ALEXANDER RAUN

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EDUCATION

Harvard University Graduated May 2017

B.S. *cum laude in Electrical Engineering*

- Senior Thesis: *Titanium Nitride Microstructures for Intracellular Delivery* (Received Dean's Award for Outstanding Engineering Projects Honorable Mention)
- Coursework in Nanofabrication, MEMS, Computer Science, Engineering Design, Mathematics (Calculus, Linear Algebra), Physics (Mechanics and Relativity, Electricity and Magnetism), Environmental Engineering

RESEARCH EXPERIENCE

Harvard University Departments of Physics and Applied Physics 2014 – 2017

Advisor: Eric Mazur, Balkanski Professor of Physics and Applied Physics *Cambridge, MA*

- Fabricated Titanium Nitride micropyramid arrays via electron-beam evaporation, magnetron sputtering, and template stripping for a laser-activated intracellular delivery platform
- Optimized the perforation of cancer cell membranes and subsequent delivery of dyes in vitro via irradiation of microstructures with ultrafast pulsed lasers
- Constructed optics setups with femto- and nanosecond lasers for intracellular delivery experiments
- Simulated experiments with COMSOL to optimize microstructure geometry and study field enhancements
- Analyzed fabrication and experimental data with Scanning Electron Microscopy, fluorescent microscopy, and flow cytometry
- Collaborated with researchers across diverse science disciplines to explore design and nanofabrication options
- Maintained HeLa cervical cancer cell lines for experiments with standard cell culturing techniques
- Prepared and delivered presentations for national conferences, lab meetings, and research programs

WORK EXPERIENCE

Oliver Wyman July 2017 – Present

Consultant *Boston, MA*

- Designed and built promotion tracking models for a Fortune 10 company to monitor product sell rates in call centers across target and control customer populations; these promotions generated a sales lift of 20%
- Analyzed impact of private offers in various customer segmentation frameworks based on broadband speeds throughout the US
- Modeled oncologists' overtreatment behaviors with healthcare claims data
- Trained client teams in call center database analytics with SQL and Excel; composed instructional materials for clients to track sales performance within service call centers over time
- Documented stress-testing and liquidity models for banking clients to submit to federal authorities
- Synthesized data and created slides for senior client meetings

iRobot June – August 2016

Systems Engineering Intern *Bedford, MA*

- Increased robot sensor power by 80% through mechanical design changes
- Created test plans to identify and solve problems in robot prototypes; managed multiple testing processes in parallel; analyzed quantitative data to test hypotheses and to qualify components from new suppliers
- Presented test data and analysis to senior engineers via presentation and graphing software
- Trained manufacturing engineers in system testing procedures

Harvard Engineering Sciences 96: Junior Design Tutorial September – December 2015

Engineering Design Team Member *Cambridge, MA*

Project: Innovations in Snow Removal on Harvard's Campus

- Interviewed the Harvard Facilities Maintenance team about current snow removal process; researched and compiled information on the snow removal industry and technology
- Identified opportunities to automate the removal of up to 24,000m^3 of snow from rooftops and parking garages
- Calculated economic and technical impact of multiple ideas to narrow design choices
- Built a robotic snow blower prototype which could decrease labor costs by 50%
- Delivered client presentations and synthesized work into written reports

PUBLICATIONS

- **Raun, A.**, Saklayen, N., Zgrabik, C., Shen, W., Madrid, M., Huber, M., Hu, E., Mazur, E. (2018). A comparison of inverted and upright laser-activated titanium nitride micropyramids for intracellular delivery. *Scientific Reports*, 8(1), 15595.

CONFERENCE PRESENTATIONS (* indicates presenter)

- **Raun, A. J.***, Saklayen, N., Zgrabik, C. M., Vulis, D. I., Madrid, M., Shen, W., Hu, E. & Mazur, E. (2017, April). Reusable titanium nitride plasmonic microstructures for intracellular delivery (Conference Presentation). In *Frontiers in Ultrafast Optics: Biomedical, Scientific, and Industrial Applications XVII* (Vol. 10094, p. 100940C). International Society for Optics and Photonics.
- Saklayen, N.*, Madrid, M., Huber, M., Bi, H., **Raun, A.**, Vulis, D. I., Hu, E. & Mazur, E. (2016, April). Plasmonic Intracellular Delivery for Cell Therapy. In *Cancer Imaging and Therapy* (pp. CTh2A-3). Optical Society of America.
- **Raun, A. J.***, Saklayen, N., Zgrabik, C. M., Vulis, D. I., Madrid, M., Shen, W., Hu, E. & Mazur, E. (2016, February). Reusable titanium nitride plasmonic microstructures for intracellular delivery. Poster session presented at the SPIE Photonics West Conference, San Francisco, CA.
- Saklayen, N., Madrid, M.*, Huber, M., Vulis, D.I., **Raun, A.**, Nuzzo, V. & Mazur, E. (2015, December). High-throughput poration of mammalian cells using femtosecond laser-activated plasmonic substrates. Poster session presented at the SPIE Micro+Nano Materials, Devices, and Applications 2015 Conference, Sydney, Australia.
- **Raun, A. J.***, Saklayen, N., Zgrabik, C. M., Vulis, D. I., Madrid, M., Shen, W., Hu, E. & Mazur, E. (2015, December). Reusable titanium nitride plasmonic microstructures for intracellular delivery. Poster session presented at the 2015 Materials Research Society Fall Meeting and Exhibit, Boston, MA.

AWARDS & FELLOWSHIPS

Out For Undergrad LGBT Business Conference Attendee October 2015
Harvard Program for Research in Science and Engineering Fellow Summer 2015
Harvard College Research Program Fellow Spring 2015

LEADERSHIP

Oliver Wyman LGBTQA Employee Resource Group (GLOW) *Boston Office Co-Lead* September 2018 – Present
The Harvard-Radcliffe Gilbert & Sullivan Players *Board Member* April 2015 – May 2017
The Harvard Din & Tonics A Cappella Group *Vice President* April 2014 – March 2015

SKILLS & INTERESTS

Laboratory: Lab hardware (oscilloscopes, power meters, etc.), cleanroom fabrication experience, including thin film deposition methods (evaporation and sputtering), template stripping, laser and optics alignment, fluorescence microscopy, Scanning Electron Microscopy (SEM), and cell culture/biohood experience
Technology: MATLAB, COMSOL, SQL, Arduino, Raspberry Pi, and Microsoft Office Suite. Limited exposure to LabView.
Interests: Musical theater, piano, running