

UNIVERSITY OF PENNSYLVANIA - PERELMAN SCHOOL OF MEDICINE  
Curriculum Vitae

Date: 03/28/2018

Ethan M. Goldberg, M.D., Ph.D.

Address: The Children's Hospital of Philadelphia  
Division of Neurology  
Abramson Research Center, Room 502A  
3615 Civic Center Boulevard  
Philadelphia, PA 19104 U.S.A.

If you are not a U.S. citizen or holder of a permanent visa, please indicate the type of visa you have:  
none (U.S. citizen)

Education:

|      |       |  |
|------|-------|--|
| 1999 | B.A.  | Harvard University (Neurobiology)                                  |
| 2006 | Ph.D. | New York University School of Medicine (Physiology & Neuroscience) |
| 2008 | M.D.  | New York University School of Medicine                             |

Postgraduate Training and Fellowship Appointments:

|           |   |
|-----------|---|
| 2008-2009 | Intern in Pediatrics, The Children's Hospital of Philadelphia   |
| 2009-2010 | Resident in Pediatrics, The Children's Hospital of Philadelphia   |
| 2010-2013 | Resident, Adult and Child Neurology, The Hospital of the University of Pennsylvania and The Children's Hospital of Philadelphia |
| 2013-2015 | Post-doctoral Epilepsy Research, Douglas A. Coulter, PhD Laboratory, The Children's Hospital of Philadelphia                    |

Faculty Appointments:

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|--------------|--|
| 2013-present | Instructor A of Neurology, The Perelman School of Medicine at The University of Pennsylvania   |
| 2015-present | Assistant Professor of Pediatrics, University of Pennsylvania School of Medicine (Secondary)   |
| 2015-present | Assistant Professor of Neuroscience, University of Pennsylvania School of Medicine (Secondary) |
| 2015-present | Assistant Professor of Neurology, University of Pennsylvania School of Medicine                |

Hospital and/or Administrative Appointments:

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| 2013-present | Attending Physician, The Children's Hospital of Philadelphia Neurology |
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Specialty Certification:

|      |   |
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| 2013 | American Board of Psychiatry and Neurology (ABPN) |
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Licensure:

|      |                       |
|------|-----------------------|
| 2010 | State of Pennsylvania |
|------|-----------------------|

Awards, Honors and Membership in Honorary Societies:

|           |   |
|-----------|---|
| 1996-1999 | John Harvard Scholarship, Harvard University  |
| 1999      | cum laude, Harvard University   |
| 1999      | Certificate in Mind/Brain/Behavior, Harvard University, Faculty of Arts and Sciences Standing Committee on the Mind/Brain/Behavior Initiative |
| 2006      | William Randolph Hearst Foundation Fellowship   |
| 2008      | American Academy of Neurology Medical Student Prize for Excellence in Neurology   |
| 2011      | American Academy of Neurology Annual Meeting Resident Research Travel Scholarship   |
| 2013      | Samuel Zeritsky Award for Excellence in Research, The Hospital of the University of Pennsylvania  |
| 2014      | Grass Foundation - AES Young Investigator Travel Award  |
| 2014      | Burroughs Wellcome Fund Career Award for Medical Scientists   |
| 2017      | American Society of Clinical Investigation Young Physician-Scientist Award  |

Memberships in Professional and Scientific Societies and Other Professional Activities:International:

|              |                          |
|--------------|--------------------------|
| 2004-Present | Society for Neuroscience |
| 2012-Present | Child Neurology Society  |

National:

|              |   |
|--------------|---|
| 2010-Present | American Academy of Neurology   |
| 2011-Present | American Epilepsy Society (AES) (Scientific Program Committee 2016-present) |
| 2017-present | Dravet Syndrome Foundation (Scientific Board Member 2017-present)           |

Editorial Positions:

|              |  |
|--------------|--|
| 2010-Present | Ad hoc reviewer, Pediatric Emergency Care      |
| 2012-Present | Ad hoc reviewer, Neuroscience Letters          |
| 2012-Present | Ad hoc reviewer, Journal of Pediatric Epilepsy |

|              |  |
|--------------|--|
| 2014-Present | Ad hoc reviewer, Cell Stem Cell              |
| 2014-Present | Ad hoc reviewer, Neuron                      |
| 2014-Present | Ad hoc reviewer, Epilepsy and Behavior       |
| 2014-Present | Ad hoc Reviewer, Epilepsy Research           |
| 2014-Present | Ad hoc reviewer, PLoS One                    |
| 2015-Present | Ad hoc reviewer, PNAS                        |
| 2015-Present | Ad hoc reviewer, Human Mutation              |
| 2016-Present | Ad hoc reviewer, eNeuro                      |
| 2016-Present | Ad hoc reviewer, The Journal of Neuroscience |
| 2016-Present | Ad hoc reviewer, eNeuro                      |
| 2017-Present | Ad hoc reviewer, Biological Psychiatry       |
| 2017-Present | Ad hoc reviewer, Journal of Physiology       |
| 2017-Present | Ad hoc reviewer, Scientific Reports          |

Academic and Institutional Committees:

|              |   |
|--------------|---|
| 2012-2016    | Member, Education Committee, The Children's Hospital of Philadelphia, Division of Neurology |
| 2014-present | Member, CHOP ICU Neurology Advisory Committee   |
| 2016-Present | Member, Penn Neuroscience Graduate Group MD/PhD Admissions Committee                        |

Major Academic and Clinical Teaching Responsibilities:

|              |   |
|--------------|---|
| 2013-present | Education of medical students at the Perelman School of Medicine of The University of Pennsylvania. Role: Attending Physician, Department of Pediatrics, Division of Neurology, ICU Neurology Consult Service. Frequency: 4 weeks per year. Dr. Goldberg educates 1-2 medical students per service week during their Neurology Clerkship.   |
| 2013-present | Education of medical residents at the Perelman School of Medicine of The University of Pennsylvania. Role: Attending Physician, Department of Pediatrics, Division of Neurology, ICU Neurology Consult Service. Frequency: 4 weeks per year. Dr. Goldberg educates 2-3 medical residents in Neurology and Child Neurology per service week. |
| 2013         | "Hippocampal dentate gyrus function, and dysfunction in epilepsy: A circuit analysis," Research Institute Scientific Research Symposium, The Children's Hospital of Philadelphia, Philadelphia, PA  |
| 2014-Present | Mentoring. Role: Academic Mentor to Carlyn Patterson Gentile, MD, PhD (PGY-4 Child Neurology Resident). Frequency: semiannual and ad hoc meetings; monthly e-mail exchanges.  |

- 2015-Present Thesis Committee of Tanziyah Muqem, MD/PhD candidate in the Department of Neuroscience at Thomas Jefferson University Sidney Kimmel Medical College, in the laboratory of Manual Covarrubias, MD, PhD. Role: Committee member. Frequency: semiannual.
- 2015 "Novel treatments for epilepsy: \_from the lab to the clinic," Neonatology Research Seminar Series, Division of Neonatology, The Children's Hospital of Philadelphia, Philadelphia, PA
- 2016 Preliminary Committee of Felicia Davatolhagh, PhD candidate at UPenn in the Neuroscience Graduate Group in the laboratory of Marc Fuccillo, MD, PhD. Role: Committee member. Frequency: semiannual and ad hoc.
- 2016-present Graduate student education. Role: PhD Adviser to Nathaniel Sotuyo, UPenn VMD/PhD candidate. Frequency: weekly meetings and multiple times per week ad hoc in the laboratory
- 2017-present Graduate student education. Role: PhD Adviser to Kevin Goff, UPenn MD/PhD candidate. Frequency: weekly meetings and multiple times per week ad hoc in the laboratory
- 2017-present Thesis Committee of Sarah Reitz, PhD candidate at UPenn in the Neuroscience Graduate Group in the laboratory of Max Kelz, MD, PhD. Role: Committee member. Frequency: semiannual and ad hoc.
- 2018 Thesis Committee of Sheng Tang, MD/PhD candidate at UPenn in the Neuroscience Graduate Group in the laboratory of Douglas Coulter, PhD. Role: Outside examiner. Frequency: ad hoc.

Lectures by Invitation:

- Jun, 2006 "Fast-spiking neocortical GABAergic interneurons: Molecular determinants of cell function," Center for Theoretical Neuroscience, Columbia University, New York, NY, U.S.A.
- Aug, 2006 "Fast-spiking neocortical GABAergic interneurons: Molecular determinants of cell function," National Institute of Physiology, Okazaki, Japan.
- Oct, 2013 "Cortical interneurons and epilepsy: Mechanisms of disease, and development of experimental therapies," Department of Neurology Grand Rounds, The University of Iowa Hospitals and Clinics, Iowa City, IA.
- Dec, 2015 "Application of precision medicine in patients with KCNT1 mutation," Scientific Symposium, American Epilepsy Society 69th Annual Meeting, Philadelphia, PA.
- May, 2016 "Precision Medicine for Epilepsy." Seizure Focus Forum, Department of Pediatrics, Division of Child Neurology, Northwestern University Feinberg School of Medicine, Chicago, IL.

- May, 2016 "All-optical physiology," The Department of Pharmacology Seminar Series, Northwestern University Feinberg School of Medicine, Chicago, IL.
- May, 2017 "Mechanisms of epilepsy in Dravet syndrome," Department of Pediatrics Frontiers in Pediatric Research Seminar Series, The University of Iowa, Iowa City, IA.
- Dec, 2017 "A novel genetic cause of very early infantile epileptic encephalopathy," Neonatology Research Seminar Series, Division of Neonatology, The Children's Hospital of Philadelphia, Philadelphia, PA
- Dec, 2017 "Imaging seizures in an experimental model of Dravet syndrome," Dravet Syndrome Foundation Research Roundtable, American Epilepsy Society Annual Meeting, Washington, D.C.
- Jan, 2018 "Sodium channels and epilepsy: Something old and something new," Department of Psychology, University of California at Riverside, Riverside, CA.
- Jan, 2018 "Sodium channels and epilepsy: Something old and something new," EpiCenter Seminar Series, University of California at Irvine, Irvine, CA.

Grants:Current:

NCS-FO: Collaborative Research: Seizure control through state-specific manipulation of cell assemblies, NSF 1734813, 8/2017-7/2020. Role in grant: co-PI (with Sarah F. Muldoon).

R01 MH110185-01A1, NIH NIMH, 9/2016-8/2021. Role in grant: co-I (PI, Stewart A. Anderson).

K08 KNS097633A "Dynamic two-photon calcium imaging and optogenetic manipulation of epileptic brain circuits in an experimental model of temporal lobe epilepsy," NIH NINDS, 8/2016-7/2021. Role in grant: PI.

Career Award for Medical Scientists, Burroughs Wellcome Fund, 9/2014-9/2019. Role in grant: PI.

Past:

Taking Flight Award, Citizens United for Research in Epilepsy (CURE), 1/2014-6/2015. Role in grant: PI.

NSADA Training Grant for Child Neurologists, NINDS , NS049453, 8/2013-7/2016. Role in grant: Trainee (PI, Gihan Tennekoon).

“Cellular and circuit analysis of chronic temporal lobe epilepsy,” Epilepsy Foundation Research and Training Fellowship for Clinicians, 7/2009-6/2011. Role in grant: PI.

K<sup>+</sup> Channels in fast-spiking cell synaptic transmission, NINDS NRSA, F30 NS047882, 12/2004-11/2007 (Ethan Goldberg, MD, PhD, PI), \$44,702/annual direct costs, 80% effort (Role in grant: PI)

### Bibliography:

#### Research Publications, peer reviewed (print or other media):

1. Nadal, M.S., Ozaita, A., Amarillo, Y., Vega-Saenz de Miera, E., Ma, Y., Mo, W., **Goldberg, E.M.**, Yoshio, M., Ikehara, Y., Neubert, T.A., Rudy, B.: The CD26-related dipeptidyl aminopeptidase-like protein DPPX is a critical component of neuronal A-type K<sup>+</sup> channels. Neuron 37(3): 449-61, February 2003.
2. Szeszko, P.R., **Goldberg, E.**, Gunduz-Bruce, H., Ashtari, M., Robinson, D., Malhotra, A.K., Lencz, T., Bates, J., Crandall, D.T., Kane, J.T., Bilder, R.M.: Smaller anterior hippocampal formation volume in antipsychotic-naive patients with first-episode schizophrenia. The American Journal of Psychiatry 160(12): 2190-7, December 2003.
3. **Goldberg, E.M.**, Watanabe, S., Chang, S.Y., Joho, R.H., Huang, Z.J., Leonard C.S., Rudy, B.: Specific functions of synaptically localized potassium channels in synaptic transmission at the neocortical GABAergic fast-spiking cell synapse. The Journal of Neuroscience 25(21): 5230-5, May 2005.
4. Yan. L., Herrington, J., **Goldberg, E.**, Dulski, P.M., Bugianesi, R.M., Slaughter, R.S., Banerjee, P., Brochu, R.M., Priest, B.T., Kaczorowski, G.J., Rudy, B., Garcia, M.L.: Stichodactyla helianthus peptide, a pharmacological tool for studying Kv3.2 channels. Molecular Pharmacology 67(5): 1513-21, May 2005.
5. **Goldberg, E.M.**, Clark, B.D., Zaghera, E., Nahmani, M., Erisir, A., Rudy, B.: K<sup>+</sup> channels at the axon initial segment dampen near-threshold excitability of neocortical fast-spiking GABAergic interneurons. Neuron 58(3): 387-400, May 2008. PMCID: PMC2730466
6. **Goldberg, E.M.**, Balamuth, F., Desrochers, C.R., Mittal, M.K.: Seizure and altered mental status in a 12-year-old child with Shigella sonnei gastroenteritis. Pediatric Emergency Care 27(2): 135-7, February 2011.
7. **Goldberg, E.M.**, Jeong, H.-Y., Kruglikov, I., Tremblay, R., Lazarenko, R.M., Rudy, B.: Rapid developmental maturation of neocortical FS cell intrinsic excitability. Cerebral Cortex 21(3): 666-82, March 2011. PMCID: PMC3041012

8. **Goldberg, E.M.**, Taub, K.S., Kessler, S.K., Abend, N.S.: Anti-NMDA receptor encephalitis presenting with focal non-convulsive status epilepticus in a child. Neuropediatrics 42(5): 188-90, October 2011. PMID: PMC3414262
9. **Goldberg, E.M.**, Schwartz, E.S., Younkin, D., Myers, S.R.: Atypical syncope in a child due to a colloid cyst of the third ventricle. Pediatric Neurology 45(5): 331-334, November 2011.
10. Turkeltaub, P.E., **Goldberg, E.M.**, Postman-Caucheteux, W.A., Palovcak, M., Quinn, C., Cantor, C., and Coslett, H.B.: Alexia due to ischemic stroke of the visual word form area. Neurocase 20(2): 230-235, March 2013.
11. **Goldberg, E.M.**: Fever and bulging fontanelle mimicking meningitis in an infant diagnosed with benign intracranial hypertension. Pediatric Emergency Care 29(4): 513-4, April 2013.
12. **Goldberg, E.M.**, Titulaer, M., de Blank, P.M., Sievert, A., and Ryan N.: Anti-N-methyl-D-aspartate receptor-mediated encephalitis in infants and toddlers: case report and review of the literature. Pediatric Neurology 50(2): 181-184, February 2014. PMID: 24315538
13. Lang, S.-S., **Goldberg, E.**, Zarnow, D., Johnson, M.P., Storm, P.B., Heuer, G.G.: Prenatal diagnosis of hemimegalencephaly. World Neurosurgery 82(1-2): 241.e5-8, July-August 2014.
14. Bearden, D., Strong, A., Ehnot, J., DiGiovine, M., Dlugos, D., **Goldberg, E.M.**: Targeted treatment of migrating partial seizures of infancy with quinidine. Annals of Neurology 76(3): 457-61, September 2014.
15. Tyson, J.A., **Goldberg, E.M.**, Maroof, A.M., Xu, Q., Petros, T.J., Anderson, S.A.: Duration of culture and sonic hedgehog signaling differentially specify PV versus SST cortical interneuron fates from embryonic stem cells. Development 142(7): 1267-78, April 2015.
16. Natan, R.G., Briguglio, J.J., Mwilambwe-Tshilobo, L., Jones, S., Aizenberg, M., **Goldberg, E.M.**, Geffen, M.N.: Complementary control of sensory adaptation by two types of cortical interneurons. eLife 4: e09868, November 2015. PMID: PMC4641469

17. de Kovel, C.G.F., Syrbe, S., Brilstra, E.H., Verbeek, N., Kerr, B., Dubbs, H., Bayat, A., Desai, S., Naidu, S., Srivastava, S., Cagaylan, H., Yis, U., Saunders, C., Rook, M., Plugge, S., Muhle, H., Afawi, Z., Klein, K.M., Jayaraman, V., Rajagopalan, R., **Goldberg, E.**, Marsh, E., Kessler, S., Bergqvist, C., Conlin, L.K., Krok, B.L., Thiffault, I., Pendziwiat, M., Helbig, I., Polster, T., Borggraefe, I., Lemke, J.R., van den Boogaardt, M.J., Møller, R.S., Koeleman, B.P.C.: Neurodevelopmental Disorders Caused by De Novo Variants in KCNB1 Genotypes and Phenotypes. JAMA Neurology 74(10): 1228, October 2016.
18. Tian, G., Cristancho, A.G., Dubbs, H.A., Liu, G.T., Cowan, N.J., **Goldberg, E.M.**: A patient with lissencephaly, developmental delay, and infantile spasms, due to de novo heterozygous mutation of KIF2A. Molecular Genetics & Genomic Medicine 4(6): 599-603, November 2016. PMID: PMC5118204
19. Shen, D., Hernandez, C.C., Shen, W., Hu, N., Poduri, A., Shiedley, B., Rotenberg, A., Datta, A.N., Leiz, S., Patzer, S., Boor, R., Ramsey, K., **Goldberg, E.**, Helbig, I., Ortiz-Gonzalez, X.R., Lemke, J.R., Marsh, E.D., Macdonald, R.L.: De novo GABRG2 mutations associated with epileptic encephalopathies. Brain 140: 49-67, January 2017. PMID: PMC5226060
20. Platzer, K., Hongjie, Y., Schütz, H., Winschel, A., Chen, W., Hu, C., Kusumoto, H., Heyne, H.O., Helbig, K.L., Tang, S., Willing, M.C., Tinkle, B.T., Adams, D.J., Depienne, C., Keren, B., Mignot, C., Frengen, E., Strømme, P., Biskup, S., Döcker, D., Strom, T.M., Mefford, H.C., Myers, C.T., Muir, A.M., LaCroix A., Sadleir, L., Scheffer, I.E., Brilstra, E., van Haelst, M.M., van der Smagt, J.J., Bok Levinus, A., Møller, R.S., Jensen, U.B., Millichap, J.J., Berg, A.T., **Goldberg, E.M.**, De Bie, I., Fox, S., Major, P., Jones, J.R., Zackai, E.H., Abou, J.R., Rolfs, A., Leventer, R.J., Lawson, J.A., Roscioli, T., Jansen, F.E., Ranza, E., Korff, C.M., Lehesjoki, A.E., Courage, C., Linnankivi, T., Smith, D.R., Stanley, C., Mintz, M., McKnight, D., Decker, A., Tan, W.-H., Tarnopolsky, M.A., Brady, L.I., Wolff, M., Dondit, L., Pedro, H.F., Parisotto, S.E., Jones, K.L., Patel, A.D., Anup D., Franz, D.N., Vanzo, R., Marco, E., Ranells, J.D., Di Donato, N., Dobyns, W.B., Laube, B., Traynelis, S.F., Lemke, J.R.: GRIN2B encephalopathy: novel findings on phenotype, variant clustering, functional consequences and treatment aspects. Journal of medical genetics 54(7): 460-470, July 2017.
21. Zaman, T., Helbig, I., Božović, I.B., DeBrosse, S.D., Bergqvist, A.C., Wallis, K., Medne, L., Maver, A., Peterlin, B., Helbig, K.L., Zhang, X., **Goldberg, E.M.**: Mutations in SCN3A cause early infantile epileptic encephalopathy. Annals of Neurology doi: 10.1002/ana.25188, February 2018.

Research Publications, peer-reviewed reviews:



1. Clark, B.D., **Goldberg, E.M.**, Rudy, B.: Electrogenic tuning of the axon initial segment. The Neuroscientist 15(6): 651-68, December 2009. PMCID: PMC2951114
2. Coulter, D.A., Yue, C., Ang, C.W., Weissinger, F., **Goldberg, E.**, Hsu, F.-C., Carlson, G.C., Takano, H.: Hippocampal microcircuit dynamics probed using optical imaging approaches. The Journal of Physiology 589(Part 8): 1893-903, April 2011. PMCID: PMC3090592
3. **Goldberg, E.M.**, Coulter, D.A.: Mechanisms of epileptogenesis: a convergence on neural circuit dysfunction. Nature Reviews Neuroscience 14(5): 337-49, May 2013. PMCID: PMC3982383
4. Abend, N.S., Wusthoff, C.J., **Goldberg, E.M.**, Dlugos, D.J.: Electrographic seizures and status epilepticus in critically ill children and neonates with encephalopathy. Lancet Neurology 12(12): 1170-1179, December 2013. PMCID: 24229615
5. **Goldberg, E.M.**, Coulter, D.A.: Seizing the opportunity: Stem cells take on epilepsy. Cell Stem Cell 15(5): 527-8, November 2014.

#### Abstracts:

1. **Goldberg, E.M.**, Takano, H., Coulter, D.A.: Cell type-specific processes regulate gating behavior in the dentate gyrus (150.1) Poster presentation at the Society for Neuroscience Annual Meeting, San Diego, CA November 2010.
2. **Goldberg, E.M.**, Turkeltaub, P.E., Postman-Cauchetaux, W.A., Palovcak, M., Quinn, C., Cantor, C., Coslett, H.B.: A case of alexia due to ischemic stroke of the visual word form area. Platform Presentation at the 2011 American Academy of Neurology Annual Meeting April 2011.
3. **Goldberg, E.M.**, Coulter, D.A.: Cell type-specific responsiveness of hippocampal dentate gyrus neurons to perforant path stimulation (3.101). American Epilepsy Society, Washington, D.C. December 2013.
4. **Goldberg, E.M.**, Zhou, J., Yue, C., Wang, P.J., Coulter, D.A.: A novel mouse model of X-linked epilepsy (P1.266) Poster presentation at the American Academy of Neurology Annual Meeting, Philadelphia, PA April 2014 Notes: [http://n.neurology.org/content/82/10\\_Supplement/P1.266](http://n.neurology.org/content/82/10_Supplement/P1.266).

5. **Goldberg, E.M.**, Zhou J., Yue C., Wang P.J., Coulter D.A.: A novel mouse model of chromosome Xq22.1 deletion syndrome displays epilepsy and cortical circuit dysfunction (C.06). Platform Session at the American Epilepsy Society 68th Annual Meeting in Seattle, WA. December 2014.
6. **Goldberg, E.M.**: "Simultaneous twophoton calcium imaging and optogenetics using GCaMP6 andChrimsonR" (92.28) Poster presentation at the Society for Neuroscience Annual Meeting in San Diego, CA. November 2016.
7. Favero, M., Casey, C., and **Goldberg, E.M.**: Developmental trajectory of interneuron dysfunction in a mouse model of Dravet syndrome (560.15). Poster presentation at the Society for Neuroscience Annual Meeting, Washington, D.C. November 2017.
8. Vaiana, M., **Goldberg, E.M.**, and Muldoon, S.F.: Real-time, automatic calcium image segmentation via topology (721.15). Poster presentation at the Society for Neuroscience Annual Meeting, Washington, D.C. November 2017.
9. Tran, C.H., Vaiana, M., Goldstein, N., Muldoon, S.F., and **Goldberg, E.M.**: In vivo two-photon calcium imaging shows cell type-specific activity during seizure propagation in a model of Dravet syndrome (1.014). Poster presentation at the American Epilepsy Society Annual Meeting, Washington, D.C. December 2017.

Editorials, Reviews, Chapters, including participation in committee reports (print or other media):

1. Rudy, B., Maffie, J., Amarillo, Y., Clark, B., **Goldberg, E.M.**, Jeong, H.J., and others: Voltage gated potassium channels: Structure and function of Kv1 to Kv9 subfamilies. Encyclopedia of Neuroscience. Squire, L. (eds.). Oxford Academic Press, Oxford, U.K. Page: 397-425, 2009.
2. Rudy, B., Maffie, J., Amarillo, Y., Clark, B.D., **Goldberg, E.M.**, Jeong, H.Y., Kruglikov, I., Kwon, E., Nadal, M., Zaghera, E.: Voltage-gated K<sup>+</sup> channels. In Ion Channels: Structure and Function. Kew J., Davies C. (eds.). Oxford University Press, New York, NY, 2009.