

# JONATHAN LIU

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## RESEARCH INTERESTS

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Quantitative biology, gene regulation, synthetic biology, systems biology, stochastic processes

## EDUCATION

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**University of California, Berkeley**

*Aug 2016 - Present*

PhD in Physics (*expected graduation 2021-2022*)

**California Institute of Technology**

*Sept 2011 - June 2015*

BS in Applied Physics with Honors

## APPOINTMENTS

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**NDSEG Graduate Research Fellow** - UC Berkeley

*Aug 2017 - Present*

PhD Advisor: Hernan Garcia

- Investigated biophysical models of gene regulation through live imaging fluorescence microscopy of nascent RNA transcription in fly embryos, with 2 first-author publications in preparation
- Used modern image analysis tools such as machine learning segmentation to convert microscopy data into large time series (several TB, hundreds of cells over minutes with time resolutions of seconds)
- Applied statistical inference techniques (e.g. Markov Chain Monte Carlo) in MATLAB with statistical physics models of gene regulation to interpret time series datasets
- Used synthetic biology tools such as CRISPR to create fluorescent reporters for microscopy

**Graduate Student Instructor** - UC Berkeley

*Aug 2016 - Aug 2017*

**Fulbright Visiting Student** - Ludwig Maximilian University of Munich

*Sept 2015 - July 2016*

Research Advisor: Dieter Braun

- Studied biomolecule accumulation in heated microscale fluid systems as a plausible scenario for the origins of life, resulting in cover-featured publication in *Nature Chemistry*
- Designed a microfluidic chamber to produce accumulations of over 1000-fold, and recapitulated findings with theoretical fluid mechanics model and finite-element simulations in COMSOL

## HONORS AND AWARDS

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2017 DoD NDSEG Graduate Fellowship (1 of 195 fellows)

2015 U.S. Fulbright Student Fellowship (1 of ~100 fellows)

2015 Caltech B.S with Honors

2014 DAAD RISE Research Internship

2013 Caltech SURF Fellowship

2012 Caltech SURF Fellowship

## PUBLICATIONS

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1. **Jonathan Liu**, Donald Hansen, Elizabeth Eck, Yang Joon Kim, Meghan Turner, Simon Alamos, Hernan Garcia. “Quantitative characterization of the eukaryotic transcription cycle using live imaging and statistical inference.” Submitted.
2. Elizabeth Eck\*, **Jonathan Liu\***, Maryam Kazemzadeh-Atoufi, Sydney Ghoreishi, Shelby Blythe, Hernan Garcia. “Non-equilibrium regulation of chromatin accessibility and transcription in development.” In revision. (\*equal authorship)
3. Matthias Morasch, **Jonathan Liu**, *et al.* “Heated gas bubbles enrich, crystallize, dry, phosphorylate, and encapsulate prebiotic molecules.” *Nature Chemistry*, Jul 2019 (cover article).

## TALKS PRESENTED

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Feb 2020	Contributed	Winter q-bio Conference
Aug 2019	Contributed	DoD NDSEG Graduate Conference
May 2019	Invited	DoD STIx on the Hill: Science, Technology, and Innovation Exchange
Jan 2019	Contributed	Gordon Conference: Stochastic Physics in Biology
Dec 2018	Invited	DoD Science, Technology, and Innovation Exchange
Nov 2018	Contributed	UC Berkeley Physics Compass Lecture Series
Feb 2018	Contributed	Biophysical Society 62nd Annual Meeting
Aug 2017	Contributed	Canadian-American-Mexican Graduate Student Physics Conference
Mar 2016	Invited	German Fulbright Berlin Conference

## TEACHING AND MENTORING

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**Graduate Student Mentor** - UC Berkeley SURF Office *May 2019 - Aug 2019*

Organized professional development workshops, reviewed and helped develop student oral and poster presentations, and mentored undergraduate researchers in summer research program

**Teaching Assistant** - Caltech Physical Biology Boot Camp *Sept 2018*

Assisted with week-long physical biology course for incoming graduate students  
Designed and ran experimental module on live imaging of transcription in fruit flies

**Graduate Student Instructor** - Physics for Engineers and Scientists (7B) *Aug 2016 - May 2017*

Taught small sections for large undergraduate physics course  
Prepared section materials, supervised lab projects, held office hours, and graded exams

**Student Tutor** - Caltech Undergraduate Dean's Office *Sept 2012 - June 2015*

Tutored undergraduate students in STEM courses

### Students mentored:

Scout Weber (undergraduate, 2020)  
Donald Hansen (graduate, 2019)  
Liya Oster (graduate, 2018)  
Aaron Perez (undergraduate, 2018)

## OUTREACH AND SERVICE

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**Member** - Graduate Professional Development Advisory Committee *Sep 2019 - Dec 2019*

Discussed and planned initiatives for improving graduate student professional development as part of Academic Senate subcommittee

**Co-director, Team Member** - Beyond Academia *Aug 2019 - present*

Team member of student organization that hosts an annual two-day conference for 300+ current PhDs and postdocs, featuring over 100 speakers  
 Managed budget of over \$100,000 and coordinated fundraising across several campus departments and organizations  
 Contacted and planned speaker lists for panel and workshop events

**Member** - UC Berkeley Physics Faculty Search Committee *Jan 2019 - Mar 2019*

Part of graduate student subcommittee interviewing and reviewing applications for new faculty tenure-track position

**Organizer** - Grounds for Science *July 2018 - Present*

Organizer for local public science lecture series, run by and for graduate students

**Reader** - UC Berkeley SURF Office *Mar 2018*

Reviewed applications for summer undergraduate research fellowship program

**Organizer** - Physics Graduate Student Seminar *Jan 2017 - Aug 2018*

Started and helped run seminar series for graduate students in UC Berkeley Physics department

**Member** - Physics Graduate Admissions Committee *Jan 2018 - Mar 2018*

Helped plan and organize admitted graduate student visit program

**Member** - Caltech Academics and Research Committee *Sept 2013 - June 2015*

Member of undergraduate committee overseeing undergraduate curriculum and research issues  
 Chaired 2015 committee on updating Applied Physics department curriculum requirements

## WRITING

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1. "Using physics to search for meaning in the chaos of gene regulation." *QB3-Berkeley*.  
<https://qb3.berkeley.edu/using-physics-to-search-for-meaning-in-the-chaos-of-gene-regulation/>
2. "Machine Learning: Chapter 3 (Particle Physics)." *Berkeley Science Review (Fall 2018)*.  
<http://www.berkeleysciencereview.com/article/machine-learning-chapter-3/>
3. "Why (anti)hydrogen matters." *Berkeley Science Review (Spring 2017)*.  
<http://berkeleysciencereview.com/article/why-antihydrogen-matters/>

## MISCELLANEOUS

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Programming languages:	MATLAB, Python, Java, R, Mathematica, LabVIEW
Software:	Autodesk Inventor, Adobe Illustrator, COMSOL Multiphysics
Hardware:	Microfluidics, fluorescence microscopy, optics, electronic circuitry
Molecular biology:	PCR, cloning, transgene design, CRISPR/Cas9, synthetic biology
Analytical skills:	Statistical inference, modeling, numerical simulations, image analysis
Mathematical knowledge:	Calculus, linear algebra, differential equations, probability, statistics
Languages:	English (native), Mandarin (proficient), German (proficient)