

# Nikolaos Karalis

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## Current position

### Research fellow

2018 - now Friedrich Miescher Institute for Biomedical Research  
Group leader: Dr. Andreas Lüthi

## Education

### Ph.D. candidate in Neuroscience

2013 - 2018 Faculty of Medicine, Ludwig-Maximilians University Munich  
Thesis Oscillatory architecture of memory circuits  
Advisor Prof. Dr. Anton Sirota

### M.Sc. Neurasmus Joint Master in Neuroscience

2011-2012 Charité University Medicine, Berlin – Medical Neuroscience  
2012-2013 University Bordeaux II – Neuroscience and Neuropsychopharmacology Grade 18/20  
Thesis Neuronal signatures of fear memory - Oscillatory synchronization underlying fear memory expression Ranking 1/5

### B.Sc. & M.Sc. School of Applied Mathematics and Physical Sciences

2004 – 2011 National Technical University of Athens (NTUA) Grade 7.42/10  
Majors Computational Mathematics, Statistics  
Thesis EEG signal analysis methods for characterization of meditative states Grade 10/10

## Research methods

*in vivo* electrophysiology, high-dimensional data analysis, closed-loop optogenetics

## Selected Publications (Citations: 315 ; h-index: 5 ; \*: equal contribution)

ORCID: 0000-0002-1804-9756

1. Prefrontal-Periaqueductal Gray-Projecting Neurons Mediate Context Fear Discrimination  
Rozeske R, Jercog D, **Karalis N**, Chaudun F, Khoder S, Girard D, Winke N, Herry C **Neuron, 2018**
2. Prefrontal neuronal assemblies temporally control fear behavior.  
Dejean C\*, Courtin J\*, **Karalis N\***, Chaudun F, Wurtz H, Thomas Bienvenu, Herry C **Nature, 2016**
3. 4 Hz oscillations synchronize prefrontal - amygdala circuits during fear behaviour.  
**Karalis N**, Dejean C, Chaudun F, Khoder S, Rozeske R, Wurtz H, Bagur S, Benchenane K, Sirota A, Courtin J, Herry C **Nature Neuroscience, 2016**
4. Prefrontal parvalbumin interneurons shape neuronal activity to drive fear expression.  
Courtin J, Chaudun F, Rozeske R, **Karalis N**, Gonzalez-Campo C, Wurtz H, Abdi A, Baufreton J, Bienvenu T, Herry C **Nature, 2013**
5. Persistence of amygdala gamma oscillations during extinction learning predicts spontaneous fear recovery.  
Courtin J, **Karalis N**, Gonzalez-Campo C, Wurtz H, Herry C **Neurobiology of Learning and Memory, 2013**
6. Effects of Himalayan tradition meditation during a SSVEP study.  
**Karalis N**, Karanasiou I, Uzunoglu N, & Braboszcz C **Neuroscience Letters, 2011**

## Invited Talks

<b>2017</b>	Neuronal synchrony and oscillatory coupling Neuronal correlates of breathing Respiratory entrainment of memory circuits Respiratory entrainment of prefrontal circuits Prefrontal oscillatory mechanisms of fear behavior	Coupling & Causality in Complex Systems Bernstein Conference PhD Symposium Harvard-LMU Young Scientists' Forum Japan Neuroscience Society meeting British Neuroscience Association meeting
<b>2016</b>	Oscillatory circuit organization during fear behavior Neuronal signatures of fear behavior	LMU lecture series Neurizons – Young Investigator Talks
<b>2015</b>	High-density characterization of network activity	German Neuroscience Society
<b>2014</b>	Neurophysiological correlates of rodent communication	Animal Communication Workshop
<b>2013</b>	Neuronal signatures of fear memory Neuronal signatures of fear memory	Neurasmus Workshop Neurasmus Orientation Week
<b>2011</b>	SSVEP effects of Himalayan tradition meditation	Breaking Convention
<b>2007</b>	Novel graph invariants for fast graph isomorphism Combinatorial and statistical analysis of keno game	Mitacs Industrial Math Summer School Canadian Undergraduate Mathematics Conference

## Research Experience

<b>2013 – 2018</b>	<b>PhD candidate</b> Mechanisms of memory consolidation across hippocampal and cortical circuits Advisor Prof. Dr. Anton Sirota	<b>Ludwig-Maximilians-Universität München</b> Faculty of Medicine
<b>2012 – 2013</b>	<b>M.Sc. Thesis</b> Neuronal signatures of fear memory Supervisor Dr. Cyril Herry	<b>Neurocenter Magendie, Bordeaux</b> INSERM
<b>2009 – 2011</b>	<b>M.Sc. Thesis</b> EEG Analysis of the neurophysiological effects of meditation on visual evoked potentials Supervisors Dr. Irene Karanasiou & Dr. Nikolaos Uzunoglou	<b>National Technical University of Athens</b> Electrical Engineering Dept.
<b>2005 – 2009</b>	<b>Research assistance</b> CERN Grid Computing infrastructure - Network development and administration	<b>National Technical University of Athens</b> High Energy Physics Dept.

## Scholarships and Grants

<b>2014 – 2017</b>	Ludwig-Maximilians-Universität München
<b>2013 – 2014</b>	Centre for Integrative Neuroscience (CIN) - University of Tübingen
<b>2011 – 2013</b>	Erasmus Mundus scholarship for the Neurasmus Joint Master degree program in Neuroscience
<b>2010</b>	University of Pennsylvania Grant
<b>2009</b>	Erasmus scholarship (Research exchange)
<b>2007</b>	MITACS scholarship

## Awards

<b>2010</b>	“Thomaideio Award” for conference presentation from National Technical University of Athens for the presentation “Short term effects of Vipassanā meditation in a single subject SSVEP study”
<b>2008</b>	“Thomaideio Award” for best journal publication from National Technical University of Athens for the publication “Effect of meteorological variables on the incidence of lower urinary tract infections”

## Experimental Techniques

<b>Electrophysiology</b>	<i>in vivo</i> extracellular recordings (tetrodes, silicon probes, ECoG) in freely behaving & head-fixed rodents high-dimensional neural data analysis, human EEG recordings
<b>Imaging</b>	calcium imaging in freely-behaving mice (miniscope), fiber photometry
<b>Circuit manipulation</b>	closed-loop optogenetics, pharmacogenetics & pharmacology
<b>Programming</b>	Matlab, Python, Julia, Java, C++
<b>Electronics</b>	circuit design and implementation, electrophysiology and behavioral equipment setup, 3D printing
<b>Lab techniques</b>	stereotaxic neurosurgeries, behavioral analysis, immunohistochemistry, microscopy, cell cultures

## Workshops and summer schools

<b>2017</b>	Junior Scientist Workshop on Neural Circuits and Behavior, Janelia Farm, Washington
<b>2015</b>	Mechanisms of Memory Consolidation, Reconsolidation and Extinction, Lausanne Why trust a theory? – Modern Physics Scientific Methodology, LMU 3rd Baltic-Nordic Summer School on Neuroinformatics, University of Tartu Optogenetics Workshop SPP1665, Ruhr University Bochum 7th G-Node Winter Course in Neural Data Analysis, LMU
<b>2014</b>	NIN Interneuron Summer School, Amsterdam Understanding Sleep: Novel Perspectives in Neurosciences, European Sleep Research Society, Milan Optogenetics: controlling the brain with light, University of Oxford International Course on Animal Communication, University of Tübingen Practical course optical imaging in Neuroscience, University of Tübingen
<b>2013</b>	Models of Synaptic Plasticity Doctoral Course, University of Tübingen 1st Live Cell Imaging and Electrophysiology Workshop, Pasteur Institute, Athens 11th Summer Course on Computational Neuroscience, Göttingen Neurasmus Workshop, Coimbra 5th G-Node Winter Course in Neural Data Analysis, LMU Brain-Computer Interface workshop and hands-on seminar, INRIA, Bordeaux
<b>2012</b>	Super Resolution Imaging Techniques Workshop, Bordeaux Imaging Center Neurasmus Workshop, Barcelona Mathematical Cell Biology Graduate Summer Course, University of British Columbia, Vancouver Cerebral Ischemia: in vivo and in vitro models (Methods Course), Dept. Of Exp. Neurology, Charité, Berlin FELASA category B training (License for experimentation on living animals), Charité, Berlin
<b>2010</b>	5th International Summer School on Emerging Technologies in Biomedicine, Patras Summer Program in Computational Neuroscience, University of Pennsylvania, Philadelphia Study Group Mathematics with Industry, Amsterdam
<b>2009</b>	8th EEGLAB Workshop, Aspet
<b>2008</b>	Modern Methods in Industrial Mathematics Ph.D. Course, Technical University of Denmark, Copenhagen 66th European Study Group with Industry, Technical University of Denmark, Copenhagen Mathematics Summer School, University of Crete Graduate Industrial Mathematics Modeling Camp, University of Regina Industrial Problem Solving Workshop, University of Regina 2nd Workshop for Drug Design, National Hellenic Research Foundation, Athens
<b>2007</b>	MITACS Industrial Math Summer School, Simon Fraser University, Vancouver
<b>2006</b>	Arizona Winter School “Computational Aspects of Algebra and Arithmetic”, Tucson, Arizona Introduction to Grid Computing, Athens Next Generation Computing Systems - AIT Summer School, Athens BEST Robotics Summer School, Athens
<b>2001 – 2004</b>	Participation in national mathematical competitions

## Travel grants

<b>2018</b>	Onassis Foundation nomination and grant to attend Lindau Nobel Laureate Meeting FENS-IBRO/PERC travel grant to attend FENS Forum 2018
<b>2017</b>	BCCN travel grant to attend Bernstein Conference Janelia Farm travel grant to attend Junior Scientist Workshop on Neural Circuits and Behavior FENS travel grant to attend JNS Annual Meeting Travel grant to attend EMBL Symposium on Neural Circuits Travel grant to attend 37th Blankenese Conference
<b>2015</b>	University of Tartu – INCF travel grant
<b>2014</b>	British Neuroscience Association travel grant
<b>2013</b>	Hellenic Pasteur Institute travel grant
<b>2011</b>	Thomaideio grant (NTUA) for active participation in conference.
<b>2010</b>	COST Grant (5th International Summer School on Emerging Technologies in Biomedicine) Centrum Wiskunde & Informatica (CWI) (Study group Mathematics with Industry)
<b>2009</b>	Centre de Recherche Cerveau et Cognition
<b>2008</b>	Danish Center for Applied Mathematics and Mechanics (DCAMM) University of Crete Pacific Institute for the Mathematical Sciences (PIMS) grant
<b>2006</b>	FORTH scholarship Athens Information Technology (AIT) National Science Foundation (NSF)

## Student supervision

2016 – 2017	Jialiang Lu	M.Sc. Thesis	Currently: Graduate student at Caltech
2017	Auguste Schulz	Research Internship	Currently: M.Sc. student at TUM
2016	Sandra Reinert	Research Internship	Currently: Graduate student at LMU
2015 – 2016	Elena Itzcovich	Research Internship	Currently: Graduate student at LMU
2015 – 2016	Amar Roy	M.Sc. Thesis	Currently: Industry
2015 – 2016	Felix Brechtmann	Research Internship	Currently: Industry

## Scientific outreach

2016 – today	Administrator of Systems Neuroscience mailing list
2016 – today	Peer reviewer
2015 – today	Organizer of Neurophysiology Nights seminar series, LMU
2012 – 2015	Writer & editorial board of the “CNS Charité Neuroscience Newsletter”
2012 – 2013	Neurasmus course representative at the Erasmus Mundus Association (EMA)
2012 – today	Scholarpedia Assistant Editor
2011 – 2014	TED talks translator
2008 – 2010	American Mathematical Society's (AMS) poster series “Mathematical Moments” translator
2004 – 2006	Organizer and invigilator - National mathematical competitions - Hellenic Mathematical Society (HMS)
2004	Coordinator, guide and invigilator at the International Mathematical Olympiad (IMO) 2004
2004	Coordinator, guide and invigilator at the International Informatics Olympiad (IOI) 2004

## Teaching experience

2017	Assistance at Miniscope Workshop Munich
2015 - 2017	Student supervision
2015	Tutor at the 7th G-Node Winter Course in Neural Data Analysis
2012	“Speaking to the public” (M.Sc. course), Charité University Hospital, Berlin
2004 – 2012	Private and group tutor (university and high school students), Athens

## Internships

2011 – 2012	<b>Lab Rotations - Charité - Universitätsmedizin Berlin</b> “Comparison of cell counting techniques for the assessment of cell death in tissue slices” “Effects of PEDF on primary neuronal cells after oxygen-glucose deprivation” Departments of Experimental Neurosurgery & Experimental Neurology Supervisors: Dr. Ana Luisa Piña – Dr. Marietta Zille
2010	<b>Summer research scholar - University of Pennsylvania</b> Department of Psychiatry, Supervisor: Dr. Ruben Gur
2009	<b>M.Sc. Thesis - Université Paul Sabatier, Toulouse</b> Centre de Recherche Cerveau et Cognition (CERCO), Supervisor: Dr. Arnaud Delorme
2008	<b>Internship on Biostatistics - Alfa Institute of Biomedical Sciences (AIBS)</b> Supervisors: Dr. Matthew E. Falagas - Dr. Dimitrios Matthaiou
2007	<b>Graph theory research for MapleSoft – Simon Fraser University (SFU)</b> “Algorithmic graph isomorphism determination” Centre for Experimental and Constructive Mathematics (CECM) Supervisors: Dr. Michael Monagan - Mohammad Ghebleh

## Other publications

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|---|--|
| 7. Combinatorial and statistical analysis of keno game.<br><b>Karalis N</b>   | <b>CUMC Annual, 2007</b>   |
| 8. Effect of meteorological variables on the incidence of lower urinary tract infections.<br>Falagas ME, Peppas G, Matthaiou DK, Karageorgopoulos DE,<br><b>Karalis N, Theocharis G</b> | <b>European Journal of Clinical Microbiology and Infectious Diseases, 2009</b> |
| 9. Novel graph invariants for fast graph isomorphism identification.<br><b>Karalis N, Aliaga R, Arnold R, Wu W</b>  | <b>Mitacs Proceedings, 2007</b>  |

## Conference abstracts

- 2018** Dynamic organization of limbic circuit dynamics by breathing  
**Karalis N**, Sirota A [FENS forum 2018]  
 Oscillatory architecture of memory circuits  
**Karalis N**, Sirota A [68<sup>th</sup> Lindau Nobel Laureate Meeting]]
- 2017** Respiratory entrainment of memory circuits  
**Karalis N**, Sirota A [Junior Scientist Workshop on Neural Circuits and Behavior]  
 Respiratory entrainment of memory circuits  
**Karalis N**, Sirota A [SfN Meeting 2017]  
 Neuronal synchrony and oscillatory coupling - Functional role and implementation  
**Karalis N**, Sirota A [Coupling and Causality in Complex Systems Conference]  
 Respiratory entrainment of prefrontal circuits  
**Karalis N**, Sirota A [Bernstein Conference 2017]  
 Respiratory entrainment of prefrontal circuits  
**Karalis N**, Sirota A [40th Meeting of Japan Neuroscience Society]  
 Respiratory entrainment of prefrontal circuits  
**Karalis N**, Sirota A [Causation, Explanation, Conditionals workshop]  
 Respiratory entrainment of prefrontal circuits  
**Karalis N**, Sirota A [EMBL Symposium Neural Circuits in the Past, Present and Future]  
 Respiratory entrainment of prefrontal circuits  
**Karalis N**, Sirota A [37th Blankenese Conference on Synaptic plasticity & stability]
- 2016** Manipulating and interpreting fast oscillatory dynamics using optogenetics  
**Karalis N**, Lu J, Sirota A [3rd Bordeaux Neurocampus Conference]  
 Manipulating and interpreting network dynamics using optogenetics  
**Karalis N**, Lu J, Sirota A [Bernstein Retreat - 10th Sparks Workshop]  
 Oscillatory circuit organization during fear behavior  
**Karalis N**, Courtin, J, Dejean C, Chaudun F, Rozeske R, Wurtz H, Herry C [Neurizons]
- 2015** High-density electrophysiological characterization of the hippocampal and cortical network activity  
**Karalis N**, Blanco-Hernandez E, Sirota A [11th Meeting of the German Neuroscience Society 2015]  
 Multichannel extracellular recordings in freely behaving rodents  
 Resnik E, **Karalis N**, Schwesig G, Sirota A [Center of Competence in Neuroengineering Meeting 2015]
- 2014** Synchronized prefrontal-amygdala 4Hz oscillations mediate fear behavior  
**Karalis N**, Courtin, J, Dejean C, Chaudun F, Rozeske R, Wurtz H, Herry C [SfN Meeting 2014]  
 Prefrontal circuits of contextual fear discrimination and generalization  
**Rozeske R**, Khoder S, Chaudun F, Karalis N, Wurtz H, Herry C [SfN Meeting 2014]  
 Towards the dissection of the olfactory sampling strategies during exploratory activity  
 Blanco-Hernandez E, Graboski J, **Karalis N**, Sirota A [Olfaction SPP 5th Annual Meeting].  
 Long-range synchronization of prefrontal-amygdala neuronal circuits during fear behavior  
**Karalis N**, Courtin, J, Dejean C, Chaudun F, Rozeske R, Wurtz H, Herry C [FENS Meeting 2014]  
 Prefrontal Circuits of Contextual Fear Discrimination  
 Rozeske R, Chaudun F, Khoder S, **Karalis N**, Wurtz H, Herry C [FENS Meeting 2014]  
 Medial prefrontal cortex neuronal ensembles encode conditioned fear behavior  
 Dejean C, Courtin, J, **Karalis N**, Wurtz H, Herry C [FENS Meeting 2014]  
 Synchronized prefrontal-amygdala 4Hz oscillations mediate fear behavior  
**Karalis N**, Courtin, J, Dejean C, Chaudun F, Rozeske R, Wurtz H, Herry C [NIN Interneurons Summer School]
- 2013** Increased prelimbic neuronal activity is associated with contextual fear discrimination  
 Rozeske R, **Karalis N**, Khoder S, Herry C [4th GDR Congress]
- 2011** Effects of Himalayan tradition meditation during a SSVEP study  
**Karalis N**, Karanasiou I, Uzunoglu N [Meeting of the Society of Applied Neurosciences 2011]
- 2010** Short term effects of Vipassanā meditation in a single subject SSVEP study  
**Karalis N**, Karanasiou I, Uzunoglu N [4<sup>th</sup> Congress for Electr. Engin. Students]
- 2006** Grid Computing [TEE Research and Technology Days]

## Languages

Language	Level		Certification
Greek	First language		
English	Fluent	C2	Cambridge First Certificate in English (2001)
German	Intermediate	C1	Zentrale Mittelstufenprüfung (2002) Zertifikat Deutsch als Fremdsprache (2000)
Spanish	Intermediate	B2	
French	Intermediate	B2	

## Soft skills courses

2017	Patent and IP workshop, Center for Nanoscience, Munich
2015	Project management workshop, LMU Graduate School, Munich
2015	Grant writing workshop, LMU Graduate School, Munich
2015	Academic presentation workshop, LMU Graduate School, Munich
2014	Educational course on manuscript and grant writing, Milan

## Professional memberships

2017 – today	Japan Neuroscience Association
2014 – today	Society for Neuroscience
2013 – today	Bernstein Center for Computational Neuroscience
2013 – today	Neurasmus Alumni Association
2012 – today	Neuroscience in Bordeaux Association
2012 – today	Federation of European Neuroscience Societies
2012 – today	Hellenic Society for Neurosciences
2011 – today	“School of Applied Mathematics and Physics” Alumni Association
2004 – today	Hellenic Mathematical Society

## Volunteering work

2011	Volunteering for EDASA (Forest Wildfire Protection), Athens
2010	JeffHOPE student-run free clinics, Philadelphia, PA
2010	Books Through Bars, Philadelphia, PA
2009 – 2012	Photographer in various artistic events
2007	Teaching computer skills to immigrants at the Underground Free University, Athens
2005	European Youth Week 2005, Athens

## Non-academic work experience

2011 – 2012	Civic Consulting (Research assistance), Berlin, Germany
2011	Greek Population Census
2010 – 2012	Founder of tutoring and career counseling organization
2009 – 2011	Photographer (freelance, Demotix agency)
2007 – 2011	Animateur
2004 – 2012	Web development (PHP, HTML, CSS, Javascript, LaTeX, SQL)
2010	Hellenic Post
2004	Hellenic Telecommunications Organization (OTE)
2004	Athens Urban Transportation Organization (OASA)

## Conference participation

<b>2018</b>	68 <sup>th</sup> Lindau Nobel Laureate Meeting in Physiology & Medicine 11 <sup>th</sup> FENS forum, Berlin
<b>2017</b>	Society for Neuroscience Meeting, Washington, DC Bernstein Conference 2017, Göttingen Coupling & Causality in Complex Systems, Cologne Harvard-LMU Young Scientists' Forum, Munich Japan Neuroscience Society annual meeting, Tokyo Bernstein Retreat and Causation, Explanation, Conditionals Workshop, Tutzing EMBL Symposium Neural Circuits in the Past, Present and Future, Heidelberg 37th Blankenese Conference on Synaptic plasticity & stability, Hamburg British Neuroscience Association festival, Birmingham Swiss Society for Neuroscience annual Meeting, Basel
<b>2016</b>	Probing neuronal circuits during behavior, Bordeaux Neurizons, Göttingen Bernstein Retreat and Multichannel Electrophysiology Workshop, Tutzing
<b>2015</b>	Bernstein Conference, Heidelberg Cutting Edge Technologies, Munich Bernstein Retreat and Virtual Reality Workshop, Tutzing 11 <sup>th</sup> Meeting of the German Neuroscience Society, Göttingen Center of Competence on Neuroengineering Meeting, Technical University of Munich
<b>2014</b>	Society for Neuroscience Meeting, Washington, DC 9 <sup>th</sup> FENS Forum of Neuroscience, Milan
<b>2013</b>	Bernstein Conference, Tübingen 1st European Neuroscience Conference by Doctoral Students, Bordeaux European Neuroscience Campus Annual Meeting, Bordeaux
<b>2012</b>	8 <sup>th</sup> FENS Forum of Neuroscience, Barcelona ENC Network Annual Joint Meeting, Barcelona Erasmus Mundus Association General Assembly, Prague 7 <sup>th</sup> International Symposium on Neuroprotection and Neurorepair, Potsdam
<b>2011</b>	Berlin Brain Days 22 <sup>nd</sup> European Students Conference on Regenerative Medicine, Berlin Society of Applied Neuroscience meeting, Thessaloniki Breaking Convention, University of Kent 34 <sup>th</sup> European Conference on Visual Perception, Toulouse 25 <sup>th</sup> Annual Hellenic Congress of Neurosurgery, Athens 25 <sup>th</sup> Annual Hellenic Congress of Neurology, Athens
<b>2010</b>	4 <sup>th</sup> Congress for Electrical Engineering Students, Patras
<b>2009</b>	The Brain: Function, Imaging and Repair, Athens
<b>2007</b>	Canadian Undergraduate Mathematics Conference, Simon Fraser University, Vancouver
<b>2006</b>	Which mathematics for biology?, FORTH, University of Crete

## References

### **Anton Sirota, Ph.D.**

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