

# Salwan Butrus

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<https://salwanbutrus.github.io/>

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## EDUCATION

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**University of California, Berkeley, CA**

**August 2019-Present**

Ph.D. Chemical and Biomolecular Engineering

GPA: 3.96/4.00

Designated Emphasis in Computational and Genomic Biology

**University of Michigan, Ann Arbor, MI**

**September 2015-April 2019**

B.S.E. Chemical Engineering, *Summa Cum Laude*

GPA: 3.87/4.00

## AWARDS AND HONORS

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### Individual

- Society for Neuroscience 2021 Trainee Professional Development Award
- Best Talk Award at the 2021 Computational Biology Retreat. UC Berkeley (2021)
- NSF Graduate Research Fellowship (2019)
- 1<sup>st</sup> place, ChE UG Research Poster Competition. Ann Arbor, MI (2019)
- Sinnott Prize, Outstanding ChE Senior for academics and leadership. Ann Arbor, MI (2019)
- 1<sup>st</sup> place, Oral Presentation in Biomaterials. GCURS. Houston, TX (2018)
- 2<sup>nd</sup> place, AIChE Undergraduate Poster Competition. Pittsburgh, PA (2018)
- Facilitator of the Year, Organic Chemistry II, Science Learning Center. Ann Arbor, MI (2018) ([Student testimonials](#))
- 2<sup>nd</sup> Place, EBICS Conference Poster Competition. Atlanta, GA (2017)
- 1<sup>st</sup> place, UROP Summer Symposium Poster Competition. Ann Arbor, MI (2016)

### Team

- 1<sup>st</sup> Place Award, The Landes Contest in Technical Communication, Best ChE 488/489 Final Report, Poster, and Presentation. Ann Arbor, MI (2019)
- 1<sup>st</sup> Place Award, Best All-Around ChE 342 Project. Ann Arbor, MI (2018)
- 1<sup>st</sup> Place Award, Best All-Around ChE 230 Project. Ann Arbor, MI (2016)

## RESEARCH EXPERIENCE

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**University of California, Berkeley | Shekhar Lab**

**October 2019-Present**

*Graduate Student Researcher*

- Developing machine learning models and leveraging single-cell transcriptomics data to explore the molecular underpinnings of cellular diversity in the visual cortex
  - Undergraduate mentees: Srikant Sagireddy, Jason Hou, Xiaoqi Sun

**University of California, Berkeley | Landry Lab**

**May-August 2018**

*Amgen Scholar*

- Conceived and executed a project to systematically probe the influence of gold nanoparticle physicochemical properties on bio-cargo loading efficiency
- Developed two separate nanoplatforms for the delivery of siRNA and pDNA to intact leaves

**Massachusetts Institute of Technology | Hammond Lab**

**June-August 2017**

*EBICS REU Intern*

- Synthesized and characterized a library of polymers to identify candidates with maximum uptake to cytotoxicity ratios in cartilage for applications in osteoarthritis drug delivery
- Elucidated relationships between the physicochemical properties of polymers and their transport properties and toxicity in cartilage.

- Harnessed nanoindentation to probe the interfacial properties that govern how synthetic polymer brushes support human embryonic stem cells (hESCs)
- Through a statistical DOE, developed a relationship between bulk and nanomechanical properties that explained the behavior of hESCs on polymer brush surfaces

## PUBLICATIONS (\*equal contribution)

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- 1) **Butrus, S.**, Hou, J., Sagireddy, S., Shekhar, K. A decision tree-based graph on single-cell sequencing data. *Under preparation.*
- 2) \*Whitney, I., \***Butrus, S.**, Sanes, J.R., Shekhar, K. Vision-dependent and -independent molecular maturation of mouse retinal ganglion cells. *Under review at European Journal of Neuroscience.*
- 3) Shekhar, K., Whitney, I., **Butrus, S.**, Peng, Y., Sanes, J.R. Diversification of multipotential postmitotic mouse retinal ganglion cell precursors into discrete types. *eLife* (2022) 11; e73809.
- 4) \*Cheng, S., \***Butrus, S.**, \*Tan, L., Sagireddy, S., Trachtenberg, J.T., Shekhar, K., Zipursky, L. Vision-dependent specification of cell types and function in the developing cortex. *Cell* (2022) 185, 2: pp. 311-327.
  - Highlighted in [Nature](#) by Puiggros and Jabaudon (2022).
  - Highlighted in *UC Berkeley, College of Chemistry Press Release* (2022).
  - Highlighted in [EurekAlert](#) (2022).
- 5) Zhang, H.\* Goh, N.S.\*, Wang, J., Demirer, G.S., **Butrus, S.**, Park, S-J, Landry, M.P. Nanoparticle Cellular Internalization is Not Required for RNA Delivery to Mature Plant Leaves. *Nature Nanotechnology* (2021)
- 6) **Butrus, S.**, Sagireddy, S., Shekhar, K. Defining selective neuronal resilience and identifying targets of neuroprotection and axon regeneration using single-cell RNA sequencing – computational approaches. *Methods in Molecular Biology* (2022). *In press.*
- 7) Kölsch, Y., Hahn, J., Sappington, A., Stemmer, M., Fernandes, A.M., Helmbrecht, T.O., Lele, S., **Butrus, S.**, Laurell, E., Arnold, I., Shekhar, K., Sanes, J.R., Baier, H. Molecular classification of zebrafish retinal ganglion cells links genes to cell types to behavior. *Neuron* (2020) 109, 4: pp. 645-662.
- 8) **Butrus, S.**, Greenman, K., Kopyeva, I., Khera, Eshita., Nishii, A. An Undergraduate-Led, Research-Based Course that Complements a Traditional Chemical Engineering Curriculum. *Chemical Engineering Education* (2020) 54, 2; pp. 97-106.
- 9) Wang, J.W., Grandio, E.G., Newkirk, G.M., Demirer, G.S., **Butrus, S.**, Giraldo, J.P., Landry, M.P. Nanoparticle-mediated genetic engineering of plants. *Molecular Plant* (2019) 12; pp. 1037-1040.

## SELECTED PRESENTATIONS

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- 1) **Butrus, S.**, Shekhar, K. *Vision mediates molecular patterning in the developing visual cortex.* UC Berkeley Center for Computational Biology Retreat (2021).
- 2) **Butrus, S.**, Shekhar, K. *Single-Cell Transcriptional Dynamics of Retinal Ganglion Cell Diversification.* 2020 AIChE Meeting.
- 3) **Butrus, S.**, Demirer, G., Goh, N., Zhang, H., Cunningham, F., Landry, M. *Development and Characterization of Gold Nanoparticles for Plant Genetic Engineering*
  - **Oral:** UC Berkeley Amgen Scholars Program Symposium, Berkeley, CA (2018); ABRCMS Annual Meeting, Indianapolis, IN (2018); GCURS Rice University, Houston, TX (2018)
  - **Poster:** UC Berkeley Amgen Scholars Program Symposium, Berkeley, CA (2018); BMES Annual Meeting, Atlanta, GA (2018); AIChE Annual Meeting, Pittsburgh, PA (2018)
- 4) **Butrus, S.**, Geiger, B., Grodzinsky, A.J., Hammond, P.T., *Tuning Size and Charge of a Multivalent Polymer Library for Enhanced Drug Delivery to Cartilage*
  - **Oral:** AIChE Annual Conference, Minneapolis, MN (2017)

- **Poster:** MIT Summer Research Programs Annual Poster Session, Cambridge, MA (2017); EBICS Annual Conference, Atlanta, GA (2017); BMES Annual Conference, Phoenix, AZ (2017); NanoDDS Annual Meeting, Ann Arbor, MI (2017)

## TEACHING EXPERIENCE

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**Berkeley Bioinformatics Bootcamp** | *Lecturer and TA* **January 2022-Present**

- Lead Python programming sessions on introductory bioinformatics concepts

**InspiritAI** | *AI Scholars Instructor* **December 2021-Present**

- Immerse high school students in Artificial Intelligence through lectures, assignments, and projects

**UC Berkeley Chemical and Biomolecular Engineering Department** | *Graduate Student Instructor*

*ChemEng 142: Chemical Kinetics and Reaction Engineering*

**August 2019-December 2019**

*ChemEng 150A: Transport Processes* (4.7/5 rating, 93 students, [testimonials](#))

**January 2021-May 2021**

- Prepared and taught weekly discussion sessions to support student understanding of course material
- Developed homework solutions, held weekly office hours, and proctored and graded exams

**University of Michigan Chemical Engineering Department** | *Teaching Assistant*

*ChE 496: Introduction to Experimental and Computational Research in ChE*

**March 2018-May 2019**

- Assembled a group of 10 undergraduate and graduate peers in collaboration with faculty members and researchers to design a research-focused course in our ChemE department
  - Guided efforts in organizing meetings, developing content, and securing resources and instructors; Secured a \$15,000 departmental grant to support course launch
- Led the conceptualization and ultimate realization of course objectives and structure
- Led the design and organization of laboratory and lecture assignments
- Developed and tested laboratory modules, held weekly office hours, and graded assignments

*ChE 344: Reactor Design and Engineering*

**September 2018-May 2019**

- Prepared and taught weekly review sessions to improve student understanding of course material
- Developed homework solutions, held weekly office hours, and proctored and graded exams

**University of Michigan Science Learning Center**

**January 2017-May 2019**

*Organic Chemistry II Course Leader*

*Organic Chemistry II Study Group Facilitator* (4.9/5 rating, 86 students, [testimonials](#))

- Held weekly sessions supplementing lecture by reinforcing and reviewing course concepts
- Led collaborative course meetings to provide resources, support, and mentorship for study group facilitators
- Developed and presented topic workshops and designed study materials for facilitators' use

## SERVICE EXPERIENCE

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**Be A Scientist! and GOLD Science Fair** | *Mentor*

**January 2021-Present**

- Support and mentor middle school and high school students on the design, execution, and communication of science projects

**Undergraduate Research Symposium Committee** | *Founder*

**November 2018-May 2019**

- Assembled a team of 8 undergraduate peers to organize the first campus-wide undergraduate research symposium at the University of Michigan
- Fundraised over \$12,000 from 16 entities on campus to support an event of 150 presenters and 100 judges

**Camp Kesem** | *Camp Counselor and Unit Leader*

**July 2016-August 2019**

- Fundraised \$500 annually to send children whose families are affected by cancer to a free, one-week summer camp; maintained the health and well-being of several children and counselors throughout a week of camp activities

**ChemE Undergraduate Program Committee | Member**

**October 2017-May 2019**

- Discussed and voted on improvements to the ChemE program and funding requests for students and organizations

**University of Michigan Student Life Housing**

**August 2017-May 2018**

*Residential Advisor, First Generation Student Theme Community*

- Designed weekly social and educational activities to foster an inclusive and cohesive community of residents; advised residents on academic, personal, and professional matters

## **SKILLS**

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**Laboratory:** tissue dissociation | bioconjugation | ellipsometry | tissue culture | nanoindentation | chemical vapor deposition | ATRP | nanomaterial synthesis and characterization | electrophoresis

**Software:** Python | R | COMOSL | C++ | MATLAB | ASPEN Plus

**Languages:** English (fluent) | Arabic (fluent) | Chaldean (fluent) | Spanish (beginner)

**Hobbies:** Piano, Soccer, Ultimate Frisbee, Basketball, Running, Hiking, Camping