David Lu
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Education:

Brown University, Class of 2020 (3.87 GPA) – chemistry/ chemical engineering/ computer science

Relevant Courses: Organic Chemistry I and II; Nanoscale Materials: Synthesis and Applications; Cell and Molecular Biology; Equilibrium, Rate, and Structures (Chemistry); Materials Science; Dynamics and Vibrations; Honors Intro to Engineering (Statics and Engineering Computing); Object-Oriented Programing and Computer Science; Algorithms and Data Structures; Computer Systems; Data Science

Research Experience:

1. Brown University Chemistry Department, Sun Lab, Student Researcher (8/2017-present)
   - Synthesize monodisperse FePd nanoparticles for dehalogenation catalysis and AgPd nanoparticles for formic acid dehydrogenation catalysis
   - Functionalize nanoparticles with ligands like oleyalmine and oleic acid for unique catalytic properties
   - Run organic reactions testing catalysis of nanoparticles
   - Particle/crystal structural analysis using TEM, X-Ray Diffraction, and ICP spectroscopy
2. Brown University Chemistry Department, Sello Lab, Student Researcher (6/2017-present)
   - Disrupted peroxidase and cyclic AMP gene in *Streptomyces* (*Mycobacterium tuberculosis* model) bacteria by PCR Targeting
   - Bacterial transformation *via* electroporation, heat shock, and conjugation of *Streptomyces*
   - Grow, clone, and maintain bacterial cultures and stocks
   - Design primers for gene knockouts and knockout detection PCR
   - Extract, purify, and analyze genomic, plasmid and cosmid DNA
   - Analyze wild type and mutant *Streptomyces* cosmid and strains via restriction digest and detection PCR
   - *In vitro* well microplate antimicrobial drug susceptibility tests via resazurin microtiter assay
   - *In vitro* test of peroxidase null *Streptomyces* under simulated hydrogen peroxide and cumene hydroperoxide stress
   - Extract, purify, and analyze proteins through SDS-PAGE
   - Conducted electron microscopy for phenotypic characterization of peroxidase null mutant vs *Streptomyces* wildtype
3. Lawrence Berkeley National Laboratory, Research Intern (6/2014 - 6/2016, 5/2017 - 6/2017)
   - Semifinalist for the Siemens Competition in Math, Science, & Technology, the nation's premier high school science research competition
   - Conducted nano-imaging research using Transmission Electron Microscope (TEM)
   - Developed micro-chamber for first ever visualization of various phenomena like phase changes, Brownian motion, and liquid gas interface behavior of low melting point samples under TEM
   - Processed recorded data with EMAN by tracking and analyzing particle and phase properties through calculation of mean square displacement, particle speed, acceleration, and forces causing movement
   - Co-authored research paper, under review by *Nature*
   - Reconstructed 2D Cryo-EM TEM images of HDL, LDL, and CETP into 3D models
4. Beijing FCTL Chemical Co., Research Intern (6/2012 - 8/2012, 7/2016 - 8/2016, 8/2017)
   - Catalyst preparation using impregnation and precipitation methods
   - molecular sieve design and preparation of ZSM-5 zeolites
   - Studied surface area and pore structure of catalysts using BET Surface Area and Micropore Analyzer
   - Conducted sample analysis using gas chromatography
   - Operated reflux ratio on batch distillation column and continuous distillation column
5. Hebei HuaXu Chemical Co. (Chemical/Pharmaceutical company), Research Assistant (6/2016 - 7/2016)
   - Conducted research to optimize D-phenylglycine production process (increased quality, yield, production capacity. Decreased production cost by 15% and reduced water waste per ton of product from 47 tons to 27 tons)

- Performed phenylhydantoin synthesis, hydrolysis reaction, and enantiomer separation using 1R-camphorsulfonic acid to produce enantiopure D-phenylglycine
- Product analysis using TLC, HPLC (normal and chiral), and NMR
- Assisted development of industrial scale process based on the lab scale procedure

Leadership and Engagement:

1. Cloud Agronomics, Cofounder and Head of Research and Development (1/2017 - present)
   - Design and built solar-powered UAVs from the bottom up with proprietary imaging technology to cheaply manage sustained aerial data acquisition in fields of agriculture, communication, and emergency services.
   - Aiming to break 81-hour flight endurance world record for UAV under 50 lb.
   - Selected to represent Brown University to compete for the Hult Prize at the Ivy league and northeast regional competition
   - Awarded first runner up for Startup Storm Global Business Plan Competition and third in the Inaugural Penn Aerospace Pitch Competition
   - Received Brown Maker Grant, Brown Explore Grant, and formed partnership with US Solar Works
   - Working with Institute at Brown for Environment and Society, NASA, Boeing, and Stanford professors
2. Brown Space Engineering- Power Team and Research Team (9/2016 - present)
   - Developed satellite to be launched by NASA and deployed off the ISS in March 2018
   - Patented satellite power board coating procedure and use of LiFePO4 batteries in space
   - Testing LiFePO4 batteries, solar panels, power supply of satellite
   - Designed, developed, and launched high altitude weather balloon, returning altitude, temperature, and video data of the stratosphere
3. Brown Chemistry Undergraduate Group and ACS Chapter, Student Leader (9/2016 - present)
   - Organize chemistry talks by professors on research for the undergraduate community on campus
   - Run Brown STEM day, a day to bring local high school students on campus and teach them about college life and what it's like studying STEM and conducting research
   - Advise to first years interested in studying chemistry

Hackathon Experience:

- HACKMIT –best data visualization award – Web app plotting location and tonal data of news articles in 65 different languages around the world. Analysis of how international image and view of companies in certain locations effect their stock price
- HackHarvard – developed real time image to braille machine, describing the immediate surroundings to the visually impaired to aid in their navigation of everyday life
- MHacks – App that returns nutritional facts of all your groceries with a snap of your receipt. Use of Google Cloud Vision to analyze text from image
- HackPrinceton, YHack, Hack@Brown, Brown Hack Health

Skills:

- Gas Chromatography, HPLC, TLC, IR Spec, Mass Spec, H-NMR, ^{13}C NMR, NOESY, BET Surface Area and Micropore Analyzer, XRD, Electron Microscopy, NanoDrop Spectroscopy, DNA Extraction, DNA purification, Protein extraction, Protein purification, PCR Amplification, Knockout PCR, Detection PCR, Gel Electrophoresis, SDS-PAGE, Cell Culture, Cloning, Primer Design, Gene Knockout
- Java, Python, C, assembly, R, JavaScript, HTML, Node.js, MATLAB, SolidWorks, Eagle, Adobe Illustrator, Photoshop, Premiere Pro, ETomo, EMAN, UCSF Chimera, Linux
- Metalworking, woodworking, laser cutting, 3D printing, soldering
- English, Chinese

References:

- Dr. Gary Ren, Staff Scientist at the Lawrence Berkeley National Laboratory; email: gren@lbl.gov
- Professor Jason Sello, Brown University Professor of Chemistry; email: jason_sello@brown.edu
- Dr. Richard Mariita, Brown University Presidential Post Doctorate Research Associate; email: richard_mariita@brown.edu