

# Antonio Fernandez-Ruiz, PhD

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## Education

<b>PhD in Biophysics</b> School of Physics, Complutense University of Madrid.	<b>2013-2015</b>
<b>MSc in Biomedical Physics</b> School of Physics, Complutense University of Madrid.	<b>2009-2011</b>
<b>Licenciatura in Biological Sciences</b> <b>Master in Neurobiology</b> School of Biological Sciences, Complutense University of Madrid.	<b>2007-2009</b>
<b>BSc in Biology</b> School of Biology, University of Sevilla.	<b>2004-2007</b>

## Research positions

<b>Assistant Professor</b> Nancy and Peter Meinig Family Investigator in the Life Sciences Department of Neurobiology and Behavior, Cornell University.	<b>July 2021- present</b>
<b>Postdoctoral Fellow</b> NYU Neuroscience Institute, Langone Medical Center, New York University. Supervisor: Prof. György Buzsáki.	<b>Dec 2016 – July 2021</b>
<b>Visiting Researcher</b> Department of Physiology of Cognitive Processes, Max Plank Institute for Biological Cybernetics. Supervisor: Prof. Nikos Logothetis	<b>March 2016- present</b>
<b>Postdoctoral Fellow</b> Department of Physiology, School of Medicine, University of Szeged. Supervisor: Prof. Antal Berényi.	<b>Nov 2015 – Nov 2016</b>
<b>Visiting researcher</b> NYU Neuroscience Institute, New York University Medical Center. Supervisor: Prof. György Buzsáki.	<b>April 2013 – Mar 2014</b>
<b>Graduate Research Fellow</b> Department of Applied Physics III, School of Physics, Complutense University of Madrid. Supervisors: Prof. Sagrario Muñoz. and Prof. Miguel Sancho	<b>Jan 2013 -Oct 2015</b>
<b>Graduate Research Fellow</b> Cajal Institute, Spanish Research Council (CSIC). Superv.: Dr. Óscar Herreras.	<b>Sept 2009- Jan 2013</b>
<b>Visiting Student</b> Xlab, George-August Universitat of Gottingen. Supervisors: Prof. Erwin Neher and Prof. Eva-Maria Neher.	<b>Mar 2008- April 2008</b>

## Grants and fellowships

**NARSAD Young Investigator Grant, 2020-2022**

NIMH **K99** Pathway to Independence Award, 2019-2024  
**Sir Henry Wellcome Postdoctoral Fellowship**, 2016-2020  
**EMBO long-term postdoctoral fellowship**, 2015-2017.  
Max Planck - Prince of Asturias Collaboration Grant, 2015-2016.  
'La Caixa' **PhD of Excellence Fellowship**, 2013-2015  
EMBO Short-Term Fellowship, 2013.  
JAE Pre-doctoral Fellowship, CSIC, 2009-2013.  
Undergraduate Research Fellowship, Spanish Ministry of Education, 2008-2009.  
Xlab Fellowship for Introduction to Research, George-August Universitat, 2008.  
JAE Fellowship for Introduction to Research, CSIC, 2008.

## Awards and prizes

**Blavatnik Award** for Young Scientists in the Life Sciences, NY Academy of Sciences, 2020  
Havens Family Investigator, Brain & Behavior Research Foundation, 2020.  
**Nancy and Peter Meinig Family Investigator in the Life Sciences**, Cornell University, 2020.  
**Regeneron Prize for Creative Innovation**, 2020.  
**Peter and Patricia Gruber International Research Award**, Society for Neuroscience, 2019.  
Outstanding reviewer eNeuro 2018.  
**NYU Outstanding Postdoc** 2018.  
Austin Conference on Learning & Memory travel award, 2017.  
Participation award for the Brain Prize Master Class on Translational Neuroscience. 2016.  
**Best PhD dissertation 2015**. Complutense University of Madrid. 2016.  
FENS travel award for the SfN meeting, 2013.  
SENC travel award for the SfN meeting, 2013.  
Travel award for IV ROE Symposium, 2011.  
Travel award for XIX SENC meeting, 2011.  
Roche Continents 2008 Award  
**Extraordinary Prize of the Degree**. Complutense University of Madrid. 2009. (for graduating with the **highest GPA**)  
Extraordinary Prize of the Baccalaureate. Spanish Ministry of Education. 2004.

## Publications

**Fernández-Ruiz A**, Oliva A, Soula M, Rocha-Almeida F, Nagy G, Martin-Vazquez G, Buzsáki G. (2021) *Gamma rhythm communication between entorhinal cortex and dentate gyrus neuronal assemblies*. Science, 2;372(6537):eabf3119.

Sharif F, Tayebi B, Buzsaki G, Royer S, **Fernández-Ruiz A\***. (2021) *Subcircuits of deep and superficial CA1 place cells support efficient place coding across heterogeneous environments*. Neuron, 109: 363-376. (\* senior author).

Oliva A, **Fernández-Ruiz A**, Leroy F, Siegelbaum S. (2020) *Hippocampal CA2 ripples recruit social replay and promote social memory*. Nature, 587: 264-269.

Buzsaki G., **Fernández-Ruiz A**. (2019) *Utility of the Idling Brain: Abstraction of new knowledge*. Cell 178(3), 513-515.

**Fernández-Ruiz A**, Oliva A, Fermino de Oliveira E, Rocha-Almeida F, Tingley D, Buzsáki G. (2019) *Long-duration Hippocampal Sharp Wave Ripples Improve Memory*. Science 364 (6445), 1082-1086

Senzai Y\*, **Fernández-Ruiz A\***, Buzsáki G. (2019) *Layer-specific physiological features and interlaminar interactions in the primary visual cortex of the mouse*. Neuron 101,1-14. (\* equal contribution) (Preview by Vinck and Perrenoud, 2019, Neuron, 3:358-360).

Oliva A, **Fernández-Ruiz A**, Fermino de Oliveira E, Buzsáki G. (2018) *Origin of gamma frequency power during hippocampal sharp-wave ripples*. Cell Reports, 25 (7), 1693-1700.

Barth A.M., Domonkos A., **Fernandez-Ruiz A.**, Freund T.F., Varga V (2018) Hippocampal network dynamics during rearing episodes. Cell Reports, 23 (6), 1706.

Vöröslakos M, Takeuchi Y, Brinyiczki K, Zombori T, Oliva A, **Fernández-Ruiz A**, Kozák G, Kincses Z, Iványi B, Buzsáki G, Berényi A. (2018). *Direct effects of transcranial electric stimulation on brain circuits in rats and humans*. Nat Comm, 9 (1): 483.

**Fernández-Ruiz A**, Oliva A, Nagy GA, Maurer AP, Berényi A, Buzsáki G. (2017) *Entorhinal-CA3 dual-input control of spike timing in the hippocampus by theta-gamma coupling*. Neuron, 93:1213-1226.

Buzsáki G, **Fernández-Ruiz A.** (2017) Hippocampus: network physiology. In: Handbook of Brain Microcircuits, Ed: Sheperd GM and Grillner S. Oxford University Press.

Oliva A, **Fernández-Ruiz A**, Buzsáki G, Berényi A. (2016) *Spatial coding and physiological properties of hippocampal neurons in the Cornu Ammonis subregions*. Hippocampus, 26: 1593–1607.

Oliva A, **Fernández-Ruiz A**, Buzsáki G, Berényi A. (2016) *Role of hippocampal CA2 region in triggering sharp-wave ripples*. Neuron 91:1342-1355.

**Fernández-Ruiz A**, Oliva A. (2016) *Distributed representation of "what" and "where" information in the parahippocampal region*. J Neurosci, 36:8286-8288.

Oliva A, **Fernández-Ruiz A.** (2016) *Incorporating single cell contribution into network models of ripple generation*. J Physiol, 595(1):9-10.

**Fernández-Ruiz A** (2016) Extracellular potentials in the hippocampus. Springer. (book).

Schomburg EW\*, **Fernández-Ruiz A\***, Berényi A, Mizuseki K, Anastassiou CA, Koch C, Buzsáki G. (2014) *Theta phase segregation of input-specific gamma patterns in entorhinal-hippocampal networks*. Neuron. 84:470-485. (\* equal contribution). (Preview by Buttler and Paulsen, 2014. Neuron, 84:251

Benito N\*, **Fernandez-Ruiz A\***, Makarov VA, Makarova J, Korovaichuk A, Herreras O. (2014) *Spatial blocks of coherent pathway-specific LFPs in the hippocampus reflect different modes of presynaptic synchronization*. Cereb Cortex. 24:1738-52 (\* equal contribution).

Enriquez-Barreto L, Cuesto G, Dominguez-Iturza N, Gavilán E, Ruano D, Sandi C, **Fernández-Ruiz A**, Martín-Vázquez G, Herreras O, Morales M. (2014) *Learning improvement after PI3K activation correlates with de novo formation of functional small spines*. Front Mol Neurosci 2;6:54.

**Fernández-Ruiz A\***, Schomburg EW\*. (2013) *The rules of entrainment: are CA1 gamma oscillations externally imposed or locally governed?* J Neurosci 33:19045-19047. (\* equal contribution).

**Fernandez-Ruiz A**, Muñoz S, Sancho M, Makarov VA, Herreras O. (2013) *Cytoarchitectonic and dynamic origins of giant positive LFPs in the Dentate Gyrus*. J Neurosci 33:15518-15532.

**Fernández-Ruiz A**, Herreras O. (2013) *Identifying the synaptic origin of ongoing neuronal oscillations through spatial discrimination of electric fields*. Front Comput Neurosci 7:5.

**Fernandez-Ruiz A**, Makarov VA, Herreras O. (2012) *Sustained increase of spontaneous input and spike transfer in the CA3-CA1 following long-term potentiation in vivo*. Front Neural Circuits. 6:71.

**Fernandez-Ruiz A**, Makarov VA, Benito N, Herreras O. (2012) *Schaffer-specific local field potentials reflect discrete excitatory events at gamma-frequency that may fire CA1 units*. J Neurosci. 32:5165-5176.

## Invited speaker

Friedrich Miescher Institute for Biomedical Research, Basel, Switzerland, 2021.  
UCSD, La Jolla. 2020.  
UCLA Medical School, LA. 2020.  
Boston University, Boston. 2020.  
Cornell University, Ithaca, 2020.  
Janelia Research Campus, Ashburn, 2020.  
Vanderbilt University, Nashville, 2020.  
Iowa Neuroscience Institute, Iowa City, 2020.  
University of Alabama Medical School, Birmingham, 2020.  
Case Western Reserve University School of Medicine, Cleveland, 2020.  
Rockefeller Neuroscience Institute, West Virginia University, Morgantown, 2020  
Georgetown University Medical Center, Washington DC, 2020  
Winter Conference on Learning and Memory, Park City 2020 (Organizer).  
12<sup>th</sup> FENS Forum of Neuroscience, Glasgow, 2020.  
Ludwig-Maximilians University of Munich, 2019.  
Stanford University, 2019.  
Max Planck Florida Institute, Jupiter, 2019.  
University of Maryland Medical School, Baltimore, 2019.  
Gordon Research Conference on Inhibition, Sunday River, 2019.  
Hippocampal Research Conference. Taormina, 2019 (Organizer).  
Hippocampus Meeting, HHMI Janelia Research Campus, Ashburn, 2018.  
17<sup>th</sup> Spanish Society for Neuroscience Meeting. Alicante, 2017 (Organizer).  
Hippocampal Research Conference. Taormina, 2017.  
Brain Prize Master Class on Translational Neuroscience. Copenhagen, 2016.  
Max Planck Institute for Biological Cybernetics, Tübingen, 2016.  
15<sup>th</sup> Biannual Conference of the Hungarian Neuroscience Society. Budapest, 2015.

## Referee

Neuron, Current Biology, Cell Reports, eLife, Journal of Neuroscience, Journal of Neurophysiology, Progress in Neurobiology, PLoS One, Frontiers in Neuroscience, eNeuro, Journal of Neuroscience Methods, Journal of Physiology, Neuroscience

## Teaching and Mentoring

- Hiring and mentoring Postdoc Farnaz Shariff, NYU Medical School, 2019-present
- Supervising MD-PhD student Marisol Soula, NYU Medical School, 2018-2020
- Supervising PhD student Florbela da Rocha, NYU Medical School, 2018
- Supervising MSc student Eliezyer Fermino, NYU Medical School, 2017-2018
- Direction of MSc Thesis: *Behavioral modulation of layer specific activity in the rat entorhinal cortex*. Gergo Nagy. University of Szeged, 2016.
- Direction of MSc Thesis: *Cortical circuits dynamics during spatial learning*. Raul Granados. School of Physics, Complutense University. Madrid, 2015.
- Direction of MSc Thesis: *Oscillatory synchrony in memory consolidation during sleep*. Isabel Suarez. School of Physics, Complutense University. Madrid, 2015.
- Direction of MSc Thesis: *Causality measures of population synchrony in the hippocampus*. Guillermo Arbilla. School of Physics, Complutense University. Madrid, 2013.
- Teaching Assistant in Biophysics, Complutense University, 2011-2013
- Teaching Assistant in Neurophysiology, Complutense University, 2008-2009
- Teaching Assistant in Animal Physiology, University of Seville, 2006-2007.