**Curriculum Vitae**

**Nikolaos Karalis**

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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 – 08.2013Erasmus 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

1. 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

1. 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

1. Re-thinking the etiological framework of neurodegeneration **Front. in Neuroscience, 2019**

Castillo X, …, **Karalis N**, ..., Villringer A, Winek K, Zille M

1. IgSF9b regulates anxiety behaviors through centromedial amygdala inhibitory synapses **Nature Communications, 2018**Babaev O, Cruces-Solis H, …, **Karalis N**, …, Brose N, Krueger-Burg D
2. 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

1. Prefrontal neuronal assemblies temporally control fear behavior. **Nature, 2016**

Dejean C\*, Courtin J**\***, **Karalis N\***, Chaudun F, Wurtz H, Thomas Bienvenu, Herry C

1. 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
2. Prefrontal parvalbumin interneurons shape neuronal activity to drive fear expression. **Nature, 2013**

Courtin J, Chaudun F, Rozeske R, **Karalis N**, …, Bienvenu T, Herry C

1. Persistence of amygdala gamma oscillations during extinction learning **Neurobiology of Learning**

predicts spontaneous fear recovery. **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**

**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

**2022** Canadian Neuroscience Society (symposium)

**2021** Giessbach meeting

**2020** Neurizons – Young Investigator Talks

Neuromatch 2.0

**2019** FENS-Hertie Winter School

**2017** JaneliaJunior 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

**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](http://www.medical-neurosciences.de/en/about_us/newsletter/)”

2012 – 2013 Neurasmus course representative at the [Erasmus Mundus Association (EMA)](http://www.em-a.eu/)

2004 – 2006 Coordinator and invigilator - National mathematical competitions - [Hellenic Mathematical Society (HMS)](http://www.hms.gr)

2004 Coordinator, guide and invigilator at the International Mathematical Olympiad (IMO) 2004

2004Coordinator, guide and invigilator at the [International Informatics Olympiad (IOI) 2004](http://www.epy.gr/ioi2004/)

**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**

1. *Effects of Himalayan tradition meditation during an SSVEP study.*

**Karalis N**, Karanasiou I, Uzunoglu N, Braboszcz C

**Society of Applied Neuroscience, 2011**

1. *Novel graph invariants for fast graph isomorphism identification*

**Karalis N**

**Mitacs Proceedings, 2007**

1. *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**

**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

**Conferences**

13thFENS Forum 2022 \*

Canadian Neuroscience Society 2022 🕇

Giessbach Meeting 2021 🕇

Neuromodulation of Neural Microcircuits 2019 \*

Computational and Systems Neuroscience 2019 \*

11thFENS 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 \*

🕇: oral presentation

\*: poster presentation