PETE B. RIGAS

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https://gitlab.com/peterigas11 • Youtube channel: https://www.youtube.com/channel/UC2N0Ul8_e26a2_yOoa9UM0A

• Google Scholar: Pete Rigas

EDUCATION

CORNELL UNIVERSITY DEPARTMENT OF STATISTICAL SCIENCE, Ithaca, NY
Master of Professional Studies (MPS) in Applied Statistics (Option I), May 2020
GPA: 3.691

CORNELL UNIVERSITY, Ithaca, NY
B.S. in Mathematics, *summa cum laude*, May 2019
GPA: 3.541
Honors: Dean's List - Fall 2016, Fall 2017, Spring 2018, Spring 2019 [*13 graduate courses in Mathematics]*
Activities: Volunteer, Mathematics Club
Member, CNS Journal Club
Probability Seminar

Graduate Coursework: Real Analysis, Algebra I & II, Commutative Algebra, Probability Theory I & II, Homological Algebra, Complex Analysis, Differentiable Manifolds, Topics in Probability Theory (Statistical Mechanics, Percolation), Riemannian Geometry, Algebraic Number Theory, Genomics/Genetics, Topics in Probability Theory (Random Dispersive Equations), Databases & SAS HPC with DBMS, Statistical Computation with SAS, Probability Models & Inference

VIRTUALLY DELIVERED TALKS

- Modeling exponential decay in maximum capacitance from specified flight patterns in small aircraft
  - 5 minute elevator pitch & 20 minute presentations in *Paper Session 4: Electric and Autonomous Vehicles,* hosted on November 12, 2020, from article submission with Dr. Chetan Kulkarni, of NASA Ames at the Annual Conference of the Prognostics and Health Management (PHM) Society.
  - Conference preceding available at https://papers.phmsociety.org/index.php/phmconf/article/view/1199

- Binding energies of Fn Cas12a
  - Presentation planned for 2020 APS March Meeting canceled due to COVID-19.
  - Abstract available at https://meetings.aps.org/Meeting/MAR20/Session/S20.13

- Computation of exit times in potential landscapes for CRISPR binding
  - Presentation delivered at 2021 APS March Meeting.
  - Abstract available at https://ui.adsabs.harvard.edu/abs/2021APS..MARC12006R/abstract
  - Conference presentation available at https://www.youtube.com/watch?v=kApXaBAFPEA

- Renormalization of crossing probabilities in the dilute Potts model

  o Presented at regional Probability conference, 2021 FPD (Frontier Probability Days), on works in Mathematical Physics & Statistical Mechanics for the dilute Potts model on December 4, 2021.
  o Conference slides available at http://lechen.faculty.unlv.edu/FPD20/Slides/Rigas_Pete.pdf
  o Conference abstract available at http://lechen.faculty.unlv.edu/FPD20/abstracts.html
  o Conference presentation available at https://www.youtube.com/watch?v=sdfYV6ESEe8

- Binding selectivity of Cas nucleases

  o Presented at 2022 APS March Meeting on theoretical predictions of Cas binding activity from a first-passage time model.
  o Conference abstract available at https://ui.adsabs.harvard.edu/abs/2022APS..MARY05005R/abstract
  o Conference presentation available at https://www.youtube.com/watch?v=S0UQtk0J7sw

- Variational quantum algorithms for PDE measurement extraction

  o Presented at 2022 APS April Meeting on adaptations of a recent variational quantum algorithm for solving PDEs.
  o Conference abstract available at https://ui.adsabs.harvard.edu/abs/2022APS..APRS07003R/abstract
  o Conference presentation available at https://www.youtube.com/watch?v=bFSI6PIt6xI

- Variational quantum algorithms for numerical PDE solving

  o Presented at Dartmouth College Applied & Computational Mathematics Seminar, on September 20, 2022, on a longer version of the 2022 APS April Meeting presentation, with a focus towards standing wave & soliton solutions obtained from analysis of nonlinearities of the Camassa-Holm equation.
  o Seminar presentation available at https://www.youtube.com/watch?v=4uhOTIPJwrU

- Kesten's Incipient Infinite cluster for the three-dimensional metric-graph GFF, and for the Villain models

  o Talk available at https://www.youtube.com/watch?v=SA2-PVCqO50

- Lower bounds on the correlation length of the random-field Ising, and of the random-field Potts, models with the greedy lattice animal

  o Short talk available at https://www.youtube.com/watch?v=vb0PK7cVvDY

- Logarithmic delocalization of the height function for the six-vertex model under sloped boundary conditions

  o Talk available at https://www.youtube.com/watch?v=PQBB5ENUO-g

- Weakened crossing probability estimates for the Ashkin-Teller model from logarithmic delocalization
    - Talk available at https://www.youtube.com/watch?v=93KhYI8Fy_M

INDIVIDUALLY AUTHORED PREPRINTS ON THE ARXIV

1. **Rigas, P**. A computation of the covariance between two linear statistics for the Jellium model (*https://arxiv.org/abs/2212.01948*)
2. **Rigas, P**. Kesten's incipient infinite cluster for the three-dimensional, metric-graph Gaussian free field, from critical level-set percolation, and of the Villain model, from random cluster geometries and a Swendsen-Wang type algorithm (*in process of submitting to the arXiv, talk available for an overview of the project in the previous section on YouTube*).
3. **Rigas, P**. From logarithmic delocalization of the six-vertex height function under sloped boundary conditions to weakened crossing probability estimates for the Ashkin-Teller, generalized random-cluster, and q-cubic models *(https://arxiv.org/abs/2211.14934)*.
4. **Rigas, P**. Correlation length lower bound for the random-field Potts model with the greedy lattice animal (*https://arxiv.org/abs/2211.06795*).
5. **Rigas, P**. Variational quantum algorithm for measurement extraction from the Navier-Stokes, Einstein, Maxwell, Boussniesq-type, Lin-Tsien, Camassa-Holm, Drinfeld-Sokolov-Wilson, Hunter-Saxton, KdV-Burgers, non-homogeneous KdV, generalized KdV, KdV, translational KdV, super KdV, Benney-Luke, and Airy equations (*https://arxiv.org/abs/2209.07714*).
6. **Rigas, P**. Renormalization of crossing probabilities in the dilute Potts model (*https://arxiv.org/abs/2111.10979)*.

CONFERENCE PRECEEDINGS

7. **Rigas, P.**, Kulkarni, C. Modeling exponential decay in capacitance across specified flight patterns in small aircraft (*https://papers.phmsociety.org/index.php/phmconf/article/view/1199)*.

PROFESSIONAL EXPERIENCE

AIMdyn, Inc.
Engineer, September 2022– December 2022

- Construction of finite-dimensional representations,
- Time-evolution of observables, & of deterministic and stochastic dynamical systems, for establishing performance comparisons with ML models,
- Numerical approximation of Koopman modes for interpretation of dynamics,
- Debugging, automation, and deployment, of Python scripts for training Koopman models,
- Participation in classified, government-sponsored, research.

Provivi, Inc.
Computational Biologist/Data Scientist, July 2021-August 2022

- Manipulation of publicly available genomic data from the UCSC Genome Browser, Protein DataBank, & NCBI Genome browser,
- Implementation of machine-learning methods for gene prediction, assembly of Lepidioptera transcriptomes, any of which contain on the order of hundreds of thousands of genes, for an aggregate collection of millions of genes,
- Construction of high-degree graphs with Bandage assembly for interpretation of sequencing ambiguity, identifying homolog variants for sequences with associated enzymatic function,
- Identifying conserved motifs from protein, DNA or RNA sequences,
- Generating approximations of binding affinity with molecular docking simulations of ligand-receptor interactions, building single or double-bonded molecules in Avogrado, Chimera X, & PyMol,
- Comparison of binding affinities for different compounds from renderings of molecular orientations about the receptor active site,
- Publication of two internal reports spanning more than 50 pages of material,
- Debugging, automation, and deployment, of a few thousand lines of Python scripts for in-house database capability for constructing phylogenetic trees, and other graphical structures,
- Development of ETL pipelines for parsing, graphing, and visualizing, various forms of experimental data gathered for assessing performance of various metabolic pathways,
- Command line scripting of tBLASTn, tBLASTp, BLASTn, & BLASTp NCBI commands for searching through pools of thousands of genetic sequences, making use of files in FASTA/FASTQ & Newick tree formats, AWS & GCP cloud computing.

RESEARCH EXPERIENCE

Interests: Discrete Probability, Statistical Mechanics

Languages: Matlab, Python, R, SAS, SQL, Linux shell scripting

PHILIPPE SOSOE, DEPARTMENT OF MATHEMATICS, CORNELL UNIVERSITY, ITHACA, NY

Research Assistant *in Probability*, Sept. 2018 – June 2019

- Statistical Mechanics I: Studied different types of percolation, configurations of physical systems, Poisson point processes, generalizations of the Duminil-Copin & Tassion renormalization argument for the Loop O(n) model aka dilute Potts model
  - o Supervised reading on *Subcritical phase of d-dimensional Poisson-Boolean Percolation and its vacant set (2018)*, the *Existence of phase transition for percolation using the Gaussian Free Field (2018)*, and *Upper bound on the decay of correlations in a general class of O(n) symmetric models (2014)*.
  - o Established groundwork for an application of a renormalization argument, due to Duminil-Copin, Tassion, from the random cluster model to the Loop O(n) model, with primary steps pertaining to *(i)* modifications of the spatial Markov property, and comparison between boundary conditions in several arguments for horizontal and vertical crossings, for +/- measurable spin configurations, *(ii)* construction of symmetric domains dependent on crossings to one of six edges of a hexagonal box, *(iii)* manipulation of horizontal and vertical strip inequalities under the spin loop O(n) measure with free and wired boundary conditions, *(iv)* a classification of four possible behaviors of the loop O(n) model, including subcritical, supercritical, continuous & discontinuous critical.

GUILLAUME LAMBERT, Applied and engineering physics, Cornell University, Ithaca, NY

Research Assistant *in Probability/Data Analysis*, Sept. 2019 –

- Statistical Mechanics II: Studied binding energies of the FnCas12a protein, developing generalizations of a thermodynamic model to predict binding energies for wider families of Cas proteins (**Github Repository external link**: https://github.com/peter-beep/Lambert-Lab)
  - o Supervised reading on *Massively parallel CRISPRi arrays reveal concealed thermodynamic determinants of dCas12a binding (2018)*
  - o Generalized work from aforementioned paper to compute 'randomized' partition functions for a thermodynamic model of Fn Cas12a binding, under simulations of random changes of DNA bases within the Hamming distance, from contributions of an exponential random variable.
  - o Identified exact solutions for exit time computations for classes of potentials with *(i)* vanishing first derivative across all base pairs of the target sequence, *(ii)* constant first derivative amongst all base pairs, *(iii)* polynomial terms corresponding to subspaces of the standard n dimensional polynomial vector space, *(iv)* exponentially decaying dependence with respect to the location of a base pair along the target sequence, *(v)* logarithmic spatial dependence with respect to base pair location.
  - o Constructed rearrangements of bases surrounding binding sites of Fn Cas12a, leading to a formulation of an algorithm that sorts through binding energy data, by *(i)* ranking binding energies in increasing order, *(ii)* assigning Ising "spins" from DNA base pairs in gRNA and DNA sequences for base pairs from the guide and target sequences that are either in agreement or disagreement, *(iii)* determining whether there is agreement amongst the base pairs of the guide (gRNA) sequence and target DNA sequence through an assignment of +1 or -1 spin to in the Hamiltonian, (*iv)* computing, amongst thousands of DNA sequences in parallel, transition probabilities for random walks whose transitions at locations along the sequence, past an experimentally observed base pair mismatch at an earlier position, are multiplied by a decaying exponential to determine the difference in number of visits of the walk to the site of binding, in

correspondence with base pair mismatches.

o To analyze binding energies for families of CRISPR proteins, *(i)* formulated, from expressions of the transition probabilities for agreeing and disagreeing DNA base pairs, a random term, which serves as a modification to the partition function normalization, which is dependent on the proximity of a base pair mismatch to the binding site, *(ii)* computed, from differences in the number of visits of distinct random walks, the probability of having a 99% chance of binding at an arbitrary site of target DNA sequences, by making use of a suitable upper bound derived from a probability measure of binding configurations.

o Preliminarily, to ensure that continuously varying mismatch parameters introduced to exponential mismatch terms in the partition function exhibits a continuous phase transition, developed implementations to *(i)* plot changes in the Hamiltonian, based on a product representation of the measure taken disjointly over base pair matches & mismatches, *(ii)* numerically quantifying, and discriminating, between the effect of different base pair mismatches on the expected number of visits for different positions along the target DNA sequence, *(iii)* compute the change in binding energy, from experimentally recorded sequences, at some position of binding.

o Derived upper bounds by enforcing criterion that the transition probabilities of the random walk strictly decrease across base pairs that are mismatches, insofar as guaranteeing that Hamiltonians, across thousands of binding sequences, can be calculated (**Github Repository external link:**

https://github.com/peter-beep/Lambert-Lab/blob/master/Lambert_Lab_update%20(3).pdf**).**

o Produced plots of *(i)* admissible potential candidates, *(ii)* approximations for exit times which are dependent on the position of the target sequence along which the absorbing boundary is placed, *(iii)* visits of the random walk up to a binding site for Fn Cas12a binding.

PETER MCMAHON, Applied and engineering physics, Cornell University, Ithaca, NY
Research Assistant *in PDE, quantum variational algorithm, variational quantum computing*

January 2020 –

- PDE measurement readout with quantum computation: Formalized, and applied, quantum variational algorithm for solving non-linear problems in various PDEs, primarily focusing on the Navier-Stokes equations (**Github Repository external link**: https://github.com/peter-beep/McMahon-Lab)

o Supervised reading on Lubasch et al, *Variational quantum algorithms for nonlinear problems*

o Constructed quantum circuits in Cirq to study nonlinearities of the Navier-Stokes equations through measurement of quantum states from a superposition of expectation terms in the Navier-Stokes cost function.

o Computed the time evolution of variational states that are classically optimized from the cost function, typical of quantum classical feedback loops in variational quantum algorithms, to apply the Lubasch et al variational algorithm to Navier-Stokes.

o In quantum circuit construction, measurements from the Navier-Stokes equations were obtained through specification of the *(i)* action of ancilla qubits, each of which undergo Hadamard gates before entry into the quantum nonlinear processing unit (QNPU), *(ii)* superposition of nonlinear terms in the Navier-Stokes equations through manipulation of quantum states associated with the cost function, *(iii)* pressure distribution so as to compute pressure dependent expectations in the cost function, *(iv)* optimization routines for the minimization of the cost function, which coincides with finding the ground state, *(v)* representative circuit diagrams of the most significant qubits associated with quantum computation in the QNPU.

o Discussed future directions of investigation of the variational algorithm for Navier-Stokes through *(i)* implementing circuit simulations of cost function expectation terms, *(ii)* the formation of ground states for the Navier-Stokes equations under different assumptions on the pressure distribution, including that the pressure be uniformly constant over the entirety of the domain over which measurement readouts are produced, or spatially dependent pressure distributions subject to geometrical, or other, constraints, *(iii)* simulated time evolution of a Hamiltonian with algebraically decaying coupling constants, which could prove to be valuable for identifying ground states of the cost function dependent on various pressure distributions.

o Over the course of several Slack posts in the McMahon Lab variational PDE subgroup, *(i)* developed Python script for constructing couplings for a Hamiltonian to accompany optimization procedure for the cost function in the Lubasch et al variational algorithm, *(ii)* analyzed different cases of distribution mean & variance towards characterizing perturbations to the distribution of read out values produced from the variational algorithm for ancilla qubits, *(iii)* applications of the variational algorithm towards Navier-Stokes read out in three dimensions.

NASA Ames Research Center, MPS PROJECT, Cornell University, Ithaca, NY
Research Assistant to *Dr. Chetan Kulkarni*, in *battery fault detection*

January 2020 – November 2020

● Modeling Battery Health: Submitted results to PHM conference describing computational avenues of approximating maximum capacitance decay in small aircraft (**Github Repository external link:** https://github.com/peter-beep/NASA).

o Supervised reading on Hogge et al, *Verification of remaining flying time predictions system for small electric aircraft*

o Compiled Master's project report before presentation at PHM Conference, with discussion of exponentially decaying factors to model maximum capacitance degradation in small aircraft (**Github Repository external link:** https://github.com/peter-beep/NASA/blob/master/NASA_report%20(11).pdf)

o Generated predictions for maximum capacitance decay in aircraft from exponential quantities, in which *(i)* different trajectories of exponential decay in flight trajectories were simulated through appropriate choice of free beta parameters, *(ii)* MSE estimates were obtained through smoothly approximating flight plan data with an elementary polynomial root finding technique, *(iii)* performed numerical experiments on the magnitude of Fourier sine & cosine coefficients in approximations of flight plan data, *(iv)* formulated exponential decay in maximum capacitance in MPS project (**Github Repository external link:** https://github.com/peter-beep/NASA/blob/master/NASA_report%20(11).pdf), discussing applications of the method to chamber data in future experiments.

o Submitted and presented results in the PHM conference, with a 5 minute elevator pitch describing *(i)* the composition of exponentially decaying factors for maximum capacitance decay across sections of flight plan data partitioned in time by an auxiliary algorithm, *(ii)* exponentially decaying factors for maximum capacitance decay in the presence of parasitic loads whose rate of decay is either polynomial or exponential with respect to distance, in addition to a 20 minute presentation, very briefly providing *(iv)* examples of flight plans for which exponentially decaying values of the maximum capacitance were simulated, *(v)* comparisons of several approaches to most efficiently process chamber measurements from flight plan data, by carefully accounting for the disparity between rates of decay between the maximum capacitance, parasitic load, and remaining time duration in the flight plan.

o Implementing further changes from publicly available Matlab code on Github for data analysis in additional experiments.

SMITH LAB, Cornell University, Ithaca, NY

Research Assistant *in Behavioral Experiments and Matlab Analysis*, June 2018 – Dec. 2019

● Hippocampus & Retrosplenial Cortex: Explored the connection of the hippocampus with learning and memory (**Github Repository external link:** https://github.com/peter-beep/Smith-Lab)

o Conducted various behavioral experiments, including white cylinder acclimations and Morris Water Maze, in collaboration with DREDD infused rats

o Built micro-drives for surgical implantation in rodents, including glass and guide tubes, tetrodes, and molds

o Spike-sorted neural signals from recorded data in behavioral experiments.

o Developed implementations in Matlab to *(i)* view Dot plots, heatmaps, and place fields, *(ii)* calculate p-values, rate remapping indices, correlation values for left and right hemispheres in hippocampal recordings, and *(iii)* calculate the magnitude and direction of average velocities of rats in behavioral experiments

o Processed hippocampal ripple data by *(i)* identifying beginning and ending times of sharp wave ripples, *(ii)* quantifying the number of spikes 3 seconds before the onset of each sharp wave ripple, *(iii)* identifying the maximum times of unique cell firing, *(iv)* approximating the final time of each sharp wave ripple

o Dynamically modeled firing rates to study memory representations and formations in the hippocampus and retrosplenial cortex, by *(i)* computing different initial firing rates in the retrosplenial cortex, *(ii)* correlating initial rate of firing in the retrosplenial cortex to firing rates in the hippocampus, *(iii)* performing principal components analysis to determine whether representations in the hippocampus, on the neuronal ensemble level, are numerically correlated to firing rates in the retrosplenial cortex, *(iv)* computing durations of exposure in white box and black box environments, insofar as to construct ensemble firing rate vectors, in 250 ms time bins, *(vii)* constructing matrices of ensemble firing rate vectors, *(viv)* bootstrapping the principal component analysis.

o Arranged dotplots and heatmaps in Photoshop for analysis of firing rates of neurons o Interpreted neural data to determine how the hippocampal and retrosplenial cortex representations of memory influence different behaviors

o Analyzed firing patterns of neurons to study characteristics of hippocampal place fields. o

Performed T-maze acclimations, to ensure that rats achieve more than 80% accuracy, 32 out of 40, correct trials

GLENN HEALEY, UC IRVINE SAMUELI, IRVINE, CA
Research Assistant *in Probability*, June 2019 – Aug. 2019

- Statistical Mechanics III: Implemented Simulated Annealing (SA) algorithm for surface fitting.

  o Supervised reading on *Bayesian method for computing intrinsic pitch values (2018)*

  o Developed implementations in Matlab to *(i)* group velocities from 2014 MLB player data into groups based on numeric thresholds, *(ii)* compared relative energies of different pitches, from the initial and final velocities.

  o *(i)* Calculated different initial and final temperatures *T*, cooling factors, energy norms, *(ii)* generated smooth surfaces by cross correlating different groups of data points, *(iii)* empirically determined data of pitch values that minimized errors *E_i* , and *(iv)* plotted surfaces for intrinsic pitch values from the group of points that minimized *E_i*, in the normalized window of pitch values in the *x* and *z* directions, with speeds of 50 mph.

  o *(i)* Randomly generated 2-D array of samples, through a cross-validation scheme, by dividing pitch data into halves from which a smooth *F* was generated, based on day, *(ii)* determined the best input of parameters, corresponding to the smallest *E_i*.

KECK SCHOOL OF MEDICINE OF USC, LOS ANGELES, CA
Research Assistant *to Ophthalmologist Cheryl M. Craft*, June 2019 – Aug. 2019

- Clusterin: Studied whether injections of the clusterin protein impact the degeneration of eyesight in rats and mice, as a human model for studying ophthalmic disorders
  (**Github Repository external link:** https://github.com/peter-beep/Craft-Lab)

  o Injected eyes of anesthetized mice and rats, 15 days after birth, with clusterin to study Retinitis Pigmentosa.

  o Performed electroretinograms (ERGs) on anesthetized rats and mice.

  o Measured action potentials, from rods and cones, of photoreceptors in the eye.

  o Developed implementations in Matlab to *(i)* detect, and count, dots representing nuclei of cells on the eyes of rats and mice, *(ii)* 'sketch,' and calculate, the area of Voronoi domains corresponding to nuclei, *(iii)* distributionally represent the area of Voronoi domains, *(iv)*, calculate, and compare, values of Clusterin coefficients for individual Voronoi domains.

  o Analyzed ERG data to *(i)* calculate mean Voronoi domain area, *(ii)* calculate clustering coefficients, *(iii)* construct Voronoi tessellations through colorings of Voronoi domains on the lattice.

XU LAB, UC IRVINE, IRVINE, CA
Research Assistant *in Optogenetics & Data Analysis*, Oct. 2013 – Aug. 2017

- SADDG-EGP virus tracing: Made use of the retrograde SADDG-EGP virus, in addition to the CAV2-Cre adenovirus tracing to study connectivity between anterodorsal BNST (adBNST), and other areas of the brain (graphs, data analysis, presentation slides, fluorescent labeling images available at (**Github Repository external link:** https://www.dropbox.com/s/e2tsc0dx8jawx9d/Supporting_Materials.pdf?dl=0)

o Observed, and quantified, significant SADDG-EGP labeling.
o Determined that a SADDG-EGP retrograde virus, in comparison to the canine adenovirus, labeled less neurons in the paraventricular, medial and lateral hypothalamus, cortical and lateral amygdale, and amygdale-hippocampal areas.
o Quantified labeling from the canine adenovirus in peripheral subregions including the subiculum, entorhinal cortex, medial, basolateral and basomedial amygdala.
o Characterized inhibitory and exhibitory mechanisms of adBNST circuits, providing results that coincided with a previous 2009 work describing the role of glutamatergic inputs from the basolateral amygdala and central amygdala to adBNST in regulating and sustaining fear.

● Bed nucleus of the stria terminalis (BNST): Studied the mouse brain, including reprogramming neurons to remedy neural impairment

o Cut, mounted, and counted fluorescent labeling in neurons from the mouse brain. o Investigated the effect of a genetically modified virus from injections in ventral and lateral sub-regions of the medial and lateral bed nucleus of the stria terminalis (BNST).
o Quantified more than 20,000 fluorescent labels of bodies sharing neural pathways with the central and medial amygdala, visual cortices, and brain stem from either the medial or lateral BNST, suggestive of circuit differences between the medial and lateral BNST.
o Calculated the average number of fluorescent labels of neurons across different brain regions. o Organized data to compare differences in average fluorescent labeling across different brain regions in mice injected in the medial and lateral BNST.

● Paraventricular nuclei (PVN): Investigated the effects of a Cre-dependent monosynaptic rabies tracing system on the PVN

o Determined that CRH neurons receive synaptic connections from more than 140 brain regions. o Enumerated regions that received significant input, which include the dorsomedial, ventromedial and lateral hypothalamus, lateral and medial preoptic nuclei, and arcuate nuclei. o Studied direction of global information flow directly impinged on CRH+ PVN neurons. o Identified excitatory and inhibitory neurons through antibody immunostaining.

BARTELS LAB, UC Riverside, riverside, CA
Research Assistant *in Materials Science,* Oct. 2013 – May 2014

● Monolayer MOS2, WSe2 Growth: Conducted experiments to grow MOS2 film on wafer substrates.

o Performed Raman Spectroscopy to analyze layered structure of transition metal dichalcogenides.
o Conducted MOS2 and metal dichalcogenide growth experiments in vacuum, in order to gain insight on the structure of these compounds, in addition to the binding energies of reactants. o Analyze morphologies of MOS2 film to determine whether monolayer MOS2 film exists on experimentally 'grown,' molecular film substrates.
o Computationally modeled systems with periodic boundary conditions.