Curriculum Vitae

Nikolaos Karalis

Friedrich Miescher Institute for Biomedical Research
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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. **Neurasmus Joint Master in Neuroscience**
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. **School of Applied Mathematics and Physical Sciences**
09.2004 – 03.2011 National Technical University of Athens (NTUA)
Majors: Computational Mathematics, Statistics
Thesis: *EEG signal analysis methods for characterization of meditative states*

Scholarships and Grants

06.2021 – 06.2023 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

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.
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

Selected Publications

(Citations: 1139; h-index: 11) ORCID: 0000-0002-1804-9756

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

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

Academic service & outreach

2020 – present FMI young investigator seminar series organizer (>50 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**
"*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 **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 Matthaiou

2007 **Graph theory research – Simon Fraser University (SFU)**
"*Algorithmic graph isomorphism determination*" - 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 *in vivo* 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

Conferences

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

†: oral presentation
*: poster presentation