomy, Drexel University College of Medicine, Philadelphia, PA.

Graduate Research Fellow (2009-2011). 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

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,* Oct 7 2010.

Y. I. Molkov, A. P. Abdala, **B. J. Bacak**, J. C. Smith, J. F. Paton and I. A. Rybak, "Late-expiratory activity: emergence and interactions with the respiratory CPG," *J Neurophysiol,* vol. 104, pp. 2713-29, Nov 2010.

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

Y.I. Molkov*, **B.J. Bacak***, A.E. Talpalar, I.A. Rybak. "Mechanisms of Left-Right Coordination in Mammalian Locomotor Pattern Generation Circuits: A Mathematical Modeling View". *PLoS Computational Biology*. vol. 11:5, June 2015. *These authors contributed equally to this study

Manuscripts in Submission

B. J. Bacak, J. Segaran, Y. I. Molkov. "Reevaluating the dependence of bursting properties on potassium concentration: a mathematical modeling study". Invited to resubmit Nov 2015, Journal of Computational Neuroscience.

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." Invited for full submission Dec 2015, eLife

Manuscripts in Preparation

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

INVITED TALKS

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

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

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

CONFERENCE ABSTRACTS

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

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

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

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

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.

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

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

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)

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

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

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.

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

CONFERENCE ATTENDANCE

INNOVATE. A conference on global technology and engineering: Ho Chi Minh City, Vietnam & Taipei, Taiwan 2009
Drexel University Research Day. Philadelphia, PA: 2010, 2014
Drexel University College of Medicine – Medical Student Research Day: 2012-2015
Society for Neuroscience Annual Meeting. 2008, 2009, 2014, 2015
Northeast Meeting of the American Physician Scientists Association: 2014
American Academy of Neurology Annual Meeting: 2014
Computational Motor Control Workshop. Beersheba, Israel: 2015

OTHER EXPERIENCE

Tutored first and second year medical students, Drexel University College of Medicine (2012-present)

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

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

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

Academic steering committee for Philip Yates, a junior MD/PhD student (July 2015-present)

SKILLS

Programming**:** C, C++, XPPAUT, python, gnuplot, Matlab
Laboratory**:** Molecular Cloning, Cell Culturing, Fluorescent Imaging
Other**:** SolidWorks (CAD), COSMOSWorks (FEA & CFD), LabVIEW

AWARDS

Study Abroad Scholarship - University of Pittsburgh (2005)
Honors College Scholarship - University of Pittsburgh (2005-2009)
Term Honor List: 4 Semesters - Swanson School of Engineering (2008-2009)
Research Fellowship – Center for the Neural Basis of Cognition (2008-2009)
Student Achievement Award (Immunology) - Drexel University College of Medicine (2013)
Student Excellence Award – Drexel University College of Medicine (2014)
Conference Travel Award – Ben Gurion University of the Negev (2015)

HOBBIES

Running, powerlifting, guitar, piano, cooking