

Curriculum Vitae

Nikolaos Karalis

Friedrich Miescher Institute for Biomedical Research
Maulbeerstrasse 66
4058, Basel, Switzerland

Website www.nikolaskaralis.gr
Email nikolaos.karalis@fmi.ch
Tel. +41 779 656 702

Current position

Research fellow

01.2018 – present Friedrich Miescher Institute for Biomedical Research
Project: *Neuromodulatory organization of amygdala circuits*
Group leader: Prof. Dr. Andreas Lüthi

Education

Ph.D. in Neuroscience

09.2013 - 12.2017 Faculty of Medicine, Ludwig-Maximilians University Munich
Thesis: *Oscillatory architecture of memory circuits* (Thesis defense: 25.02.2019)
Advisor: Prof. Dr. Anton Sirota

M.Sc.

09.2011 - 09.2012 Charité University Medicine, Berlin – Medical Neuroscience
09.2012 - 08.2013 University Bordeaux II – Neuroscience and Neuropsychopharmacology
Thesis: *Neuronal signatures of fear memory*

B.Sc. & M.Sc.

09.2004 – 03.2011 School of Applied Mathematics and Physical Sciences
National Technical University of Athens (NTUA)
Majors: Computational Mathematics, Statistics
Thesis: *EEG signal analysis methods for characterization of meditative states*

Scholarships and Grants

11.2022 – present Swiss National Foundation Ambizione (835.000 CHF)
06.2021 – 10.2022 Marie Curie Individual Fellowship (191.000 EUR)
04.2019 – 06.2021 EMBO Long-Term Fellowship (151.000 CHF)
12.2014 – 12.2017 Ludwig-Maximilians-Universität München
09.2013 – 11.2014 Centre for Integrative Neuroscience (CIN) - University of Tübingen
09.2011 – 08.2013 Erasmus Mundus scholarship for the *Neurasmus Joint Master degree program in Neuroscience*
06.2010 University of Pennsylvania Grant
03.2009 Erasmus scholarship (Research exchange)
07.2007 MITACS scholarship

Awards

2018 Onassis Foundation nomination and grant to attend Lindau Nobel Laureate Meeting
2010 “*Thomaideio Award*” for best conference presentation from NTUA
2008 “*Thomaideio Award*” for best journal publication from NTUA

Major travel grants and scholarships

2019 Travel grant to attend the Neuromodulation of Neural Microcircuits conference
Travel grant to attend the Computation and Systems Neuroscience (Cosyne) conference
2018 FENS-IBRO/PERC travel grant to attend FENS Forum 2018
2017 BCCN travel grant to attend Bernstein Conference
HHMI Janelia 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
2015 University of Tartu – INCF travel grant
2014 British Neuroscience Association travel grant
2013 Hellenic Pasteur Institute travel grant
2011 Thomaideio grant (NTUA) for active participation in conference.

Selected Publications (Citations: 1139; h-index: 11)

ORCID: 0000-0002-1804-9756

1. Breathing coordinates cortico-hippocampal dynamics in mice during offline states
Karalis N, Sirota A **Nature Communications, 2022**
2. Intercalated amygdala clusters orchestrate a switch in fear state
Hagihara KM, Bukalo O, Zeller M, Aksoy-Aksel A, **Karalis N**, ..., Lüthi A, Holmes A **Nature, 2021**
3. Efficient optogenetic silencing of neurotransmitter release with a mosquito rhodopsin
Mahn M, Saraf-Sinik I, Patil P, Pulin M, Bitton E, **Karalis N**, ..., Wiegert S, Yizhar O **Neuron, 2021**
4. Re-thinking the etiological framework of neurodegeneration
Castillo X, ..., **Karalis N**, ..., Villringer A, Winek K, Zille M **Front. in Neuroscience, 2019**
5. IgSF9b regulates anxiety behaviors through centromedial amygdala inhibitory synapses
Babaev O, Cruces-Solis H, ..., **Karalis N**, ..., Brose N, Krueger-Burg D **Nature Communications, 2018**
6. 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**
7. Prefrontal neuronal assemblies temporally control fear behavior.
Dejean C*, Courtin J*, **Karalis N***, Chaudun F, Wurtz H, Thomas Bienvenu, Herry C **Nature, 2016**
8. 4 Hz oscillations synchronize prefrontal - amygdala circuits during fear behaviour.
Karalis N, Dejean C, Chaudun F, ..., Benchenane K, Sirota A, Courtin J, Herry C **Nature Neuroscience, 2016**
9. Prefrontal parvalbumin interneurons shape neuronal activity to drive fear expression.
Courtin J, Chaudun F, Rozeske R, **Karalis N**, ..., Bienvenu T, Herry C **Nature, 2013**
10. 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**

*: equal contribution

Student supervision

Doctoral candidates, M.Sc. thesis, Research interns

Patents

WO/2017/021542 Method and device for modulating fear and/or anxiety

Peer-reviewing

Independent: Science Advances, Brain Stimulation, PLOS Biology, SLEEP, Frontiers in Neuroscience (review editor), Frontiers in Neural Circuits (review editor), Frontiers in Computational Neuroscience, Frontiers in Network Physiology (review editor), Neurocomputing, Cognitive Neurodynamics, Neuroscience Letters, Computational and Systems Neuroscience conference, Polish National Science Center

With mentors: Nature, Science, Cell, Nature Neuroscience, Neuron, Journal of Neuroscience, Journal of Neurophysiology

Teaching and conference organization

- 2020 - 2022 Organizer of FMI Young Researcher seminar series (>50 speakers hosted)
- 2019 Tutor at FENS CAJAL course - Biosensors and actuators for systems neuroscience, Bordeaux
- 2017 Co-organizer of Miniscope Technology Transfer Workshop at LMU, Munich
- 2015 - 2017 Organizer of Neurophysiology Nights seminar series, LMU
- 2015 Tutor at the 7th G-Node Winter Course in Neural Data Analysis
- 2012 Organizer of "Speaking to the public" (M.Sc. course), Charité University Hospital, Berlin

Invited Talks

2022	FMI Annual Meeting	2016	LMU lecture series
2021	Giessbach meeting		Neurizons – Young Investigator Talks
2020	Neurizons – Young Investigator Talks	2015	German Neuroscience Society
	Neuromatch 2.0	2014	Animal Communication Workshop
2019	FENS-Hertie Winter School	2013	Neurasmus Workshop
2017	Janelia Junior Scientist Workshop on Neural Circuits		Neurasmus Orientation Week
	Coupling & Causality in Complex Systems	2011	Breaking Convention
	Bernstein Conference PhD Symposium	2007	Mitacs Industrial Math Summer School
	Harvard-LMU Young Scientists' Forum		Canadian Undergr. Math. Conference
	Japan Neuroscience Society meeting		
	British Neuroscience Association meeting		

Academic service & outreach

2020 – present	FMI young investigator seminar series organizer (>70 speakers hosted)
2019 - present	FMI postdoc representative
2016 - present	Administrator of Systems Neuroscience mailing list (>2000 members)
2016 - present	Peer reviewer
2012 – 2015	Writer & editorial board of the “CNS Charité Neuroscience Newsletter”
2012 – 2013	Neurasmus course representative at the Erasmus Mundus Association (EMA)
2004 – 2006	Coordinator 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

Other Research Experience

2011 – 2012	Lab Rotations - Charité - Universitätsmedizin Berlin <i>“Comparison of cell counting techniques for the assessment of cell death in tissue slices”</i> <i>“Effects of PEDF on primary neuronal cells after oxygen-glucose deprivation”</i> Departments of Experimental Neurosurgery & Experimental Neurology Supervisors: Dr. Ana Luisa Piña – Dr. Marietta Zille
2010	Summer research scholar - University of Pennsylvania Department of Psychiatry, Supervisor: Dr. Ruben Gur
2009	M.Sc. Thesis - Université Paul Sabatier, Toulouse Centre de Recherche Cerveau et Cognition (CERCO), Supervisor: Dr. Arnaud Delorme
2008	Internship on Biostatistics - Alfa Institute of Biomedical Sciences (AIBS) Supervisors: Dr. Matthew E. Falagas - Dr. Dimitrios Matthaïou
2007	Graph theory research – Simon Fraser University (SFU) <i>“Algorithmic graph isomorphism determination”</i> - Centre for Experimental and Constructive Mathematics Supervisors: Dr. Michael Monagan - Mohammad Ghebleh
2005 – 2009	Research assistance - National Technical University of Athens - High Energy Physics Dept. CERN Grid Computing infrastructure - Network development and administration

Research methods and experimental techniques

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

Full publication list

Publications in international peer-reviewed scientific journals

1. **Karalis, N., & Sirota, A.** (2022).
Breathing coordinates cortico-hippocampal dynamics in mice during offline states.
Nature communications, 13(1), 467. <https://doi.org/10.1038/s41467-022-28090-5>
2. Hagihara, K. M., Bukalo, O., Zeller, M., Aksoy-Aksel, A., **Karalis, N.**, Limoges, A., Rigg, T., Campbell, T., Mendez, A., Weinholtz, C., Mahn, M., Zweifel, L. S., Palmiter, R. D., Ehrlich, I., Lüthi, A., & Holmes, A. (2021).
Intercalated amygdala clusters orchestrate a switch in fear state.
Nature, 594(7863), 403–407. <https://doi.org/10.1038/s41586-021-03593-1>
3. Mahn, M., Saraf-Sinik, I., Patil, P., Pulin, M., Bitton, E., **Karalis, N.**, Bruentgens, F., Palgi, S., Gat, A., Dine, J., Wietek, J., Davidi, I., Levy, R., Litvin, A., Zhou, F., Sauter, K., Soba, P., Schmitz, D., Lüthi, A., Rost, B. R., ... Yizhar, O. (2021).
Efficient optogenetic silencing of neurotransmitter release with a mosquito rhodopsin.
Neuron, 109(10), 1621–1635.e8. <https://doi.org/10.1016/j.neuron.2021.03.013>
4. Castillo, X., Castro-Obregón, S., Gutiérrez-Becker, B., Gutiérrez-Ospina, G., **Karalis, N.**, Khalil, A. A., Lopez-Noguerola, J. S., Rodríguez, L. L., Martínez-Martínez, E., Perez-Cruz, C., Pérez-Velázquez, J., Piña, A. L., Rubio, K., García, H., Syeda, T., Vanoye-Carlo, A., Villringer, A., Winek, K., & Zille, M. (2019).
Re-thinking the Etiological Framework of Neurodegeneration.
Frontiers in neuroscience, 13, 728. <https://doi.org/10.3389/fnins.2019.00728>
5. Babaev, O., Cruces-Solis, H., Piletti Chatain, C., Hammer, M., Wenger, S., Ali, H., **Karalis, N.**, de Hoz, L., Schlüter, O. M., Yanagawa, Y., Ehrenreich, H., Taschenberger, H., Brose, N., & Krueger-Burg, D. (2018).
IgSF9b regulates anxiety behaviors through effects on centromedial amygdala inhibitory synapses.
Nature communications, 9(1), 5400. <https://doi.org/10.1038/s41467-018-07762-1>
6. Rozeske, R. R., Jercog, D., **Karalis, N.**, Chaudun, F., Khoder, S., Girard, D., Winke, N., & Herry, C. (2018).
Prefrontal-Periaqueductal Gray-Projecting Neurons Mediate Context Fear Discrimination.
Neuron, 97(4), 898–910.e6. <https://doi.org/10.1016/j.neuron.2017.12.044>
7. Dejean, C. *, Courtin, J. *, **Karalis, N. ***, Chaudun, F., Wurtz, H., Bienvenu, T. C., & Herry, C. (2016).
Prefrontal neuronal assemblies temporally control fear behaviour.
Nature, 535(7612), 420–424. <https://doi.org/10.1038/nature18630>
8. **Karalis, N.**, Dejean, C., Chaudun, F., Khoder, S., Rozeske, R. R., Wurtz, H., Bagur, S., Benchenane, K., Sirota, A., Courtin, J., & Herry, C. (2016).
4-Hz oscillations synchronize prefrontal-amygdala circuits during fear behavior.
Nature neuroscience, 19(4), 605–612. <https://doi.org/10.1038/nn.4251>
9. Courtin, J., Chaudun, F., Rozeske, R. R., **Karalis, N.**, Gonzalez-Campo, C., Wurtz, H., Abdi, A., Baufreton, J., Bienvenu, T. C., & Herry, C. (2014).
Prefrontal parvalbumin interneurons shape neuronal activity to drive fear expression.
Nature, 505(7481), 92–96. <https://doi.org/10.1038/nature12755>
10. Courtin, J., **Karalis, N.**, Gonzalez-Campo, C., Wurtz, H., & Herry, C. (2014).
Persistence of amygdala gamma oscillations during extinction learning predicts spontaneous fear recovery.
Neurobiology of learning and memory, 113, 82–89. <https://doi.org/10.1016/j.nlm.2013.09.015>
11. Falagas, M. E., Peppas, G., Matthaiou, D. K., Karageorgopoulos, D. E., **Karalis, N.**, & Theocharis, G. (2009).
Effect of meteorological variables on the incidence of lower urinary tract infections.
European journal of clinical microbiology & infectious diseases: official publication of the European Society of Clinical Microbiology, 28(6), 709–712. <https://doi.org/10.1007/s10096-008-0679-z>

*: equal contribution

Peer-reviewed conference proceedings

1. *Breathing coordinates network dynamics underlying memory consolidation*
Karalis N, Sirota A
Computational and Systems Neuroscience (CoSyNe), 2019
2. *Effects of Himalayan tradition meditation during an SSVEP study.*
Karalis N, Karanasiou I, Uzunoglu N, Braboszcz C
Society of Applied Neuroscience, 2011
3. *Novel graph invariants for fast graph isomorphism identification*
Karalis N
Mitacs Proceedings, 2007
4. *Combinatorial and statistical analysis of keno game*
Karalis N
Canadian Undergraduate Mathematics Conference Annual, 2007

Patents and licenses

1. Patent WO2017021542 “*Method for modulating fear and/or anxiety*”

Selected conferences, summer schools, and workshops

†: oral presentation
*: poster presentation

Conferences

Ascona Neural Circuits Meeting 2022 *
13th FENS Forum 2022 *
Canadian Neuroscience Society 2022 †
Giessbach Meeting 2021 †
Neuromodulation of Neural Microcircuits 2019 *
Computational and Systems Neuroscience 2019 *
11th FENS Forum 2018 *
68th Lindau Nobel Laureate Meeting 2018
SfN Meeting 2017 *
Bernstein Conference 2017 *
Harvard-LMU Young Scientists' Forum 2017 †
Japan Neuroscience Society annual meeting 2017 †
EMBL Symposium on Neural Circuits 2017 *
Probing neuronal circuits during behavior 2016
Mechanisms of Memory Consolidation 2015
11th Meeting of the German Neuroscience Society 2015 †
Bernstein Conference 2015 *
SfN Meeting 2014 *
FENS Forum 2014 *
Bernstein Conference 2013 *
FENS 2012 *

Summer schools and workshops

EMBO Laboratory Leadership course 2022 (planned)
Project Management – a Toolbox for Scientists 2020
Learning to Lead a Successful Work Environment 2020
FENS CAJAL course – Biosensors 2019 (tutor)
FENS-Hertie Winter School – Innate Behavior 2019 **
New Paths Towards Neurodegeneration think tank 2018
Janelia Workshop on Neural Circuits 2017 †
Baltic-Nordic School on Neuroinformatics 2015 *
Optogenetics Workshop SPP1665 2015
7th G-Node Course in Neural Data Analysis 2015 (tutor)
NIN Interneuron Summer School 2014 *
11th Summer Course on Computational. Neurosc. 2013
5th G-Node Course in Neural Data Analysis 2013
Mathematical Cell Biology Graduate Course 2012
Emerging Biotechnologies Summer School 2010 *
UPenn CompNeuro summer research program 2010
66th European Study Group with Industry 2008
MITACS Industrial Math Summer School 2007
Computational Aspects of Algebra and Arithmetic 2006

Other travel grants and scholarships

2010 COST Grant (5th International Summer School on Emerging Technologies in Biomedicine)
Centrum Wiskunde & Informatica (CWI) (Study group Mathematics with Industry)

2009 Centre de Recherche Cerveau et Cognition

2008 Danish Center for Applied Mathematics and Mechanics (DCAMM)
University of Crete travel grant, Pacific Institute for the Mathematical Sciences (PIMS) grant

2006 FORTH, Athens Information Technology (AIT), and Hellenic National Science Foundation (NSF) scholarships