Erik Jue

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Profile

Transparent, Excellent, Concise

Multidisciplinary engineer dedicated to accelerating diagnostic development for improved health outcomes.

Experience

2021-Now *Point-of-care Molecular Diagnostics* – pocmdx.com
Founder, Independent Consultant

- pocmdx.com
- Strategic technical and timeline analyses for point-of-care molecular diagnostic product development.
- Product development consulting and execution

2020-21 *ALine Inc.* (9 months) – alineinc.com
Senior Microfluidic Lead Engineer

- Led product development engineering programs from proposal to prototypes. Designed parts from concepts, determined best scale-up manufacturing practices, executed experiments, interfaced with clients and vendors.
- Supported internal R&D programs and automated repetitive processes

Education and Training

2014-20 *California Institute of Technology (Caltech)*
Ph.D. in Bioengineering
Advisor: Rustem F. Ismagilov
Thesis: Improved tools for point-of-care nucleic acid amplification testing

- Designed a 25 min point-of-care sample-to-answer molecular STI test
- Improved NA extraction purity with two-phase wash (patent pending)
- Identified misquantification of SARS-CoV-2 (COVID) RNA used in validation studies for FDA emergency-use authorizations
- Designed 3D printed meter-mix device to lyse and transfer urine samples

- Wrote digital real-time NAAT image processing script to analyze >100 images each with 20,000 wells (MATLAB)
- Designed pumping lid interface to facilitate loading in microfluidics

2010-14 *University of California, Los Angeles (UCLA)*
B.S. in Bioengineering, *cum laude*
Advisor: Daniel T. Kamei
Field of study: Improving sensitivity of the lateral-flow immunoassay

- Capstone Senior Design Project: Led a team of 6 and discovered phenomenon leading to rapid aqueous two-phase separation on paper.
  - Honorable Mention (DEBUT Challenge)
  - Honorable Mention (BMEStart Competition)
  - Best Capstone Poster (UC Systemwide BE Symposium)
  - Best Oral Presentation (UCLA Capstone Symposium)
- Project: Improved lateral-flow immunoassay with PEG-salt aqueous two-phase system to detect viruses.

Publications

1st authored

1. **E. Jue**. "Improved tools for point-of-care nucleic acid amplification testing". *PhD Dissertation, California Institute of Technology*. (2020) DOI: 10.7907/d6mf-5081
2. **E. Jue** and R.F. Ismagilov. "Commercial stocks of SARS-CoV-2 RNA may report low concentration values, leading to artificially increased apparent sensitivity of diagnostic assays. *medRxiv*, **pre-print** (2020). DOI: 10.1101/2020.04.28.20077602
3. **E. Jue**, D. Witters, and R.F. Ismagilov. "Two-phase wash to solve the ubiquitous contaminant-carryover problem in commercial nucleic-acid extraction kits." *Scientific Reports,* (2020). DOI: 10.1038/s41598-020-58586-3
4. **E. Jue**, N.G. Schoepp, D. Witters, and R.F. Ismagilov "Evaluating 3D printing to solve the sample-to-device interface for LRS and POC diagnostics: example of an interlock meter-mix device for metering and lysing clinical urine samples" *Lab on a Chip,* (2016). DOI: 10.1039/c6lc00292g
5. **E. Jue**, C.D. Yamanishi, R.Y.T. Chiu, B.M. Wu, and D.T. Kamei, "Using an aqueous two-phase polymer salt system to rapidly concentrate viruses for improving the detection limit of the lateral-flow immunoassay", *Biotechnology and Bioengineering*, (2014). DOI: 10.1002/bit.25316

Other publications

1. J.C. Rolando, **E. Jue**, J. Barlow, and R.F. Ismagilov. "Real-time kinetics and high-resolution melt curves in single-molecule digital LAMP to differentiate and study specific and nonspecific amplification." *Nucleic Acids Research,* (2020). DOI: 10.1093/nar/gkaa099
2. J.C. Rolando, **E. Jue**, N.G. Schoepp, and R.F. Ismagilov. "Real-time, digital LAMP with commercial microfluidic chips reveals the interplay of efficiency, speed, and background amplification as a function of reaction temperature and time." *Analytical Chemistry,* (2018). DOI: 10.1021/acs.analchem.8b04324

3. J. Rodriguez-Manzano, M.A. Karymov, S. Begolo, D.A. Selck, D.V. Zhukov, **E. Jue**, and R.F. Ismagilov "Reading out single-molecule digital RNA and DNA isothermal amplification in nanoliter volumes with unmodified camera phones" *ACS Nano,* (2016). DOI: 10.1021/acsnano.5b07338
4. R.Y.T. Chiu, **E. Jue**, A.T. Yip, A.R. Berg, S.J. Wang, A.R. Kivnick, P.T. Nguyen, and D.T. Kamei, "Simultaneous concentration and detection of biomarkers on paper", *Lab on a Chip,* (2014). DOI: 10.1039/c4lc00532e
5. R.Y.T. Chiu, P.T. Nguyen, J. Wang, **E. Jue**, B.M. Wu, and D.T. Kamei, "Dextran-coated gold nanoprobes for the concentration and detection of protein biomarkers", *Annals of Biomedical Engineering*, (2014). DOI: 10.1007/s10439-014-1043-3

Presentations

Oral Presentations

1. **E. Jue** and R.F. Ismagilov "Improved tools for point-of-care nucleic acid amplification testing" *Zoom Thesis Defense*, May 2020.
2. **E. Jue**, D. Witters, and R.F. Ismagilov "How to diagnose and solve the ubiquitous contaminant-carryover problem in commercial nucleic acid extraction kits" *PittCon 2020,* Chicago, IL, Mar 2020.
3. **E. Jue**, D. Witters, N Schoepp, S. Begolo, J. Rodriguez-Manzano, F. Shen, H. Maamar, A. Shur, and R.F. Ismagilov "Automated, distributed nucleic acid amplification testing device", *Guest Lecture ChE10,* Caltech, Pasadena, CA, Feb. 2020.
4. **E. Jue**, D. Witters, N Schoepp, S. Begolo, J. Rodriguez-Manzano, F. Shen, H. Maamar, A. Shur, and R.F. Ismagilov "Automated, distributed nucleic acid amplification testing device", *Guest Lecture ChE10,* Caltech, Pasadena, CA, Feb. 2019.
5. **E. Jue**, D. Witters, N Schoepp, S. Begolo, J. Rodriguez-Manzano, F. Shen, H. Maamar, A. Shur, and R.F. Ismagilov "Automated, distributed nucleic acid amplification testing device" *Biolunch,* Caltech, Pasadena, CA, Apr. 2018.
6. **E. Jue**, N.G. Schoepp, D. Witters, and R.F. Ismagilov "A 3D printed meter-mix device to solve the sample-to-device interface for LRS and POC diagnostics" *AAAS Pacific Division Oral Presentation,* University San Diego, San Diego, CA, Jun. 2016.
7. **E. Jue**, N.G. Schoepp, D. Witters, and R.F. Ismagilov "Interlock meter-mix device for metering and lysing clinical samples" *AAAS Pacific Division Scientific Maker Exhibit*, University San Diego, San Diego, CA, Jun. 2016.
8. **E. Jue**, A.T. Yip, A.R. Berg, S.J. Wang, A.R. Kivnick, P.T. Nguyen, "SwabSense" *Capstone Design Shark Tank Finalist*, *UC Systemwide BE Symposium*, UCI, Irvine, CA, Jun. 2014
9. **E. Jue**, A.T. Yip, A.R. Berg, S.J. Wang, A.R. Kivnick, P.T. Nguyen, "Concentrating biomarkers with paper: revolutionizing the lateral-flow immunoassay", *Open House Oral Presentation*, UCLA Dept. of Bioengineering, Los Angeles, CA, Apr. 2014
10. **E. Jue**, A.T. Yip, A.R. Berg, S.J. Wang, A.R. Kivnick, P.T. Nguyen, "Concentrating biomarkers with paper: revolutionizing the lateral-flow Immunoassay", *Bioengineering Capstone Design Symposium*, UCLA, Los Angeles, CA, Mar. 2014

Poster Presentations

1. D. Witters, **E. Jue**, N.G. Schoepp, S. Begolo, J. Rodriguez-Manzano, F. Shen, H. Maamar, A. Shur, and R.F. Ismagilov "Autonomous and portable device for rapid sample-to-answer molecular diagnostics at the point-of-care" *MicroTAS 2017*, Savannah, Georgia, Oct. 2017

2. **E. Jue**, D. Witters, N.G. Schoepp, S. Begolo, J. Rodriguez-Manzano, F. Shen, H. Maamar, A. Shur, and R.F. Ismagilov "Automated, portable, distributed device for rapid sample-to-answer molecular diagnostics at the point-of-care" *Caltech BBE Retreat*, Pasadena, CA, Sep. 2017
3. **E. Jue**, D.V. Zhukov, S. Begolo, and Rustem F. Ismagilov "Screw it: using 3D Printed materials to close the gap between glass, plastic, and the world", Sep. 2015, Long Beach, CA, Sep. 2015
4. **E. Jue**, R.Y.T. Chiu, C.D. Yamanishi, B.M. Wu, and D.T. Kamei "Using Aqueous Two-Phase Systems to Rapidly Concentrate Viruses for Improving the Detection Limit of the Lateral-Flow Immunoassay" *UCLA Science Poster Day*, Los Angeles, CA, May 2014
5. A.R. Berg, **E. Jue**, A.R. Kivnick, P.T. Nguyen, S.J. Wang, A.T. Yip, Yiquing Zhao, and D.T. Kamei "Concentration with only Paper: Revolutionizing the Lateral-Flow Immunoassay" *2014 UC Systemwide BE Symposium at UCI*, Irvine, California, Jun. 2014

Awards and Fellowships

1. 2017 MicroTAS Hochuen Portable Microfluidic Device Award
2. 2016 NIH Training grant awardee
3. 2015 NSF graduate research fellowship
4. 2014 Rose Hills Fellowship

Patents

1. R.F. Ismagilov, **E. Jue**, and D. Witters "Purification and detection of analytes" US2019/0100747A1, Published Apr. 4, 2019, Pending
2. R.F. Ismagilov, **E. Jue**, and D. Witters "Methods and systems and related compositions for mixtures separation with a solid matrix" US20190078080A1, Published Mar. 14, 2019, Pending
3. R.F. Ismagilov, J.R. Manzano, M. Karymov, D.A. Selck, S. Begolo, **E. Jue**, and D.Z. Zhukov "Devices and methods for direct visual detection and readout of single nucleic acid molecules" US2018/0321137A1, Published Nov. 8, 2018, Pending
4. R.F. Ismagilov, E. Khorosheva, T.S. Schlappi, M.S. Curtis, N.G. Schoepp, H. Maamar, F. Shen, and **E. Jue** "Microfluidic measurements of the response of an organism to a drug" US2018/0274020A1, Published Sep. 27, 2018, Pending
5. R.F. Ismagilov, **E. Jue**, and N.G. Schoepp "Devices and methods for preparing biological samples" US2017/0299483A1 Published Oct. 19, 2017, Pending
6. S. Begolo, D.V. Zhukov, D. Witters, **E. Jue**, and R.F. Ismagilov "The pumping lid: devices and methods for programmable generation of positive and negative pressures" US2017/0225161A1 Published Aug. 10, 2017, Pending

Selected Coursework

- Bioengineering / Diagnostics
    - Design, Invention, and Fundamentals of Microfluidic Systems
    - Design and Construction of Biodevices
    - Optical Methods for Biomedical Imaging and Diagnosis
    - Introduction to Mechanical Prototyping
    - Biopolymer Chemistry
    - Biotransport and Bioreactions

    - Biomedical Transducers
    - Biocompatibility
    - Drug Delivery
- Programming
    - Introduction to Computer Science 1, 2
    - Data Analysis in the Biological Sciences
    - Database Systems
    - Artificial Intelligence

Teaching and Mentoring

- Grad TA for microfluidics course (design, invention, fundamentals)
    - 5-star ratings in feedback reports and positive reviews by students
- Mentored 11 students (high school, undergraduates, grad students)

Professional Certifications

- Certified GD&T Fundamentals (GD&T Basics Course)
- Certified SolidWorks Professional (CSWP)
- Project Management Certificate (Caltech CTME): 80 course hours
    - Project initiation, costing, and selection
    - Project organization and leadership
    - Detailed project planning
    - Project monitoring and control
    - Project risk management
- Eagle Scout, Silver Palm (BSA)

Technical Skills

- Microbiology and molecular biology
    - BSL-2 sample handling
    - Mammalian and bacterial cell culture
    - NA sample preparation
    - Dry reagent storage (lyophilization)
    - NA amplification (qPCR, dPCR, LAMP, dLAMP)
    - Fluorescent/colorimetric readout
    - Lateral-flow immunoassay
    - Cloning
- Device fabrication
    - CAD (Solidworks, AutoCAD, Adobe illustrator)

    - 3D printing
    - Laser cutting
    - Waterjet cutting
    - PDMS
    - Glass chemical etching
    - Metal machine shop
- Programming
    - C++
    - MATLAB
    - Arduino
    - LabView
    - Python
- Interdisciplinary engineering
    - Mechanical design: motors, gears, hermetic sealing
    - Electrical design: sensors, temperature control, motor control
    - Optical design: fluorescence imaging, filters, alignment
- Project management
    - Experienced grant writer, contributed to DoD grant that funded my thesis ($3.4M award)
    - Project planning (e.g. Gantt chart, critical path analysis) and risk assessment
    - Goal setting and managing expectations
    - Inventory management (>15 chemicals and >85 components in one project). $17k-$24k annual budget for consumables.
    - Collaborations with product development firms and med device consultants (e.g. Ximedica/Accel Biotech, Cambridge Design Partners, Green Domain Design)
    - Equipment sourcing and troubleshooting (e.g. lyophilizer, 3D printer, laser cutter)
    - Biweekly reporting of results to PI, monthly reports to funding agencies

Volunteering

March 2017 – present: *The Mawanda Project*
CFO and Advisory Board Member

- Non-profit that provides education, food, and housing to underprivileged children in Uganda, Africa
- Management, documentation, taxes, and reporting: ~$35k annual budget