

# Kathleen T Quach

San Diego, CA

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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 both predator and prey in naturalistic predator-prey interactions in a laboratory setting.

## 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 disorders.
- 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 disorders 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 disorders.
- Performed data entry of therapy intake assessments and patient questionnaires for analysis in SPSS.

## Industry Experience

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### 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 Outreach Experience

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### 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.

### 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 in and exposure to 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.

### 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.

## Publications

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**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](https://kathleenqua.ch/publications).

## Awards

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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	Neurosciences Graduate Teaching Award
2014.09 - 2017.08	National Science Foundation Graduate Research Fellow

## Laboratory Skills

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

## Computational Methods

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<b>Theories &amp; Frameworks</b>	foraging theory, expected utility theory, intraguild predation, predatory imminence theory, prey refuge theory, information theory
<b>Statistics</b>	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
<b>Image Processing</b>	image segmentation, image deconvolution, morphological processing, fluorescence intensity quantification, color deconvolution
<b>Neural Dynamics</b>	time series analysis, dimensionality reduction, network analysis, network modeling

## Software, Platforms, & Languages

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

References available upon request.