

CURRICULUM VITAE

**Basilis (Vasileios) Zikopoulos, Associate Professor**

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**Education**

<b>Institution And Location</b>	<b>Degree</b>	<b>Year(s)</b>	<b>Field Of Study</b>
University of Crete, Greece	BS	1991 - 1996	Biology
University of Crete, Greece	MS	1996 - 1998	Biology
University of Crete, Greece	PhD	1998 – 2004*	Neurobiology

*\* Leave for mandatory national service in armed forces (2001 – 2003)*

**Academic Appointments**

- 2021 – **Associate Professor** (tenured), Department of Health Sciences, College of Health & Rehabilitation Sciences: Sargent College, Boston University
- 2019 – **Director, PhD Program in Human Physiology**, Department of Health Sciences, College of Health & Rehabilitation Sciences: Sargent College, Boston University (06/25/2019)  
**Faculty**, Center for Systems Neuroscience (CSN), Boston University
- 2019 – **Assistant Professor** (*secondary appointment*), Department of Anatomy and Neurobiology, Boston University School of Medicine
- 2016 – 2018 **Faculty**, Center for Research in Sensory Communication and Emerging Neural Technology (CRESCENT), Boston University
- 2015 – **Faculty/Training Faculty**, Graduate Program in Neuroscience, Boston University
- 2015 – **Assistant Professor**, Department of Health Sciences, College of Health & Rehabilitation Sciences: Sargent College, Boston University
- 2009 – 2016 **Faculty**, Center of Excellence for Learning in Education, Science, and Technology (CELEST), Boston University

- 2008 – 2015      **Research Assistant Professor**, Department of Health Sciences, College of Health & Rehabilitation Sciences: Sargent College, Boston University
- 2004 – 2008      **Post-doctoral Research Associate**, College of Health & Rehabilitation Sciences: Sargent College, Boston University
- 2003 – 2004      **Instructor**, Department of Biology, University of Crete, Greece
- 1996 – 2004      **Research Fellow**, Department of Biology, University of Crete, Greece
- 1996 – 1998      **Research Fellow**, Institute of Marine Biology of Crete, Greece

## Research Support (Grants and Fellowships)

### Current Research Funding as Principal Investigator

- **NIH/NIMH                  R01 MH118500                  Zikopoulos (PI)                  02/15/19 – 11/30/23**  
*“Organization And Circuit Interactions Of Thalamocortical Attentional Networks In Health And Disease”*  
 Role: PI

The goal is to investigate the organization and circuit interactions of thalamic networks that have significantly expanded and specialized in parallel with the cortex in primates and model their typical function and disruption in disorders.

### Current Research Funding as Co – Investigator

- **NIH/NIMH R01 MH117785 (former NS024760) Barbas (PI, Boston University)                  07/01/87 – 02/28/20**  
*“Prefrontal anatomic pathways in executive control”*

Role: Co-Investigator

The goal is to identify pathways through which prefrontal cortices exercise excitatory and inhibitory control within functionally related prefrontal cortices, and in their projection to temporal cortices at the level of systems and at the ultrastructural level.

- **NIH/NIMH R01 MH057414                  Barbas (PI, Boston University)                  04/10/99 – 03/31/21**  
*“Organization of prefrontal feedback circuits”*

Role: Co-Investigator

The goal is to study the structural organization of a massive feedback system originating from prefrontal cortices and distributed to excitatory and inhibitory systems in the amygdala and the thalamus at the level of systems and at the ultrastructural level.

- **NIH/NIDCD T32 DC013017                  Moore (PI, Boston University)                  07/01/16 – 06/30/21**  
*“Advanced Training in Communication Sciences and Disorders”*

Role: Faculty member

Advanced Training in Communication Sciences and Disorders.

## Completed Research Support

- **NIH/NIMH R01 MH101209 Zikopoulos (PI) 04/04/14 – 01/31/20**

*“Organization of Excitatory and Inhibitory Circuits in ASD”*

Role: PI

The goal is to investigate the structural and molecular organization and features of neurons in the grey matter and their axons in the white matter that underlie excitatory and inhibitory control within functionally relevant prefrontal networks in children with autism.

- **NIH/NIMH R01 MH105608 Berretta (PI, McLean Hospital) 09/01/15 – 06/30/19**

*“Thalamic axonal pathways and extracellular matrix abnormalities in schizophrenia”*

Role: Co-Investigator

The goal is to study structural and molecular features of pathways linking the thalamus and the frontal cortex and their dysregulation in schizophrenia. The focus is on the expression of chondroitin sulfate proteoglycans in oligodendrocytes and axonal coats and whether changes in their levels are associated with white matter abnormalities and dysregulation of molecular pathways related to myelin biosynthesis in schizophrenia.

- **Mentor-based Fellowship (#2156). Period: 2008 – 2011**

*“Architecture of prefrontal white matter”.*

Principal Investigator / Award Grantee: Basilis (Vasileios) Zikopoulos      Mentor: Helen Barbas

Agency: Autism Speaks ([www.autismspeaks.org](http://www.autismspeaks.org))

The goal was to investigate the largely unexplored issue of prefrontal white matter structure and pathways that exercise central executive control and are especially affected in autism.

- **NSF, CELEST (Center of Excellence for Learning in Education, Science, and Technology - 0835976). Period: 2009 – 2016**

Role: Faculty member; Principal Investigator: Barbara Shinn-Cunningham, Department of Biomedical Engineering, Boston University

Agency: National Science Foundation (NSF)

CELEST is an NSF Science of Learning Center (SLC) comprised of neuroscientists, educators, and engineers at several Boston-area universities, including Boston University, Harvard University, and MIT. The project’s central goals are to understand brain mechanisms of learning, with particular emphasis on the role of dynamical interactions within and between brain regions. The project includes specific multidisciplinary collaborations that bridge efforts across all CELEST pillars: education, science, and technology.

## Academic Honors and Awards

- **Featured Article, PLoS Biology, (2/2020), Conveying emotions (<https://journals.plos.org/plosbiology>).**
- **Supervisor of the Year Award Nomination, (2019), Boston University Student Employment Office**

- **2019 - Top 2% most downloaded article for all Frontiers journals.** Zikopoulos B, Barbas H. Altered neural connectivity in excitatory and inhibitory cortical circuits in autism. *Frontiers in Human Neuroscience*. 2013 Sep 27;7:609.
- **2019 - Top 4% most viewed and downloaded article for all Frontiers journals.** García-Cabezas MÁ, John YJ, Barbas H, Zikopoulos B. Distinction of Neurons, Glia and Endothelial Cells in the Cerebral Cortex: An Algorithm Based on Cytological Features. *Frontiers in Neuroanatomy*. 2016 Nov 1;10:107.
- **2019 - Top 5% most downloaded article for all Frontiers journals.** John YJ, Bullock D, Zikopoulos B, Barbas H (2013). Anatomy and computational modeling of networks underlying cognitive-emotional interaction. *Frontiers in Human Neuroscience*. 7:101.
- **Top 10% most cited PLOS Biology papers published in 2018.** Zikopoulos B, García-Cabezas MÁ, Barbas H. Parallel trends in cortical gray and white matter architecture and connections in primates allow fine study of pathways in humans and reveal network disruptions in autism. *PLoS Biology*, 2018 Feb 5;16(2):e2004559. doi: 10.1371/journal.pbio.2004559.
- **Featured Article, PLoS Biology**, (2018), Organization of the primate cortex (<https://journals.plos.org/plosbiology>).
- **Featured Article, Journal of Neuroscience, Society for Neuroscience, USA**, (2017), Primate pOFC Projects Densely to Amygdala Intercalated Masses (<http://www.jneurosci.org/content/37/20/i>).
- **Featured Article, Journal of Neuroscience, Society for Neuroscience, USA**, (2012), New projection from amygdala discovered (<http://www.jneurosci.org/content/32/15/i>).
- **Cover Article, Journal of Neuroscience, Society for Neuroscience, USA**, (2010), Axon changes in autism (<http://www.jneurosci.org/content/30/44.cover-expansion>).
- **Mentor-based Fellowship / Award**, (2008 – 2011), Autism Speaks.
- **Cover Article, The Neuroscientist**, (2007), Prefrontal cortex and flexible behavior.
- **HNS Research Achievement/Presentation Award**, (2003), Hellenic Neuroscience Society.
- **IBRO Travel Grant Award**, (2003), Federation of European Neuroscience Societies (FENS).
- **Research Fellowship**, (2000), GGSRT, The British Council, and Department of Biology, Open University, Milton Keynes, UK.
- **Research Fellowship**, (1998), University of Crete – Aristotle's University of Thessaloniki, Greece, and European Union.
- **Summa Cum Laude**, (1998), MS in Biology.
- **Research Scholarship**, (1996), Institute of Marine Biology of Crete, and Department of Biology, University of Crete, Greece.
- **ERASMUS Scholarship**, (1994), Greek State Scholarship Foundation and European Union. For a **Research Fellowship** in the Laboratory of Neuropharmacology, Department of Physiology and Pharmacology, School of Biological Sciences, University of Manchester, UK.

## Teaching Interests & Experience – Mentoring

**Interests:** Organization and dynamics of the cortex and its circuits from the molecular to the systems level; Neurobiology of mental disorders; Neuroanatomy.

- **Instructor**

*College of Health & Rehabilitation Sciences: Sargent College, Boston University*

HS 550: Neural Systems (*graduate/undergraduate, ~10 students/year*) 2013

HS 370/582: Neuroanatomy / Neurophysiology (*graduate/undergraduate, ~100 students/year*) 2017 –

- **Guest Lecturer / Instructor**

*Department of Biology, University of Crete, GREECE*

Computational Applications and Image Analysis in Biology (*graduate*) 2003 – 2004

*Department of Health Sciences, Boston University*

HS 550: Neural Systems (*graduate/undergraduate*) 2005 – 2012

HS 755: Readings in Neuroscience (*graduate*) 2006 – 2014

*Graduate Program in Neuroscience*

NE 500: Frontiers in Neuroscience (*graduate*) 2015

NE 800: Laboratory Rotations (*graduate*) 2015

Tools of the Trade (*graduate, summer course*) 2015 –

*Marine Biological Institute in Woods Hole, MA, USA*

Neuroinformatics (*graduate*) 2008 – 2011

*Department of Cognitive and Neural Systems, Boston University*

CN 550: Neural/Computational models of recognition, memory, and attention (*graduate*) 2012 – 2013

CN 730: Models of Visual Perception (*graduate/undergraduate*) 2005 – 2011

CN 810: Topics in Cognitive and Neural Systems (*graduate*) 2005 – 2011

*Department of Anatomy and Neurobiology, Boston University School of Medicine*

GMS AN 718: Methods in Neuroscience (*graduate*) 2011 – 2013

*Department of Psychological and Brain Sciences, Boston University*

CN 510: Neural/Computational models of recognition, memory, and attention (*graduate*) 2016 –

CN 530: Neural and Computational Models of Vision (*graduate/undergraduate*) 2018 –

- **Teaching Fellow**

*Department of Biology, University of Crete, GREECE*

Human Physiology; Neurobiology; Biochemistry 1998 – 2004

- **Advising/Mentoring (Postdoctoral fellows, graduate and undergraduate students)**

*Postdoctoral Fellows*

Xuefeng Liu, Ph.D. (2017 – )

**Ph.D.**

*Graduate Program in Neuroscience, Boston University*

Iris Trutzer (M.D./Ph.D. Mentor/Advisor, 2015 – 2019)

Mary Kate Joyce (Ph.D. Thesis committee, 2<sup>nd</sup> Reader, 2014 – 2020)

*Human Physiology Program, College of Health & Rehabilitation Sciences: Sargent College, Boston University*

Jingyi Wang (Ph.D. Thesis committee, 2<sup>nd</sup> Reader, 2014 – )

*Department of Anatomy and Neurobiology, Boston University School of Medicine*

Clare Timbie (M.D./Ph.D. Thesis committee, 2009 – 2013)

*Department of Cognitive and Neural Systems, Boston University*

Alex Storer (Ph.D. Dissertation committee, 2011)

**M.S.**

*Human Physiology Program, College of Health & Rehabilitation Sciences: Sargent College, Boston University*

Joy Ismail (M.S. Mentor/Advisor, 2015)

Kevin Pruna (M.S. Mentor/Advisor, 2016)

Nayeem Hossain (M.S. 2<sup>nd</sup> Reader, 2017)

Julia Hacker (M.S. Mentor/Advisor, 2018)

Julied Bautista (M.S. Mentor/Advisor, 2018)

Yandan Wang (M.S. 2<sup>nd</sup> Reader, 2018)

Hailey Moreira (M.S. Mentor/Advisor, 2021)

Sophie Struble (M.S. Mentor/Advisor, 2022)

Jillianne Son (M.S. Mentor/Advisor, 2022)

Brandon Coughlin (M.S. Mentor/Advisor, 2023)

Rebecca Johnson (M.S. Mentor/Advisor, 2023)

Natalia Matuk (M.S. Mentor/Advisor, 2023)

*Boston University School of Medicine*

Kayla Nist (M.S. Lab Rotation, Department of Anatomy and Neurobiology, 2019)

Elva House (GMS, 2<sup>nd</sup> Reader, 2019-2020)

**Formal Academic Advising (Undergraduates)**

*Human Physiology Program, College of Health & Rehabilitation Sciences: Sargent College, Boston University*

I formally advise on average between 25 - 30 undergraduate students per semester 2015 –

**Advising/Mentoring Undergraduate Research Fellows**

*Undergraduate Human Physiology Internship Program, Sargent College (total of 7 students)*

Mitsu Philogene (2021); Chloe Cho (2021); Brooklynn Earls (2020); Su Htwe (2018); Austin Liou (2017); Samuel Han (2016); Anna Streifel (2016)

*Undergraduate Research Opportunities Program (UROP), Boston University (total of 9 students)*

Julie Ngo (2021); Komal Wasif (2020); Najila Zaman (2019); Eugenia Angelopoulos (2019); Uma Khemraj (2019); Justin Luh (2018); Edward Liu (2018); Rebecca Salamone (2016); Justin Tepe (2014); Amar Patel (2009)

*Undergraduate Human Physiology Program, Sargent College: Dean's Scholars (total of 4 students)*  
Victoria Bemis (2017); Doreen Wu (2018); Charlie Fischer (2018); Caroline Oliver (2018)

*Summer Training as Research Scholars Program (STaRS), Graduate Medical Sciences BUSM (one student)*  
Antonio Lopez (summer 2019)

*Boston University: Volunteers and Workstudy since 2015 (total of 30 students from Departments of Biology, Biomedical Engineering, Neuroscience, Psychological and Brain Sciences, Health Sciences)*

Rebecca Housh; Dimitri Mabarak; Grace Lei; Adline Juste; Justin Kim; Justin Luh; Utsav Rana; Abraham Ha; Julia Rosario; Ismail Joy; Priya Desai; Edward Liu; Aworanti Eunice; Douglas Benishek; Hannah Hollow; Tyler Jensen; Tate Higashihara; Eugenia Angelopoulos; Sofia Konstantinidou; Maria Karanasos; Uma Khemraj; Brooklynn Earls; Lily Travis; Clemence Shi; Alexander Li; Konrad Skubritz; Najila Zaman; Komal Wasif; Sussan Al-Shanniek; Shimrani Banik

*Center of Excellence for Learning in Education, Science, and Technology (CELEST), Boston University (total of 5 students)*

Laura Bustamante (2013); Talia Raney (2013); Christina Catavero (2012); Belle English (2011); Isra Ahmed (2010)

#### ***Advising/Mentoring Minors***

Academic Immersion (AIM) Program for High School Students. Boston University Summer Term. Systems Neuroscience Research – Experimental and Computational Approaches. Summer 2019.

Authentic Science Research Program for High School Students (Manchester-Essex High School). Human Systems Neuroscience Laboratory. Systems Neuroscience Research – Experimental and Computational Approaches. Summer 2019 (2 students)

Emily Jacobsen; Lars Arntsen

## **Research Interests & Experience**

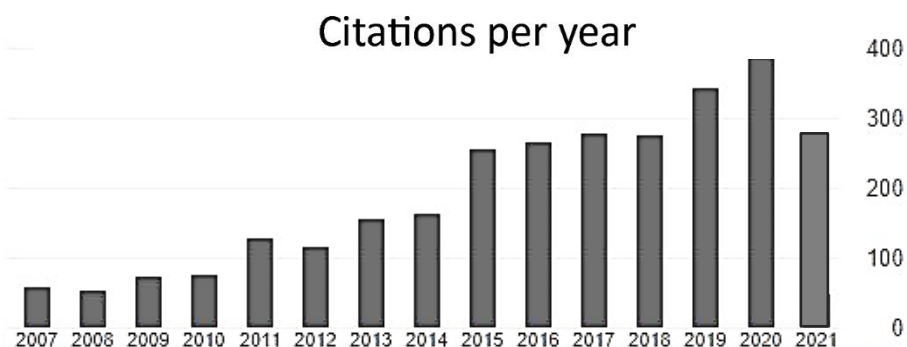
My research involves the investigation of structural, neurochemical and molecular features underlying the organization and synaptic interactions of frontal brain circuits in primates, including humans, and their disruption in disease. Increasingly, my work has been focusing on processes that shape network dynamics and the delicate balance of excitation and inhibition, which are consistently disrupted in autism and other neurodevelopmental disorders. These circuits include frontal areas and their extensive cortical and subcortical networks that are involved in translating cognitive and emotional operations to action. My work has led to the development of novel methods and significant methodological advances, including optimization of preservation and reliable triple and quadruple labeling of brain tissue for electron microscopy; correlated light and electron microscopy; and large-scale, and thus far unprecedented, three-dimensional analysis and reconstruction of labeled pathways and their synaptic and neurochemical interactions within functionally-distinct networks. These cutting-edge, high-resolution experimental approaches, complemented by advanced computational and image analysis techniques, have made it possible to conduct detailed quantitative analyses and develop brain-based circuit and computational models, describing novel circuits that have a key role in cognitive and emotional processes. In

addition, we have been successfully applying these methods to quantitatively study human brain tissue at very high resolution to model complex relationships between brain structure and function in health and disease. This experimental and theoretical framework that helps us derive principles from complex data on connections and their interactions provides a solid foundation to integrate bench and clinical research across neuroscience disciplines.

## Contribution to science and impact of selected studies: Significance & Publicity

**Number of original/peer-reviewed articles, chapters: 37; Citations: 2961; h-index: 25**

Citation Indices		
	All	Since 2016
Citations	<b>2961</b>	<b>1805</b>
h-index	<b>25</b>	<b>23</b>
i10-index	<b>31</b>	<b>27</b>
<i>Summary from Google Scholar (August 2021)</i>		



1) **Development of neuropathological changes and disruption of neural communication in autism:** In a series of studies we described, for the first time, structural and molecular changes in individual axons in the white matter below prefrontal cortices in adults with autism. In addition, we described significant changes in the ratio of excitatory and inhibitory neurons within functionally-distinct frontal networks. Our findings provided a mechanism that can help explain disruptions in neural communication both at the cellular/synaptic level and at the systems level, involving networks of areas that redirect attention, mediate social interactions and modulate emotional responses. Moreover, we correlated epigenetic changes with cellular processes and network disruption, and formulated a novel model describing the development of autism, and critical periods for the initial insult and potential interventions. During this research we developed and optimized methods to preserve and reliably label human brain tissue for electron microscopy, correlated light and electron microscopy, and large-scale, and thus far unprecedented, three-dimensional analysis and reconstruction of pathways within functionally-distinct networks. This body of work is directly related to my R01 project, currently in preparation to be resubmitted for competitive renewal of funding by NIMH (R01 MH101209).

- a) Liu X, Bautista J, Liu E, Zikopoulos B. (2020). Imbalance of laminar-specific excitatory and inhibitory circuits of the orbitofrontal cortex in autism. *Molecular Autism* 2020 11(83). <https://doi.org/10.1186/s13229-020-00390-x>.
- b) García-Cabezas MÁ, Zikopoulos B. Evolution, development, and organization of the cortical connectome. *PLoS Biol.* 2019 May 10;17(5):e3000259. doi: 10.1371/journal.pbio.3000259. eCollection 2019 May. PMID: 31075099.



- c) Trutzer IM, García-Cabezas MÁ, Zikopoulos B. Postnatal development and maturation of layer 1 in the lateral prefrontal cortex and its disruption in autism. *Acta Neuropathol Commun.* 2019 Mar 13;7(1):40. doi: 10.1186/s40478-019-0684-8. PubMed PMID: 30867066; PubMed Central PMCID: PMC6417186.
- d) Zikopoulos B, Liu X, Tepe J, Trutzer I, John YJ, Barbas H. (2018) Opposite development of short- and long-range anterior cingulate pathways in autism. *Acta Neuropathologica.* 2018 Sep 6. doi: 10.1007/s00401-018-1904-1.
- e) Zikopoulos B, Barbas H. Altered neural connectivity in excitatory and inhibitory cortical circuits in autism. *Frontiers in Human Neuroscience.* 2013 Sep 27;7:609. PubMed PMID: [24098278](#); PubMed Central PMCID: [PMC3784686](#).
- f) Zikopoulos B, Barbas H. Changes in prefrontal axons may disrupt the network in autism. *Journal of Neuroscience.* 2010 Nov 3;30(44):14595-609. PubMed PMID: [21048117](#); PubMed Central PMCID: [PMC3073590](#).

**Publicity:**

Director's Blog: NIMH's Top 10 Research Events and Advances of 2010

(<http://www.nimh.nih.gov/about/director/2010/nimhs-top-10-research-events-and-advances-of-2010.shtml>)

Autism Speaks Official Blog – What lies beneath: differences in brain connections

(<http://blog.autismspeaks.org/2010/11/11/what-lies-beneath-brain-connections/>)

Interagency Autism Coordinating Committee Strategic Plan for Autism Spectrum Disorder Research – 2010 and 2011 (<http://iacc.hhs.gov/events/2010/full-committee-mtg-minutes-dec14.shtml> and

<http://iacc.hhs.gov/strategic-plan/2011/references.shtml>)

- 2) **Comparative studies of brain networks in rhesus monkeys and humans and their disruption in disease:** In a series of high resolution comparative studies we identified similarities and key differences in cellular, synaptic, and molecular features of cortical and subcortical networks in humans and rhesus monkeys. We developed algorithms to facilitate reliable and systematic distinction of cells in the primate brain and have created a template to translate high-resolution data on connections and circuit interactions from rhesus monkeys to humans, through the side-by-side study of the structure and connections in the two species. This body of work is directly related to my R01 projects, funded by NIMH (MH101209, MH118500).
  - a) García-Cabezas MÁ, Barbas H, Zikopoulos B. Parallel Development of Chromatin Patterns, Neuron Morphology, and Connections: Potential for Disruption in Autism. *Frontiers in Neuroanatomy.* 2018;12:70. PubMed PMID: [30174592](#); PubMed Central PMCID: [PMC6107687](#).
  - b) Zikopoulos B, García-Cabezas MÁ, Barbas H. Parallel trends in cortical gray and white matter architecture and connections in primates allow fine study of pathways in humans and reveal network disruptions in autism. *PLoS Biology,* 2018 Feb 5;16(2):e2004559. doi: 10.1371/journal.pbio.2004559.
  - c) García-Cabezas MÁ, Joyce MKP, John YJ, Zikopoulos B, Barbas H. Mirror trends of plasticity and stability indicators in primate prefrontal cortex. *European Journal of Neuroscience.* 2017 Oct;46(8):2392-2405. PubMed PMID: [28921934](#); PubMed Central PMCID: [PMC5656436](#).
  - d) García-Cabezas MÁ, John YJ, Barbas H, Zikopoulos B. Distinction of Neurons, Glia and Endothelial Cells in the Cerebral Cortex: An Algorithm Based on Cytological Features. *Frontiers in Neuroanatomy.* 2016 Nov 1;10:107. PubMed PMID: [27847469](#); PubMed Central PMCID: [PMC5088408](#).

3) ***A core network that links prefrontal cortices, the thalamus and the amygdala to flexibly guide attention, through the interaction of cognitive and emotional processes:*** In another series of studies we provided, for the first time, direct evidence for a novel circuit linking prefrontal cortices, the amygdala and the inhibitory thalamic reticular nucleus that could direct attention, underlie brain activity shifts, and have a key role in flexible behavior. Based on the uniquely specialized connectivity patterns we observed in primates we formulated circuit models, suggesting that this network may form a core brain interface for cognitive-emotional interactions, ideally suited for on- and off-line processing of different types of information, for example external or internally-generated cues. I directly tested some of the predictions from my work in primates with another team of collaborators, who use rodents, because they offer an optimized genetic toolbox that allows precise optogenetic manipulation of distinct networks. Together, we showed a causal role of activity changes in the inhibitory thalamic reticular nucleus and related networks in attentional performance and provided the circuit basis for the functional segregation of external sensory and internal limbic processing across brain states, thus, improving our understanding of how we switch from perceiving the outside world to experiencing our inner thoughts. This body of work provided the foundation for my R01 project, funded by NIMH, to investigate thalamocortical circuits and their disruption in psychiatric disorders (R01 MH118500).

- a) Timbie C\*, García-Cabezas MÁ\*, Zikopoulos B\*, Barbas H. Organization of primate amygdala–thalamic pathways for emotions. *PLoS Biology* 2020 18(2): e3000639. <https://doi.org/10.1371/journal.pbio.3000639>.  
\*: **Co-First authors, equal contribution.**
- b) John YJ\*, Zikopoulos B\*, Bullock D, Barbas H. The Emotional Gatekeeper: A Computational Model of Attentional Selection and Suppression through the Pathway from the Amygdala to the Inhibitory Thalamic Reticular Nucleus. *PLoS Computational Biology*. 2016 Feb 1;12(2):e1004722. PubMed PMID: [26828203](https://pubmed.ncbi.nlm.nih.gov/26828203/); PubMed Central PMCID: [PMC4734702](https://pubmed.ncbi.nlm.nih.gov/pmc/articles/PMC4734702/). \*: **Co-First authors, equal contribution.**
- c) Halassa MM, Chen Z, Wimmer RD, Brunetti PM, Zhao S, Zikopoulos B, Wang F, Brown EN, Wilson MA. State-dependent architecture of thalamic reticular subnetworks. *Cell*. 2014 Aug 14;158(4):808-21. PubMed PMID: [25126786](https://pubmed.ncbi.nlm.nih.gov/25126786/); PubMed Central PMCID: [PMC4205482](https://pubmed.ncbi.nlm.nih.gov/pmc/articles/PMC4205482/).
- d) Zikopoulos B, Barbas H. Pathways for emotions and attention converge on the thalamic reticular nucleus in primates. *Journal of Neuroscience*. 2012 Apr 11;32(15):5338-50. PubMed PMID: [22496579](https://pubmed.ncbi.nlm.nih.gov/22496579/); PubMed Central PMCID: [PMC3342673](https://pubmed.ncbi.nlm.nih.gov/pmc/articles/PMC3342673/).
- e) Zikopoulos B, Barbas H. Prefrontal projections to the thalamic reticular nucleus form a unique circuit for attentional mechanisms. *Journal of Neuroscience*. 2006 Jul 12;26(28):7348-61. PubMed PMID: [16837581](https://pubmed.ncbi.nlm.nih.gov/16837581/).

**Publicity:**

PLoS Collections – Open highlights: Seven glimpses into the emotional brain

<https://collections.plos.org/open-highlights-emotional-brain>

Science News – Why emotions are attention-getters

[http://www.sciencenews.org/view/generic/id/339860/description/Why\\_emotions\\_are\\_attention-getters](http://www.sciencenews.org/view/generic/id/339860/description/Why_emotions_are_attention-getters))

The Washington Post – A switchboard in the brain could unlock treatments for autism and schizophrenia

<http://www.washingtonpost.com/news/speaking-of-science/wp/2014/08/14/a-switchboard-in-the-brain-could-unlock-treatments-for-autism-and-schizophrenia/>)

EurekAlert! a global news service by AAAS – Scientists use lasers to control mouse brain switchboard

[http://www.eurekalert.org/pub\\_releases/2014-08/nion-sul081114.php](http://www.eurekalert.org/pub_releases/2014-08/nion-sul081114.php))

MedicalXpress – Researchers identify a brain 'switchboard' important in attention and sleep  
(<http://medicalxpress.com/news/2014-08-brain-switchboard-important-attention.html>)

4) **Core and matrix thalamocortical networks for perception, multimodal integration and flexible behavior:** The pathways linking diverse prefrontal and limbic cortices with high-order association thalamic nuclei offer a great model to study specialized core and diffuse matrix thalamic systems in the primate brain. Our studies provided evidence for unique synaptic and molecular specificity in the organization of parallel core and matrix reciprocal thalamocortical loops in primates, systematically describing neurochemical features of thalamic projection neurons, the laminar specificity of their cortical terminations, and laminar interactions with distinct excitatory and local inhibitory interneurons in the cortex. We also described quantitatively the organization and laminar origin of reciprocal corticothalamic projections, from layers 5 and 6, and their synaptic specificity and interactions with functionally distinct receptor types in the thalamus. This body of work also provided the foundation for my R01 project, funded by NIMH, to investigate thalamocortical circuits and their disruption in psychiatric disorders (R01 MH118500).

- a) Barbas H, García-Cabezas MÁ, Zikopoulos B. Frontal-thalamic circuits associated with language. *Brain & Language*. 2013 Jul;126(1):49-61. PubMed PMID: [23211411](#); PubMed Central PMCID: [PMC3615046](#).
- b) Barbas H, Zikopoulos B, Timbie C. Sensory pathways and emotional context for action in primate prefrontal cortex. *Biological Psychiatry*. 2011 Jun 15;69(12):1133-9. PubMed PMID: [20889144](#).
- c) Xiao D, Zikopoulos B, Barbas H. Laminar and modular organization of prefrontal projections to multiple thalamic nuclei. *Neuroscience*. 2009 Jul 21;161(4):1067-81. PubMed PMID: [19376204](#); PubMed Central PMCID: [PMC2700123](#).
- d) Zikopoulos B, Barbas H. Parallel driving and modulatory pathways link the prefrontal cortex and thalamus. *PLoS One*. 2007 Sep 5;2(9):e848. PubMed PMID: [17786219](#); PubMed Central PMCID: [PMC1952177](#).

5) **Circuit mechanisms for inhibitory control in cognitive-emotional interactions:** Inhibitory control is essential for typical brain function and imbalance in excitation and inhibition underlies the symptomatology in various psychiatric and neurological diseases, including anxiety and mood disorders, schizophrenia, autism, and epilepsies. In a series of studies we investigated circuit mechanisms for inhibitory control in cortical and subcortical networks and described laminar and neurochemical specificity in pathway interactions between prefrontal and temporal cortices, amygdala and thalamus.

- a) John YJ, Zikopoulos B, Bullock D, Barbas H. Visual Attention Deficits in Schizophrenia Can Arise From Inhibitory Dysfunction in Thalamus or Cortex. *Computational Psychiatry*. 2018 Dec;2:223-257. PubMed PMID: [30627672](#); PubMed Central PMCID: [PMC6317791](#).
- b) Zikopoulos B, Hoistad M, John YJ, Barbas H. Posterior orbitofrontal and anterior cingulate cortices target inhibitory and excitatory systems with opposite functions in the amygdala. *Journal of Neuroscience*. 2017 Apr 14; 37(20): 5051-5064.
- c) Zikopoulos B, John YJ, García-Cabezas MÁ, Bunce JG, Barbas H. The intercalated nuclear complex of the primate amygdala. *Neuroscience*. 2016 Aug 25;330:267-90. PubMed PMID: [27256508](#); PubMed Central PMCID: [PMC4928580](#).
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**Publicity:**

Journal of Neuroscience Featured Article – Primate pOFC Projects Densely to Amygdala Intercalated Masses  
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1. Barbas H and **Zikopoulos B** (2007). Sequential and parallel circuits for emotional processing in primate orbitofrontal cortex. In: *The Orbitofrontal Cortex (edited by David Zald and Scott Rauch)*, pp57-92. New York: Oxford UP.  
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1. Liu X, Bautista J, Liu E, **Zikopoulos B\***. Imbalance of laminar-specific excitatory and inhibitory circuits of the orbitofrontal cortex in autism. *Research Square* 2020 (preprint under consideration at **Molecular Autism**): DOI: 10.21203/rs.3.rs-29733/v1.

**Publications: Peer-reviewed articles (36)**

(*Impact Factors for 2017 by Web of Science – Clarivate Analytics*) **Range: 31.398 – 1.266; Mean: 6.145**

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1. Wang Y, Taylor E, **Zikopoulos B**, Seta F, Huang N, Hamilton J, Katak KM, Morgan K. (2021). Aging-induced vascular damage of the mouse thalamus is associated with sensorimotor and memory defects. *Neurobiology of Aging*. 2021 Apr;100:39-47. doi: 10.1016/j.neurobiolaging.2020.11.017. PubMed PMID: 33477010.
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5. García-Cabezas MÁ, **Zikopoulos B\***. (2019) Evolution, development, and organization of the cortical connectome. *PLoS Biology*. May 10;17(5):e3000259. doi: 10.1371/journal.pbio.3000259. eCollection 2019 May.
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## **Publications: Abstracts presented in national and international meetings (49)**

1. Yazdanbakhsh A and Zikopoulos B. (2021). A model for disruption and heterogeneity of attentional processes in autism: Role of prefrontal cortical and thalamic networks. International Society for Autism Research (INSAR) Annual Meeting. May 5 – 8, 2021 Boston MA.

2. Yazdanbakhsh A and Zikopoulos B. (2021). Effects of distinct excitatory cortical and inhibitory reticular and local thalamic inputs on spindle dynamics. SfN Global Connectome. A virtual event. January 11-13, 2021.
3. Khemraj U, García-Cabezas MA, and **Zikopoulos B.** (2020). Systematic variation of epigenetic chromatin modifications in the human cortex. New England Science Symposium (NESS), April 5, 2020.
4. Yazdanbakhsh A, **Zikopoulos B.** (2019). Does layer 5 of the cortex project to the thalamic reticular nucleus? Implications for core and matrix thalamocortical circuits and sleep spindles. Society for Neuroscience, Chicago IL.
5. Wang Y, Taylor E, Kantak KM, **Zikopoulos B,** Seta F, Huang N, Hamilton J, Morgan K. (2019). Aging-induced vascular damage of the mouse thalamus is associated with both motor and memory defects. Society for Neuroscience, Chicago IL.
6. Liu X, Bautista J, Liu E, and **Zikopoulos B.** (2018). Balance of excitation and inhibition in orbitofrontal cortex and potential for disruption in autism. Society for Neuroscience, San Diego CA.
7. Trutzer I and **Zikopoulos B.** (2018). Atypical excitatory-inhibitory balance in prefrontal cortices during postnatal development in autism. Society for Neuroscience, San Diego CA.
8. Timbie C, Garcia-Cabezas MA, **Zikopoulos B,** and Barbas H. (2018). Relay of affective stimuli from amygdala to thalamus parallels sensory pathways. Society for Neuroscience, San Diego CA.
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10. García-Cabezas MÁ\*, Trutzer I\*, Salamone R, Barbas H, and **Zikopoulos B.** (2017). Common laminar distribution and density of synapses and axons in prefrontal cortices in humans and non-human primates. Society for Neuroscience, Washington DC. \* indicates equal contribution.
11. John YJ, **Zikopoulos B,** Bullock D and Barbas H (2017). Simulating thalamo-cortical dynamics underlying discontinuous tracking in schizophrenia. Society for Neuroscience, Washington DC.
12. Trutzer I and **Zikopoulos B** (2016). Atypical postnatal development of inhibition in cortical layer I in autism. Society for Developmental Biology 75<sup>th</sup> Annual Meeting Aug 4-8, 2016. Boston MA.
13. John YJ, **Zikopoulos B,** Bullock D and Barbas H (2016). The Emotional Gatekeeper: A computational model of amygdala-modulated attention. Network for the Science of Learning Awardees' Meeting Feb 8-10, 2016. Arlington, Virginia.
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## Invited Talks and Seminars

- Autism Research with the Postmortem Human Brain. **Expert Panelist**, Special Interest Group – International Society for Autism Research (INSAR): INSAR Annual International Meeting, May 3-7, 2021 Boston, MA, USA
- Structural and developmental basis for maldevelopment in disorders like autism. Special Topics In Neuroscience Seminar Series. Graduate Program in Neuroscience, School of Medicine, Universidad Autónoma de Madrid (Autonomous University of Madrid). September 3, 2020, Madrid, Spain.
- Pathology of orbitofrontal cortices in ASD. Datablitz Presentation Session and Discussion session: The future of post-mortem brain research in autism. Special Interest Group – International Society for Autism Research (INSAR) 2020 Virtual SIG (Webinar): Autism Research with the Postmortem Human Brain. July 23, 2020.
- Cortical network architecture: Development, Connectivity, and Clinical Relevance. NeuroFrontiers'2020 – Simulating Brain Circuits. June 15-17, 2020 (rescheduled for 2021 due to CoVid19 pandemic), SEU-Allen Joint Center, Nanjing, Jiangsu Province, 210096, China.
- Organization of the cortical connectome and disruptions in psychiatric disorders. Research on Tap: Innovations in Brain Research. Boston University Office of the Vice President and Associate Provost for Research. February 20, 2020, Boston MA.
- Postnatal development of prefrontal cortical network disruptions in autism. Centro de Tecnología Biomedica Universidad Politecnica de Madrid. June 4, 2019, Madrid, Spain.
- A framework for the study of the organization, connections, and pathology of the cortex. Department of Anatomy, Histology and Neuroscience, School of Medicine, Universidad Autónoma de Madrid (Autonomous University of Madrid). June 7, 2019, Madrid, Spain.
- Development of cortical network pathology in autism. Department of Anatomy and Neurobiology, Boston University School of Medicine. January 10, 2019, Boston MA.
- Development of network disruptions in autism. Research on Tap: Current Research on Autism at Boston University: From Cells to Society. Boston University Office of the Vice President and Associate Provost for Research. November 1, 2018, Boston MA.
- Development of excitatory and inhibitory cortical network disruption in autism. Sargent College Research Seminar Series, Boston University, October 3, 2018, Boston MA.
- Computational modeling of biologically realistic neural circuits. Department of Psychological & Brain Sciences, Boston University, Boston MA. May, 2018.
- From circuit models to computational models. Principles and Methods of Cognitive and Neural Modeling. Department of Psychological & Brain Sciences, Boston University, Boston MA. November 15, 2016.
- Development of focal changes in prefrontal axons that disrupt the network in autism. Center for Computational Neuroscience and Neural Technology, Department of Psychological & Brain Sciences, Boston University. February 25, 2016.

- Human systems neuroscience. Spring Cross Program Meeting, College of Health & Rehabilitation Sciences: Sargent College. February 10, 2016, Boston MA.
- Attention Spectrum Disorders: brain communication networks need our attention. Health Matters – A Virtual Conference. College of Health & Rehabilitation Sciences: Sargent College. September 17, 2015, Boston MA.
- From brain networks to neurons and their synaptic and molecular interactions in health and disease. Dean's Advisory Board meeting, College of Health & Rehabilitation Sciences: Sargent College. September 19, 2014, Boston MA.
- Circuits for attention to emotions through the thalamic reticular nucleus. Computational and Systems Neuroscience Meeting (COSYNE). *Workshop - Thalamic reticular microcircuits: from structure to function*. February 28 –March 5, 2013, Snowbird, Utah.
- A biological circuit model for attention to emotional stimuli in primates. 16<sup>th</sup> International Conference on Cognitive and Neural Systems. May 30-June 1, 2012, Boston MA.
- The neuropathology of autism. Graduate Seminar Series. April 18, 2011. Sargent College of Health and Rehabilitation Sciences, Boston University, MA, USA.
- Neuroanatomical Methods in Neuroscience. Graduate Seminar Series. April 14, 2011. Department of Anatomy and Neurobiology, Boston University School of Medicine, MA, USA.
- Corticothalamic Communications. Graduate Seminar Series. March 23, 2011. Sargent College of Health and Rehabilitation Sciences, Boston University, MA, USA.
- Imaging the brain. Methods in Neuroscience. Graduate Seminar Series (Models of visual perception). March 3, 2011. Department of Cognitive and Neural Systems, Boston University, MA.
- Changes in prefrontal axons may disrupt the network in autism. Research Seminar Series, Sargent College, Boston University. December 6, 2010, Boston MA.
- Prefrontal white matter structure in autism. Research Seminar Series, Department of Cognitive and Neural Systems, Boston University. November 2, 2010, Boston MA.
- Pathways for attentional processes through the prefrontal cortex and the thalamus. CELEST Workshop: Hardware and software of functional connections. Department of Cognitive and Neural Systems, Boston University. October 22, 2010, Boston MA.
- Prefrontal contributions to visual perception: Circuits for multisensory integration and attentional modulation through the prefrontal cortex and the thalamic reticular nucleus. Computational and Systems Neuroscience Meeting (COSYNE). February 26 –March 3, 2009, Snowbird, Utah.
- 3D-Reconstruction: From brain areas and pathways to neurons and synapses. Marine Biological Laboratory, Woods Hole. August 15 – 30, 2009, Woods Hole, MA.

## Professional Service, Memberships, & Other Experience

2021 – **Director of Communications**, Circle of Hellenic Academics in Boston

- 2020 – **Member**, External Feasibility Committee National Disease Research Interchange (NDRI)  
**Member**, Organization for Human Brain Mapping (OHBM)  
**Member**, Circle of Hellenic Academics in Boston  
**Member**, International Society for Autism Research (INSAR)  
**Member**, American Physiological Society  
**Member**, Special Interest Group – International Society for Autism Research (INSAR): Autism Research with the Postmortem Human Brain. *Participate in discussions that bring together neuroanatomists, neuropathologists, geneticists, immunologists and others to foster postmortem brain research of Autism Spectrum Disorder. Group activities are an introduction to this area of research for trainees and mature scientists alike.*  
**Book Review**, Prepublication review and commenting on book chapter entitled: The Alerting System. In Neurofeedback and ADHD by Dr. Sidiropoulos K. Springer Verlag 2021.
- 2019 – **PhD Program Director**, Human Physiology PhD Program Director, Department of Health Sciences, Boston University.
- 2019 – **Member**, Hellenic Bioscientific Association in the USA.
- 2019 – **Review Editor**, Editorial Board of Frontiers in Integrative Neuroscience.
- 2018 – 2019 **Search Committee**, Clinical-track Assistant Professor faculty position and Human Physiology Program Director, Department of Health Sciences, Boston University.
- 2018 – **Associate Editor**, Editorial Board of Frontiers in Neuroanatomy.
- 2018 – **Grant Review**, Medical Research Council (MRC), UK Research & Innovation (UKRI) and the Japan Society for the Promotion of Science (JSPS) Joint Call.
- 2018 – **Grant Review**, Department of Defense Congressionally Directed Medical Research Programs (CDMRP), Idea Development (ID) peer review panel of the FY18 Autism Research Program (ARP).
- 2018 – **Faculty Member/Reviewer**, Dudley Allen Sargent Research Fund
- 2017 – **Faculty Member**, Center for Research in Sensory Communication and Emerging Neural Technology (CReSCENT), Boston University
- 2017 **Chair**, Sargent College Graduate Education Committee
- 2016 – 2018 **Review Editor**, Editorial Board of Frontiers in Neuroanatomy.
- 2016 – **Member**, Circle of Hellenic Academics in Boston
- 2015 – **Faculty Member**, Sargent College Graduate Education Committee  
**Search Committee**, Tenure-track faculty position in cardiovascular science, Department of Health Sciences, Boston University.  
**Faculty member**, Graduate Program in Neuroscience, Boston University.
- 2014 **Session Chair**, NeuroHAM (Neural processing in humans, animals, and machines). CELEST and BU Center for Computational Neuroscience and Neural Technology. June 10 – 12, 2015. Boston, MA, USA.
- 2009 – 2016 **Faculty member**, Center of Excellence for Learning in Education, Science and Technology (CELEST), Boston University, MA, USA.  
**Visiting Scientist**, Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, MA, USA.

- 2005 – **Reviewer for journals:** Autism Research, Acta Neuropathologica, Brain Structure and Function, Cerebral Cortex, Cortex, European Journal of Neuroscience, Frontiers in Neuroanatomy, Frontiers in Neuroinformatics, Journal of Neuroscience, Journal of Neuroscience Methods, Neuroimage, PLoS Biology, Schizophrenia Bulletin, Translational Neuroscience, Human Brain Mapping.
- 2004 – **Member,** Society for Neuroscience.
- 2004 **Administrator and Designer:** Laboratory server network, software and website design, setup and administration. Windows, MacOS and Linux platforms. Programming: Turbo Pascal, Visual Basic, Python, C, HTML. Matlab.
- 2001 – 2003 **Senior Airman,** Special Security Forces – Military Police, Greek Air Force (Obligatory National Service).
- 1999 – 2000 **Consultant,** *University Press, Foundation for Research and Technology, Heraklion, Crete, GREECE.* Assisted in reviewing and editing the following Greek translations of scientific books:  
1. Robert M. Berne and Matthew N. Levy. Principles of Physiology, edited by Mosby-Year Book Inc., 1996.  
2. Eric R. Kandel, James H. Schwartz and Thomas M. Jessel. Essentials of Neural Science and Behavior, edited by Appleton & Lange, 1995.
- 1996 – 2004 **Member,** Hellenic Society for Neuroscience.  
**Member,** Federation of European Neuroscience Societies.
- 1992 – 2004 **President and board member, Photographic Society of the University of Crete (FOPK,** <http://fopk.culture.uoc.gr/>), organizing and conducting worldwide seminars on the art and techniques of photography, cultural events and photographic exhibitions.