BIOGRAPHICAL SKETCH

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NAME: Soltesz, Ivan

eRA COMMONS USER NAME (credential, e.g., agency login): ISoltesz

POSITION TITLE: Professor and Vice Chair, Neurosurgery (with courtesy appointment in Neurology and Neurological Sciences)

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
L.Eotvos University, Hungary	Diploma	1988	Biology
L Eotvos University, Hungary	Ph.D.	1989	Physiology
Oxford University, Oxford, UK	Post-doc	1990	Neuroscience
University of London, London, UK	Post-doc	1991	Neuroscience
Universite Laval, Quebec, Canada	Post-doc	1992	Neuroscience
Stanford University, Stanford, CA	Post-doc	1993	Neuroscience
UT Southwestern School of Medicine, Dallas,TX	Post-doc	1994	Neuroscience

A. Personal Statement

I am interested in inhibition in the CNS, focusing on the synaptic and cellular organization of interneuronal microcircuits in the hippocampus under normal conditions and in temporal lobe epilepsy. My laboratory employs a combination of closely integrated experimental and theoretical techniques, including closed-loop in vivo optogenetics, in vivo juxtacellular recordings from identified interneurons in awake mice, 2P functional calcium imaging, paired patch clamp recordings, AI-aided segmentation of behavior, 24/7 long-term video-EEG recordings to track seizures over time, a variety of behavioral approaches, and large-scale computational modeling methods using supercomputers. In terms of synergistic activities, I wrote a monograph book on GABAergic microcircuits (Oxford University Press), co-edited a book on Computational Neuroscience in Epilepsy (Academic Press/Elsevier), co-founded the first Gordon Research Conference on the Mechanisms of neuronal synchronization and epilepsy, and taught for several years in the Ion Channels Course at Cold Springs Harbor. I have over 30 years of research experience, with 23 years as a faculty involved in the training of graduate students (total of 14, 6 of them MD/PhDs) and postdoctoral fellows (28), several of whom received fellowship awards, K99 grants, joined prestigious residency programs and became independent faculty.

B. Positions and Honors

Positions and Employment

1995-1999 Assistant Professor, Anatomy and Neurobiology, University of California, Irvine, CA
1999-2003 Associate Professor, Anatomy and Neurobiology, University of California, Irvine, CA
2001-2015 Fellow, Center for Neurobiology of Learning & Memory, UC Irvine, CA
2003-2015 Professor, Anatomy & Neurobiology (with joint appointments in Physiology & Biophysics, and Neurobiology & Behavior), University of California, Irvine, CA
2006-2015 Chair, Anatomy & Neurobiology, University of California, Irvine, CA

7/2015 Professor and Vice Chair, Neurosurgery (with courtesy appointment in Neurology and Neurological Sciences), Stanford University

Honors

2005 Javits Neuroscience Investigator Award, NINDS
2005 Athalie Clark Research Award
2006-2009 Chair, Basic Science Committee, American Epilepsy Society
2009 Michael Prize (top international award for basic epilepsy research)
2010-2012 Scientific Advisory Board, Citizens United for Research in Epilepsy (CURE)
2010-2012 Chair, Grants and Fellowship Review Panel, Epilepsy Foundation
2011 Keynote, Organization of Computational Neurosciences meeting, Stockholm
2011-2013 Chair, Clinical Neuroplasticity and Neurotransmitters (CNNT) NIH study section
2011 Research Recognition Award, American Epilepsy Society (highest honor from AES)
2011-2015 Chancellor's Professor, UCI
7/2015 James R. Doty Professor of Neurosurgery and Neurosciences, Stanford University
2016 Keynote, Brain Informatics & Health conference
2018 Keynote, Gordon Research Conference on Epilepsy
2019 Keynote, Inhibition in the CNS Gordon Research Symposium
2019 Keynote, Epilepsy Conference, Park City, Utah

C. Contribution to Science

1. GABAergic interneurons play critical roles in virtually all aspects of cortical circuit function and dysfunction. Research in my laboratory over the years has exerted significant and lasting impact on the field and resulted in the discovery of novel principles underlying the organization of GABAergic inhibition in cortical circuits. Recently, we demonstrated that inhibition in the hippocampus is not homogenous or uniform as previously thought, but that it is organized in a highly specific manner, where individual interneurons selectively form local circuits with only specific subsets of pyramidal cells that are defined by their long-distance projection patterns. My past and recent work has significantly contributed to our understanding of the spatio-temporal organization of network oscillations in the hippocampus and resulted in the identification of new interneuronal subtypes.

a) Foldy, C., Lee, S.H., Morgan, R. and **Soltesz, I.** Regulation of fast-spiking basket cell synapses by the chloride channel ClC2. Nature Neuroscience (2010) 13(9): 1047-1049. PMCID: PMC2928876.
b) Lee, S.-H., Marchionni, I., Bezaire, M., Varga C., Danielson, N., Lovett-Barron, M., Losonczy, A. & **Soltesz, I**. Parvalbumin-positive basket cells differentiate among hippocampal pyramidal cells. Neuron (2014) 82(5) 1129-1144. PMCID: PMC4076442.
c) Varga, C., Oijala, M., Szabo, G.G., Bezaire, M., Marchionni, I., Golshani, P. and **Soltesz, I.** Functional fission of parvalbumin interneuronal classes during fast network events. eLife (2014) Nov 6;3. doi: 10.7554/eLife.04006. PMCID: PMC4270094.
d) **Soltesz, I.** & Losonczy, A. CA1 pyramidal cell diversity enabling parallel information processing in the hippocampus. Nature Neuroscience (2018) 21: 484-493. PMCID: PMC5909691.

2. Cannabinoid receptor mediated signaling provides powerful and versatile regulation of synaptic transmission in the brain. My work on the endocannabinoid control of synaptic transmission in normal and epileptic circuits resulted in several major advances, including the identification of novel mechanisms regulating tonic control of GABA release by cannabinoid receptors, discovery of cell type-specificity of cannabinoid control of GABA release, and the recognition that cannabinoid signaling undergoes robust long-term plasticity in epilepsy.

a) Lee, S.H., Foldy, C., & **Soltesz, I.** Distinct endocannabinoid control of GABA release at the perisomatic and dendritic synapses in the hippocampus. Journal of Neuroscience (2010) 30(23):7993-8000. PMCID: PMC2904437.
b) Dudok, B., Barna, L., Ledri, M., Szabó, S.I., Szabadits, E., Pintér, B., Woodhams, S.G., Henstridge, C.M., Balla, G.Y., Nyilas, R., Varga, C., Lee, S.H., Matolcsi, M., Cervenak, J., Kacskovics, I., Watanabe, M., Sagheddu, C., Melis, M., Pistis, M., **Soltesz, I.** and Katona, I. Cell-specific STORM superresolution imaging reveals nanoscale organization of cannabinoid signaling. Nature Neuroscience (2015) 18(1): 75-86. PMCID: PMC4281300.

c) **Soltesz, I.,** Alger, B.E., Kano, M., Lee, S.H., Lovinger, D.M., Ohno-Shosaku, T. and Watanabe, M. Weeding out bad waves: Towards selective cannabinoid circuit control in epilepsy. Nature Reviews Neuroscience (2015) 6(5):264-77. PMID: 25891509.
d) Maroso, M., Szabo, G.G., Kim, H.K., Alexander, A., Bui, A.D., Lee, S-H., Lutz, B. and **Soltesz, I.** Cannabinoid control of learning and memory through HCN channels. Neuron (2016) 89, 1059-1073. PMCID: PMC4777634.

3. There are over 65 million people word-wide with epilepsy, and current treatment options for epilepsy are inadequate. Research in my laboratory over the last two decades has significantly contributed to our understanding of the basic mechanisms of epilepsy. More recently, my laboratory has developed new technologies that enabled the closed-loop, on-demand control of temporal lobe epilepsy in mice with unprecedented temporal, spatial and cell type-specificity.

a) Krook-Magnuson, E., Armstron, C., Oijala, M. & **Soltesz, I.** On-demand optogenetic control of spontaneous seizures in temporal lobe epilepsy. Nature Communications (2013) 4:1376. PMCID: PMC3562457.
b) Krook-Magnuson, E. and **Soltesz, I**. Beyond the hammer and the scalpel: selective circuit control for the epilepsies. Nature Neuroscience (2015) 18(3): 331-8. PMCID: PMC4340083.
c) Bui, A.D., Nguyen, T.M., Limouse, C., Kim, K.H., Szabo, G.G., Felong, S., Maroso, M. & **Soltesz, I.** Dentate gyrus mossy cells control spontaneous convulsive seizures and spatial memory. Science (2018) 359(6377):787-790. PMCID: PMC6040648.
d) Farrell, J.S., Nguyen, Q.-A. & **Soltesz, I.** Resolving the micro-macro disconnect to address core features of seizure networks. Neuron (2019) 101: 1016-1028. PMCID: PMC6430140.

4. Normal and abnormal brain dynamics involve multiple levels of biological organization. Though there exists a wealth of data at each of these levels, the challenge of drawing connections across levels stands in the way of developing greater understanding and new treatments for the disorder. To meet this challenge, my laboratory has been at the forefront of biological data-driven modeling of control and epileptic hippocampal networks using supercomputers.

a) Morgan, R.J. & **Soltesz, I.** Non-random connectivity of the epileptic dentate gyrus predicts a major role for neuronal hubs in seizures. Proceedings of the National Academy of Sciences, USA (2008) 105(16): 6179-6184. PMCID: PMC2299224.
b) Schneider, C., Bezaire, M., & **Soltesz, I.** Toward a full-scale computational model of the rat dentate gyrus. Frontiers in Neural Circuits. (2012) 6:83 doi: 10.3389/fncir.2012.00083. PMCID: PMC3499761.
c) Schneider, C.J., Cuntz, H. & **Soltesz, I.** Linking macroscopic with microscopic neuroanatomy using synthetic neuronal populations. PLoS Comput. Biol. (2014) 10(10): e1003921. PMCID: PMC4207466.
d) Bezaire, M.J., Raikov, I., Burk, K., Dhrumil, V. and **Soltesz, I.** Interneuronal mechanisms of hippocampal theta oscillations in full-scale models of the CA1 circuit. eLife (2016) 5. PMCID: PMC5313080.

Complete List of Published Work in MyBibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/ivan.soltesz.1/bibliography/41158149/public/?sort=date&direction=ascending

D. Research Support

Ongoing Research Support

NIH R01 (PI: I. Soltesz; Co-PI: A. Losonczy) 09/01/2015-08/31/2020
1R01NS094668
Title: Closed-loop intervention in epilepsy.
The main goal of this multi-PI award is to test the mechanisms of optogenetic control of temporal lobe epilepsy through on-demand modulation of excitatory and inhibitory neurons.

NIH U19 (PI: I. Soltesz; G. Buzsaki, A. Losonczy, M. Schnizter) 09/25/2017 – 06/30/2022
NINDS NS104590-01; Title: Towards a Complete Description of the Circuitry Underlying Sharp Wave-Mediated Memory Replay.
The main goal of this collaborative project (4 major labs involved) under the BRAIN initiative is to understand a cognitively important event, called memory replay, in terms of the detailed properties of the brain cells involved.

NIH R01 (PI: I. Soltesz; Co-PI: I. Katona) 09/01/2016-08/31/2021
Title: Cannabinoid control of epilepsy.
The main goal of this project in collaboration with Dr Katona (subcontract) is to investigate the role of the CB1-HCN1 pathway in epilepsy.

NIH R01 (PI: I.Soltesz; Co-PI: R.Datta) 07/01/2019-06/30/2024
Title: Automated phenotyping in epilepsy
The main goal of this project is to develop and apply machine-learning assisted 3D video analysis technology to study chronic temporal lobe epilepsy in an objective, inexpensive and automated manner.

NASA (PI: C. Limoli; Co-PI: Soltesz) 06/01/2015-05/31/2020
NSCOR NNX10AD59G;
Title: Mechanisms underlying charged particle-induced disruption of CNS function.
The main goal of this award is to identify the functional consequences of deep space radiation in the CNS.

NIH R01 (PI: C. Limoli; Co-PI: I. Soltesz) 01/01/2016-12/31/2020
Title: Mechanisms underlying radiation-and chemotherapy induced cognitive impairment.
The main goal of this award is to determine the functional mechanisms of cognitive deficits following medically relevant doses of irradiation and chemotherapy.

Office of Naval Research (PI: G. Chowdhary; Co-PI: I. Soltesz) 07/1/19-06/30/24
Title: A CyberOctopus that Learns, Evolves, Adapts
The main goal of this project is to develop a better understanding of the neuronal control principles underlying cephalopod behaviors.