



Alexander Powers

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Education

University of California Berkeley

2013 - May 2017 (expected) GPA: 3.94/4.0

B.S. Chemical Biology with minor in Computer Science

Major course work: Organic Chemistry (A), Inorganic Chemistry in Biology (A), Quantum Mechanics (A-), Statistical Thermodynamics (A), Biochemistry (A), Chemical Biology (A), Properties of Materials (A), Physics (A+), Physical Chemistry Lab (A), Cancer Biology (A), Molecular Biology Lab (A), Immunology (current)

Minor course work: Data Structures (A+), Computational Chemistry (A), Discrete Mathematics and Probability (A), Machine Learning (A), Algorithms for Computational Biology (A-), Quantum Computing (current), Machine Architecture (current)

Research

Nanoparticle Probes for Imaging Dynamic Proteins

June 2015 – Present

- Undergraduate Researcher at Berkeley National Laboratory Molecular Foundry
- Synthesized custom nanocrystals for visualizing each step of single motors proteins in live cells, which were 3x brighter than commercial versions. Designed a custom polymer coating to improve solubility, and covalently conjugated particles to an engineered chimeric protein in vivo.
- Current project is encapsulating nanoparticles inside biomimetic peptoids for controlled surface chemistry and geometry.

Visualizing Nanoscale Forces with Liquid Electron Microscopy

May 2014 - Present

- Undergraduate Researcher at UC Berkeley Alivisatos Lab and Zheng Lab
- Used liquid cell TEM to directly observe magnetic nanoparticles assembling into chains and ordered 2D arrays. Developed an algorithm to track nanoparticle trajectories and velocity to calculate nanoscale magnetic properties.
- Synthesized nanocrystals of CdSeCdS and PbTeCdTe optimized for use in light concentrators for next gen. solar devices.

DNA Nanotechnology for Drug Delivery

Sept. 2012 - May 2013

- Designed and modeled an immunotargeted DNA nanostructure using locked drug-carrying DNA "origami" boxes and antibody-based keys to target therapeutics. (Exploravision National competition 1st place team winner)

Publications

1. Bronstein N.D., Yao Y., Xu L., O'Brien E., **Powers A.S.**, Alivisatos A.P. and Nuzzo R.G. Quantum Dot Luminescent Concentrator Cavity Exhibiting 30-fold Concentration. *ACS Photonics*, 2015. DOI: 10.1021/acsphotonics.5b00334
2. Raja S.N., Zherebetsky D., Wu S., Ercius P., **Powers A.**, Olson A.C., Du D.X., Lin L., Govindjee S., Wang L.W. and Xu T. Mechanisms of local stress sensing in multifunctional polymer films using fluorescent tetrapod nanocrystals. *Nano letters*, 2016, DOI: 10.1021/acs.nanolett.6b01907
3. Ye X., Jones M. R., Frechette L. B., Chen Q., **Powers A. S.**, Ercius P., Dunn G., Nguyen S. C., Adiga V. P., Zettl A., Rabani E., Geissler P. L., Alivisatos A. P. Direct Mapping of the Evolution of Individual Nanocrystals Undergoing Highly Non-Equilibrium Chemical Transformations. *Science*, 2016. DOI: 10.1126/science.aah4434
4. **Powers A. S.**, Liao H.G., Raja S.N., Bronstein N.D., Alivisatos A. P., Zheng H. Tracking Nanoparticle Diffusion and Interaction during Self-Assembly in a Liquid Cell. *Nano letters*, 2016. DOI: 10.1021/acs.nanolett.6b02972
5. Koc M.A., Raja S.N., Hanson L.A., Nguyen S.C., Borys N.J., Takano K., **Powers A.S.**, Wu S., Swabeck J., Olshansky J.H., Lin L., Ritchie R.O., Alivisatos A.P. Characterizing the Inner Filter Effect in Quantum Dot-Polymer Composites for Use as a Displacement Sensor. *ACS Nano*, 2016. DOI: 10.1021/acsnano.6b08277
6. Wichner S., **Powers A.S.**, Segal M.A., Mir M., Mann V., DeWitt M., Cohen B., Yildiz A., Improved covalent protein labeling and single-molecule optical properties of compact CdSe/CdS quantum dots. *Submitted*.
7. Mann V., **Powers A.S.**, Tilley D., Cohen B., Sack, J. Suppression of Copper Quenching for Click Conjugation of Tarantula Toxins to Quantum Dots. *Submitted*.

Awards

Saegebarth Prize in Chemistry, 2017 (commencement award for excellence in undergraduate research)

Hertz Finalist, 2017

Big Ideas 1st place winner, 2017 (\$10,000 grant)

Dean's List 2014, 2015, 2016

Intel International Science and Engineering Fair, 4th place chemistry, 2011

Experience

Cofounder and Director of ULAB: Undergrad Lab @ Berkeley

Sept. 2015 - Present

- I cofounded the first undergrad run research laboratory in the country – we help freshman/sophomore get started in research by pairing them up with mentors to work on Berkeley community based research projects in data science, environmental sustainability, robotics, and epidemiology. <https://undergradlab.wordpress.com>
- Secured \$20,000 in funding to run the program over the next 2 years
- 1st place winner of Big Ideas Competition at Berkeley

Berkeley Scientific Journal (Editor in Chief 2016)

Sept. 2013 - Present

- Served as a writer, department head, and editor in chief for Berkeley's undergraduate science publication, as well as a contributing writer and editor for ICSJ, an international undergraduate science journal. <https://bsj.berkeley.edu>

Internship Agilent Technologies

June 2011 – September 2011

- Helped with a method for purifying and analyzing global phosphorylated proteins from complex protein mixtures with TiO₂ beads and HPLC-MS.

Skills

Programming: (Matlab, Python, Java) strengths are image analysis, Monte-Carlo simulations, data visualization, and machine learning methods

Laboratory: HPLC, TEM, UV-Vis, NMR, Mass-Spec, DLS, Single molecule fluorescence microscopy, glove-boxes, air-free synthesis and chemicals, fluorescence lifetimes, custom laser optics