Salwan Butrus

salwan@berkeley.edu · (248) 778-8740

EDUCATION

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

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)
- 1st place, ChE UG Research Poster Competition. Ann Arbor, MI (2019)
- Sinnott Prize, Outstanding ChE Senior for academics and leadership. Ann Arbor, MI (2019)
- 1st place, Oral Presentation in Biomaterials. GCURS. Houston, TX (2018)
- 2nd place, AIChE Undergraduate Poster Competition. Pittsburgh, PA (2018)
- Facilitator of the Year, Organic Chemistry II, Science Learning Center. Ann Arbor, MI (2018) (Student testimonials)
- 2nd Place, EBICS Conference Poster Competition. Atlanta, GA (2017)
- 1st place, UROP Summer Symposium Poster Competition. Ann Arbor, MI (2016)

Team

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

RESEARCH EXPERIENCE

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.

University of Michigan Biointerfaces Institute | Lahann Lab **September 2016-Ocrober 2018**
Undergraduate Researcher

- 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)

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

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

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

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

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