Kathleen T Quach

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Summary

A **behavioral neuroscientist** with ten years of independent research experience, specializing in the application of ethological, neuroeconomic, and other behavioral frameworks to analyze decision-making processes of predator-prey interactions.

Education

University of California, San Diego (UCSD) *La Jolla, CA, USA*

PhD in Neurosciences, Specialization in Computational Neuroscience *2019*

- GPA: 3.734 / 4.000

University of California, Los Angeles (UCLA) *Los Angeles, CA, USA*

BS in Neuroscience *2010*

- GPA: 3.618 / 4.000

Research Experience

Salk Institute for Biological Studies (Molecular Neurobiology, PI: Sreekanth Chalasani) *La Jolla, CA, USA*

Postdoctoral Fellow *2019.09 - 2024.04*

- Led projects investigating the decision-making and molecular regulation of defensive behaviors by *Caenorhabditis elegans* nematodes in response to *Pristionchus pacificus* predators.
- Integrated concepts from predatory imminence theory and prey refuge theory to build a behavioral framework that can be used to predict, elicit, and interpret *Caenorhabditis elegans* defensive behaviors in response to changes in various dimensions of perceived predation risk.
- Conducted behavioral experiments on genetic mutants and transgenic strains to identify changes in interdependence between signaling partners across stages of defensive behaviors.

Salk Institute for Biological Studies (Molecular Neurobiology, PI: Sreekanth Chalasani) *La Jolla, CA, USA*

Graduate Student *2012.07 - 2019.09*

- Led projects investigating the decision-making and molecular regulation of foraging decisions by *Pristionchus pacificus* predatory nematodes in response to predator-prey competition with *Caenorhabditis elegans* prey nematodes.
- Integrated concepts from foraging theory, neuroeconomic theory, and intraguild predation theory to build a behavioral framework that can be used to predict, elicit, and distinguish between predatory and territorial motivations for attacking *Caenorhabditis elegans*.
- Conducted a screen of pharmacologically active compounds to identify signaling mechanisms underlying the switch between predatory and territorial motivation, using the behavioral framework to directly target decision-making processes rather than motor or sensory processes.
- Other projects: Co-led a project investigating whole-brain activity of *Caenorhabditis elegans* nematodes to understand how state-dependent network interactions gate sensory input at the motor and command neuron level. Supported a project investigating neural regulation of hypoxia responses in *Danio rerio* zebrafish.

UCLA (Psychiatry and Biobehavioral Sciences, PI: Mirella Dapretto) *Los Angeles, CA, USA*

Undergraduate Research Assistant *2009.02 - 2010.06*

- Conducted independent research investigating abnormal effective connectivity during emotional face processing in children with autism spectrum disorder.
- Applied dynamic causal modeling to fMRI time series data to estimate directionality and strength of coupling between brain regions during viewing of emotional faces.
- Developed methods for automating data entry of survey inputs from test subjects.

UCLA (Neurology, PI: Jack Van Horn) *Los Angeles, CA, USA*

Undergraduate Research Assistant *2010.01 - 2010.06*

- Designed graphical user interface elements for *Invizian* neuroinformatics software.

UCLA (Psychiatry and Biobehavioral Sciences, PI: Susan Bookheimer) *Los Angeles, CA, USA*

Undergraduate Research Assistant *2009.03 - 2010.06*

- Scored eye gaze behavior of 36-month old infants with autism spectrum disorder and their siblings during social interaction with caregivers and strangers.
- Drew regions of interests to quantify how much time is spent looking at facial, body, and background features.
- Developed code for automated parsing of Tobii software output.

Semel Institute, UCLA (Child and Adolescent Psychiatry, PI: Jeffrey Wood) *Los Angeles, CA, USA*

Undergraduate Research and Therapist Assistant *2007.06 - 2009.09*

- Assisted in cognitive behavioral therapy for treatment of anxiety in children with autism spectrum disorder.
- Performed data entry of therapy intake assessments and patient questionnaires for analysis in SPSS.

Industry Experience

Starbucks Coffee Company *Seattle, WA, USA*

Implementation Specialist *2011.12 - 2012.06*

- Analyzed data and implemented strategies for optimizing the function of retail networks and public Wi-Fi in over 10,000 Starbucks stores across North America.

Teaching and Mentoring Experience

Salk Summer Undergraduate Research Fellowship (SURF) *La Jolla, CA, USA*

Application Reviewer *2023.11 - 2023.12*

- Reviewed anonymized applications based on a rubric that assessed need and career goals.

Salk Summer Undergraduate Research Fellowship (SURF) *La Jolla, CA, USA*

Developer & Presenter *2023.06.12*

- Developed and presented a workshop (*Thinking like a Scientist*), introducing undergraduate interns to the values and philosophy guiding scientific research, and the principles of fostering a scientific personality resilient to failures and biases.

Salk Summer Undergraduate Research Fellowship (SURF) *La Jolla, CA, USA*

Mentor *2022.05 - 2022.08, 2023.05 - 2023.08*

- Intensively mentored undergraduates from under-resourced institutions to perform independent research in a 10-week program.

Monarch School *San Diego, CA, USA*

Tutor *2022.09 - 2022.11*

- Tutored chemistry to students impacted by homelessness to compensate for shortage of science teachers.

UCSD Biology Undergraduate and Master's Mentorship Program (BUUMP) *La Jolla, CA, USA*

Mentor *2020.09 - 2021.02*

- Mentored biology undergraduate students from underrepresented minorities.

UCSD Graduate Division (Course: Fundamentals of Statistics and Computation for Neuroscientists) *La Jolla, CA, USA*

Course Developer & Instructor *2016.03 - 2016.06*

- Developed and taught a graduate-level introductory course designed to provide literacy and entry-level competency in computational techniques.

UCSD Graduate Division (Course: Introduction to Methods in Computational Neuroscience, Instructor: Pam Reinegal) *La Jolla, CA, USA*

Teaching Assistant *2015.09 - 2015.12*

- Assisted in teaching a graduate-level course on mathematical foundations and applications of computational neuroscience methods.

Publications

Quach, K. T.*, Hughes, G. A., & Chalasani, S. H. (2024). Interdependence between SEB-3 and NLP-49 peptides shifts across predator-induced defensive behavioral modes in *Caenorhabditis elegans*. Submitted to *eLife*.

Quach, K. T., & Chalasani, S. H. (2022). Flexible reprogramming of *Pristionchus pacificus* motivation for attacking *Caenorhabditis elegans* in predator-prey competition. *Current Biology*, 32(8), 1675-1688.

Cecere, Z. T.*, **Quach, K. T.***, Yemini, E., How, J. J., Sharpee, T. O., & Chalasani, S. H. (2021). State-dependent network interactions differentially gate sensory input at the motor and command neuron level in *Caenorhabditis elegans*. *bioRxiv*, 2021-04. *co-first authors

Quach, K. T., & Chalasani, S. H. (2020). Intraguild predation between *Pristionchus pacificus* and *Caenorhabditis elegans*: a complex interaction with the potential for aggressive behaviour. *Journal of neurogenetics*, 34(3-4), 404-419.

Abstracts and .pdf versions are available at kathleenqua.ch/publications.

Awards

2022.12 - 2024.11	Maximillian E. and Marion O. Hoffman Foundation Award
2020.06 - 2022.06	Paul F. Glenn Center for Biology of Aging Research Fellow
2018.07 - 2019.07	Salk Women and Science Award
2018.03 - 2019.03	Mary K. Chapman Foundation Award
2018.10 - 2018.03	Jesse and Caryl Philips Foundation Award
2016.05.21	UCSD Neurosciences Graduate Teaching Award
2014.09 - 2017.08	National Science Foundation Graduate Research Fellow

Laboratory Skills

Model Organisms	*Caenorhabditis elegans* (nematode), *Pristionchus pacificus* (nematode), Danio rerio (zebrafish), human
Behavior	predator-prey interaction, foraging, chemotaxis, adaptation, exploration, egg-laying
Microscopy	brightfield/DIC/fluorescence, light/confocal, laser microsurgery, calcium imaging, expansion
Staining	immunocytochemistry, DiI/DiO (neuronal tracer), Oil Red O (fat)
Pharmacology	drug screens using LOPAC 1280, neurotransmitters and associated agonists/antagonists, paralytics
Bacteria	culturing/incubation, streaking/spreading/plating, colony counting, spectrophotometry, transformation, antibiotic selection
Microfluidics	device fabrication, device operation, automated control of laminar flows
Molecular biology	cloning, DNA/RNA purification, PCR, primer design, gel electrophoresis, DNA/RNAseq, DNA/RNA quantity/quality assessment

Computational Methods

Theories & Frameworks	foraging theory, expected utility theory, intraguild predation theory, predatory imminence theory, prey refuge theory, information theory
Statistics	tests for nominal variables, parametric/non-parametric tests for one/multiple measurement variable(s), ANCOVA, linear/nonlinear correlation, linear/logistic regression models, linear mixed-effects models, bootstrapping, data transformation, distributional analysis, power analysis, machine-learning
Image Processing	image segmentation, image deconvolution, morphological processing, fluorescence intensity quantification, color deconvolution
Neural Dynamics	time series analysis, dimensionality reduction, network analysis, network modeling

Software, Platforms, & Languages

Scientific Computing	MATLAB, R
Image Acquisition and Processing	ImageJ, Zen, Streampix, Metamorph
Bioinformatics	APE, Geneious, BLAST, Primer-BLAST, Galaxy, UCSC Genome Browser, IGV
OS	Windows, Linux (Ubuntu)
Adobe	Acrobat, Illustrator, Photoshop, InDesign
Microsoft Office	Word, Excel, OneNote
Google	Drive, Docs, Sheets, Slides, Forms
Collaboration	Zoom, Slack
Electronic Lab Notebook	Benchling
Inventory Management	Quartzy
Command Line	BASH, Powershell
Web	HTML, Markdown, CSS
Typesetting	LaTeX, Overleaf, TeXmaker
Version Control	Git, Github
Container	Docker
IDE	Visual Studio
Data Serialization Formats	JSON, YAML
Diagramming	PlantUML

References available upon request.