Elain S. Fu
Associate Professor
School of Chemical, Biological, and Environmental Engineering
Oregon State University

A. Education and Employment Information

A1. Education

1997	Ph.D., Physics University of Maryland Advisor: Ellen Williams
1996	M.S., Physics University of Maryland
1992	Sc.B., Physics Brown University

A2. Professional Experience

2019–present	Associate Professor School of Chemical, Biological, and Environmental Engineering Oregon State University
2015–2019	Assistant Professor School of Chemical, Biological, and Environmental Engineering Oregon State University
2013–2015	Assistant Professor (Sr. Research) School of Chemical, Biological, and Environmental Engineering Oregon State University
2010–2013	Research Assistant Professor Department of Bioengineering University of Washington
2004–2010	Senior Research Scientist Department of Bioengineering University of Washington
2001–2004	Research Scientist Department of Bioengineering University of Washington
1999–2000	Research Associate

	Department of Physics University of Washington
1997–1998	Graduate Research Assistant Department of Genetics University of Washington
1994–1997	Graduate Research Assistant Department of Physics University of Maryland
1992–1993	Graduate Teaching Assistant Department of Physics University of Maryland

Affiliations:

- 2017–present, Faculty in Humanitarian Engineering, OSU
- 2010–present, Member of the Biomedical Engineering Society
- 2018–2019, Member of the American Chemical Society
- 2013–2020, Affiliate, Department of Bioengineering, University of Washington

B. Teaching, Advising, and Other Assignments

B1. Instructional Summary

B1.1. Credit Courses

Number	Course Title	Term/Year	Credits	Enrollment
CBEE 414[1]	Process Engineering Laboratory, Section 014	Fall 2015	3	17
CBEE 414[1]	Process Engineering Laboratory, Section 017	Fall 2015	3	19
CBEE 414[1]	Process Engineering Laboratory, Section 018	Fall 2015	3	17
HEST 399[2]	Engineering for Global Health Solutions	Spring 2016	3	11
CBEE 414[3]	Process Engineering Laboratory, Section 012	Fall 2016	3	24
CBEE 414[3]	Process Engineering Laboratory, Section 018	Fall 2016	3	24
CBEE 414[3]	Process Engineering Laboratory, Section 019	Fall 2016	3	24
HEST 399	Engineering for Global Health	Spring 2017	3	5

	Solutions			
CBEE 414[3]	Process Engineering Laboratory, Section 013	Fall 2017	3	24
CBEE 414[3]	Process Engineering Laboratory, Section 017	Fall 2017	3	24
CBEE 414[3]	Process Engineering Laboratory, Section 018	Fall 2017	3	24
HEST 320	Engineering for Global Health Solutions	Spring 2018	3	21
BIOE 599	Drug and Medical Device Regulations in Technology Development	Spring 2018	2	8
CBEE 414[3]	Process Engineering Laboratory, Section 017	Fall 2018	3	21
CBEE 414[3]	Process Engineering Laboratory, Section 018	Fall 2018	3	21
CBEE 414[3]	Process Engineering Laboratory, Section 019	Fall 2018	3	22
HEST 320	Engineering for Global Health Solutions	Spring 2019	3	24
BIOE 513 Hybrid	Drug and Medical Device Regulations in Technology Development	Spring 2019	2	12
CBEE 414[3]	Process Engineering Laboratory, Section 018	Fall 2019	3	20
CBEE 414[3]	Process Engineering Laboratory, Section 019	Fall 2019	3	16
BIOE 420	Social Justice, Ethics, and Engineering, Section 001	Winter 2020	3	35
BIOE 420	Social Justice, Ethics, and Engineering, Section 010	Winter 2020	3	22
BIOE 513 Ecampus	Drug and Medical Device Regulations in Technology Development	Spring 2020	2	14
BIOE 513 Ecampus	Drug and Medical Device Regulations in Technology Development	Winter 2021	2	10
HEST 320	Engineering for Global Health Solutions	Spring 2021	3	23
BIOE 240	A Practical Introduction to Biosignals and Sensors	Spring 2021	3	13
BIOE 457/557	Bioreactors	Fall 2021	3	71/3
BIOE 513 Ecampus	Drug and Medical Device Regulations in Technology Development	Winter 2022	3	19
BIOE 240	A Practical Introduction to Biosignals and Sensors	Spring 2022	3	28

BIOE 457/557	Bioreactors	Fall 2022	3	51/4
BIOE 513 Ecampus	Drug and Medical Device Regulations in Technology Development	Winter 2023	3	24
HEST 320 Ecampus	Engineering for Global Health Solutions	Winter 2023	3	26
BIOE 240	A Practical Introduction to Biosignals and Sensors, Section 001	Spring 2023	3	30
BIOE 240	A Practical Introduction to Biosignals and Sensors, Section 002	Spring 2023	3	30

B1.2. Non-Credit Courses and Workshops

Workshop Title	Role	Term/Year
Summer Institute in Physics and Physical Science for In-service Teachers	One member of a team of instructors	Summer 1999
Summer Institute in Physics and Physical Science for In-service Teachers	One member of a team of instructors	Summer 2000
GHDx Center Course 1: Point-of-care diagnostics for global health	Lecture on "Point-of-care diagnostics for limited-resource settings"	Summer 2011
GHDx Center Course 1: Point-of-care diagnostics for global health	Lecture on "Point-of-care diagnostics for limited-resource settings"	Summer 2012

B1.3. Course and Curriculum Development

HEST 399/320 – Engineering for Global Health Solutions. I developed this new course at OSU with Dr. Jim Sweeney in 2016 (and co-taught it with Dr. Sweeney in spring 2016). Course curriculum development focused on creating worksheet-based activities for student teams to explore core concepts in the course. These activities are designed to engage students in topics introduced in their reading assignments or the mini-lectures (delivered at the beginning of a class session), and include topics such as accessing online databases and plotting health data, exploring the DALY as a metric of disease burden, considering the major drivers of healthcare costs, contrasting the different design constraints of healthcare settings around the world, and considering the characteristics of different types of vaccines and their appropriateness for different populations. Students apply what they have learned to their quarter-long project, in which they consider the disease burden (ideally including data they curate from available databases) and healthcare infrastructure in a country of interest, and then focus on a specific healthcare need and their proposed technology-based solution to that need. In subsequent years (sole instructor for 2017, 2018, 2019, and 2021), I have improved and updated materials to be relevant to current events, e.g., a focus on covid-19 vaccine development in spring 2021, and incorporated a greater variety of information sources for a diverse set of learners. Further, the course (since 2018) fulfills 3 credits of the science, technology, and society synthesis course

requirement for the OSU baccalaureate core. I developed the Ecampus version of this course in 2022 (for delivery in 2023) by mapping the course content to recorded lectures, online discussion boards, activities, and assessments. The main challenge in doing this was to try to maintain a connection between the participants, although they would be accessing course materials asynchronously.

Selected anonymous student comments from Ecampus version of HEST 320 in 2023:

I liked that there were multiple rounds of responses on the same discussion post each week. In other classes, it is more of a one-and- done post and does not encourage actual discussion. I liked that this course set you up more to have those discussions.

The communication and the feedback from the instructor were prompt and effective, especially for an ecampus course.

The course was well organized and all connected. The assignments and readings were also very interesting. I wasn't sure how interested I was going to be in the material for this course, but I have been pleasantly surprised and really enjoyed this class.

BIOE 599/513 – Drug and Medical Device Regulations in Technology Development. I co-developed this course for graduate students at OSU in 2018 (and first delivered BIOE 599 in spring 2018). The course is required for our BIOE graduate students. Course curriculum development focused on creating worksheet-based activities to familiarize students with regulatory resources such as medical device databases, provide practice relating the regulations to the classification of medical products and to the classification of medical devices, and provide practice articulating the required components of regulatory documentation in specific contexts. Students apply what they have learned to their quarter-long project in which they focus on a medical technology of interest, and then trace a path through the FDA approval process based on the relevant characteristics of the technology and an understanding of FDA regulations. I developed the Ecampus version of this course (hybrid delivery in spring 2019 and fully online delivery in spring 2020, winter 2021, and winter 2022) that included additional material in the form of online discussion boards, activities, and quizzes.

Selected anonymous student comments from Ecampus version of BIOE 513 in 2023:

All the information was very applicable to what we will be doing in the future, the assignments and papers helped solidify our knowledge.

I am a Biomedical Engineer, and this course completely covered my needs regarding bringing a medical device into the market through FDA inspections and approval processes.

Online was a good format for this class.

BIOE 240 – A Practical Introduction to Biosignals and Sensors. I developed this new course for undergraduate students at OSU, and first delivered it in spring 2021. This course was an elective the first two years it was offered and has been required of our BIOE undergraduates since spring 2023. The primary aims of the course are to equip students with a basic and robust understanding of the origin and characteristics of common biosignals, the motivation and challenges of signal processing, such as sampling and filtering, and an understanding of sensor metrics and the main challenges of designing effective sensors. Course curriculum development included material for lecture, in-class activities, and HW assignments. The emphasis of the in-

class activities is on the promotion of student active learning while working in small groups. The majority of the activities are centered on student exploration and implementation of Arduino-based circuits and sensors (e.g., manipulation of analog signals using a potentiometer, RC circuits for filtering, acquisition and digital filtering of ECG sensor data, and acquisition and analysis of pulse oximetry data). The HW assignments reinforce and extend the material presented in mini-lectures and investigated in the activities. Students also engage in a quarter-long team project on a biosignal/sensor combination of interest, and present their work to their peers and submit a report. Note: Development work on the Arduino-based activities was shared with an excellent undergraduate, Anthony Grana.

Selected anonymous student comments from in-person BIOE 240 in 2022:

Dr. Fu was always available to answer questions and made the class easier to understand. She had resources for us and truly cared about our learning. One of my favorite classes of this term and Dr. Fu never disappoints!

As a person who did electric fundamentals online and was not able to participate in the hands-on circuits, I loved working with the arduino circuits and applying efundies and physics principles. It has given me a strong base of arduino coding, breadboards, and signal processing.

The course allowed me to learn arduino in a way that I think I will allow me to remember the basics for a long time.

BIOE 457/557 – Bioreactors. This was an established, required course in the BIOE undergraduate curriculum when I first taught it in fall 2021. I had access to excellent material from Dr. Christine Kelly, and focused my curriculum development efforts on mapping relevant content to a mini-lecture plus paired worksheet-based activity for many of the class sessions. The mini-lecture that is delivered in person (between ~10 and 25 minutes), is also recorded and posted for students who are not able to attend class or students who want to review the presentation again afterwards. The remainder of the class session is then devoted to students working on the associated activity. The activity is designed to provide students with an opportunity to practice what has been covered in the mini-lecture, e.g., performing a mass balance and derivation of a relevant differential equation or implementing an extension of their base bioreactor model, and to serve as a bridge between the lecture content (and/or reading) and the HW. Discussion with peers, GTAs, and the instructor is encouraged during the activity time. The activities are due later in the week to accommodate a wide range of learners and are scored on participation/effort, and solutions subsequently provided to the students. Students also engage in a team project on a bioreactor application or other topic related to bioreactors of interest to them, and present their work to their peers and submit a report.

Selected anonymous student comments from in-person BIOE 457 in 2022:

The instructor knew the topics she was covering very well. It was also clear that she familiarized herself with each topic before lecturing on it. She was very understanding to the needs of students and ran a well structured class. The balance of lectures and activities during the class period helped students stay engaged and seemed much more effective than that of a prolonged lecture followed by activities as homework.

This course was awesome! Dr. Fu is extremely organized and set up the class for success. We were always able to get help on our homework which was based on the activities we did in class and we always received feedback in a timely manner. Solutions for activities and homework were

posted (after due dates) which helped immensely when trying to tackle harder problems and it helped me learn the course material more thoroughly. Dr. Fu and all of the TAs were always willing to schedule meetings outside of office hours if you aren't able to make the regular hours which really helps the working students. She was super accommodating and always willing to work with students to help them out. One of the best professors I have had at OSU!

I really liked the way we had a lecture and them worksheet that followed to practice the material.

B1.4. Team or Collaborative Efforts

[1] Dr. Phil Harding was the instructor for the CBEE 414 lectures and led a team of five instructors that included Dr. Devlin Montfort, Dr. Joe McGuire, Dr. Milo Koretsky, and me.

[2] I co-taught HEST 399 with Dr. Jim Sweeney in 2016.

[3] Dr. Natasha Mallette was the instructor for the CBEE 414 lectures and led a team of multiple instructors that included me.

I have contributed to additional courses as detailed below.

Number	Course Title	Term/Year	Contact hrs.	Enrollment
Before OSU:				
Physics 121, 122, and 123 Tutorials (UW)	*Tutorials for the Introductory Physics Courses*	Fall 1999/ Winter 2000/ Spring 2000	10 (each quarter)	~16 (each quarter)
Physics 410 (UW)	*Physics by Inquiry for In-Service Teachers*	Fall 1999	~10	~6
BIOE 299 (UW)	*Introduction to Bioengineering*	Spring 2013	1	~50
At OSU:				
CBEE 212 Studio	*Energy Balances Studio Section*	Winter 2014	10	22
BIOE 390	*Bioengineering Product Design – Guest Speaker*	Spring 2014	1	~6
VMB 742	*Veterinary Integrated Problem Solving*	Spring 2015	4	~6

B1.5. International Teaching

None

B2. Student and Participant Evaluations

Course No.	Term	Enroll-ment	# Re-sponding	Student Evaluation Median (#1/#2)	Required /Elective
CBEE 414 014	Fall 2015	17	15	4.3/4.6	Required
CBEE 414 017	Fall 2015	19	13	4.4/5.0	Required
CBEE 414 018	Fall 2015	17	12	5.3/5.5	Required
HEST 399	Spring 2016	11	8	5.0/5.7	Elective
CBEE 414 012	Fall 2016	24	14	4.0/5.0	Required
CBEE 414 018	Fall 2016	24	16	5.0/5.3	Required
CBEE 414 019	Fall 2016	24	17	4.5/4.9	Required
HEST 399	Spring 2017	5	No data	No data	Elective
CBEE 414 013	Fall 2017	24	13	4.1/5.1	Required
CBEE 414 017	Fall 2017	24	9	3.7/4.2	Required
CBEE 414 018	Fall 2017	24	15	4.9/5.6	Required
HEST 320	Spring 2018	21	13	5.0/5.3	Elective
BIOE 599	Spring 2018	8	3	5.8/6.0	Required
CBEE 414 017	Fall 2018	21	4	4.0/4.5	Required
CBEE 414 018	Fall 2018	21	7	5.4/5.6	Required
CBEE 414 019	Fall 2018	22	8	5.5/5.8	Required
HEST 320	Spring 2019	24	12	5.7/5.7	Elective
BIOE 513 Hybrid	Spring 2019	12	4	5.5/5.5	Required
CBEE 414 018	Fall 2019	20	6	5.5/5.8	Required
CBEE 414 019	Fall 2019	16	7	5.6/5.6	Required
BIOE 420 001	Winter 2020	35	17	5.7/5.8	Required
BIOE 420 010	Winter 2020	22	5	5.7/5.7	Required
BIOE 513 Ecampus	Spring 2020	14	NA	No scores	Required
BIOE 513 Ecampus	Winter 2021	10	3	5.8/5.8	Required
HEST 320	Spring 2021	23	7	5.5/5.5	Elective
BIOE 240	Spring 2021	13	3	6.0/6.0	Elective
BIOE 457/557	Fall 2021	74(71/3)	17	5.7/5.8	Required
BIOE 513 Ecampus	Winter 2022	19	6	4.5/4.5	Required
BIOE 240	Spring 2022	28	7	5.8/5.8	Elective
BIOE 457/557	Fall 2022	55	16	5.9/5.9	Required
BIOE 513 Ecampus	Winter 2023	24	7	5.8/5.8	Required
HEST 320 Ecampus	Winter 2023	26	8	5.7/5.7	Elective
BIOE 240 001	Spring 2023	30	5	5.3/5.7	Required
BIOE 240 002	Spring 2023	30	3	5.8/5.8	Required

B4. Advising

B4.1. Graduate Advisees – Completed

Student	Degree	Thesis	Graduated
1. Lael Wentland (student at OSU)	Ph.D.	*Development of Rapid Diagnostic Tools for Personal Health Monitors in the Context of Therapy Monitoring*	Summer 2022 (BIOE Schulien Outstanding Graduate Student Award)

2. Corey Downs (student at OSU)	Ph.D.	*Development of Microfluidic Assays and Flow Control Tools on Porous Materials: Towards a Wound-Health Monitoring Device*	Spring 2021 (CBEE Schulien Outstanding Graduate Student Award)
3. Mike Rodriguez (student at OSU)	M.S.*	*Signal enhancement in lateral flow tests for infant HIV diagnosis*	Summer 2020
4. Robert Robinson (student at OSU)	M.S.	*Development of a Paper-based Whole Blood Phenylalanine Assay for PKU Diagnosis and Monitoring in Low-Resource Settings*	Spring 2016 (CBEE Schulien Outstanding Graduate Student Award)
5. Tinny Liang (student at UW)	M.S.	*Investigation of Reagent Delivery Formats and Implications for Higher-sensitivity Detection for Paper-based Diagnostics*	Fall 2014 (NSF Graduate Research Fellowship)
6. Greg Thiessen (student at UW)	M.S.	*Development of a Field-use Paper-based PKU Test using Colorimetric Readout*	Summer 2014

*Mike Rodriguez entered the program as a Ph.D. student.

B4.2. Graduate Advisees – Current

Student	Degree	Expected Graduation	Advanced to Candidacy (Y/N)
1. Noel Lefevre	Ph.D.	Spring 2027	N
2. Khadijeh Khederlou	Ph.D.	Spring 2026	N

B4.3. Graduate Thesis or Project Committees

MEng Advisor:
Graduated
Jameson Cosgrove, 2022
Current
None

Minor Professor or Committee Member:
Graduated
1. Saichon Sumantakul, Ph.D. 2023 (OSU Analytical Chemistry)
2. Christopher Bahro, Ph.D. 2022 (OSU Analytical Chemistry)
3. Yujing Zhang, Ph.D. 2020 (OSU Chemical Engineering)
4. Jacob Dawes, M.S. 2020 (OSU Electrical Engineering)
5. Chandima Bandara, Ph.D. 2019 (OSU Analytical Chemistry)
6. John Lahmann, Ph.D. 2018 (OSU Chemical Engineering)
7. Bonan Yu, Ph.D. 2018 (OSU Chemical Engineering)
8. Ramya Raman, Ph.D. 2017 (OSU Chemical Engineering)
9. Jenna Gorecki, M.S. 2016 (OSU Chemical Engineering)
10. Brian Fuchs, M.S. 2015 (OSU Chemical Engineering)
11. Carly Holstein, Ph.D. 2015 (UW Bioengineering)

Current

1. Rubiya Yasmin, Ph.D. (OSU-UO Bioengineering)
2. Eyerusalem Gebreyesus, Ph.D. (OSU-UO Bioengineering)
3. Michelle Tran, Ph.D. (OSU Analytical Chemistry)

Graduate Council Representative:

1. Sneha George, Ph.D. (OSU Analytical Chemistry)
2. Jaehyeong Park, Ph.D. (OSU Electrical Engineering)
3. Erin Kalbaugh, Ph.D. (OSU Analytical Chemistry)
4. Yunxing Li, Ph.D. (OSU Analytical Chemistry)
5. Jacob Dawes, Ph.D. (OSU Electrical Engineering)
6. Callen Votzke, Ph.D. 2023 (OSU Electrical Engineering)
7. Jayanthi Joseph, Ph.D. 2022 (OSU Microbiology)
8. Boyu Shen, Ph.D. 2020 (OSU Electrical Engineering)
9. Justin Rewerts, Ph.D. 2020 (OSU Chemistry)

B4.4. Undergraduate Research Assistants

1. Zachariah Dieringer (Winter 2023, Spring 2023) – paid researcher
2. Kira Hallerbach (Summer 2022, Fall 2022, Winter 2023, Spring 2023) – paid researcher
3. Ander Switalla (Winter 2022, Spring 2022, Summer 2022, Fall 2022, Winter 2023, Spring 2023) – paid researcher, BIOE Outstanding Student Award 2023
4. Jade Minzlaff (Winter 2022, Spring 2022, Summer 2022, Fall 2022, Winter 2023) – paid researcher, 1st place student research poster at AIChE Pacific Northwest Regionals, April 2022
5. Natalie White (Summer 2019, Fall 2019, Winter 2020) – Johnson Intern 2019, paid researcher in 2019 and 2020, DeLoach Work Scholarship Spring 2021
6. Valerie Ranum (Winter 2019, Spring 2019, Summer 2019) – STEM Leader 2019 and Johnson Intern 2019
7. Kian Patel (Summer 2018, Fall 2018, Winter 2019, Spring 2019, Summer 2019) – Johnson Intern 2018, paid researcher in 2018 and 2019, CWI Summer Intern 2019
8. Rachel Polaski (Summer 2018, Fall 2018, Winter 2019, Spring 2019, Fall 2019, Winter 2020) – Johnson Intern 2018, paid researcher in 2018, 2019, and 2020, BIOE Outstanding Student Award 2021
9. Arianna Nejely (Summer 2017, Fall 2017, Winter 2018, Spring 2018, Fall 2018, Summer 2019, Fall 2019, Winter 2020) – Johnson Intern 2017, paid researcher in 2017, 2018, 2019, and 2020
10. Madeleine Adams (Fall 2017, Winter 2018, Spring 2018) – paid researcher in 2017 and funding from OSU Women and Minorities in Engineering (SemiConductor Research Corporation) in 2018
11. Kassie Odo (Summer 2017) – Johnson Intern 2017
12. Jensen Amens (Fall 2016, Winter 2017) – Sophomore Women's Research Fellowship
13. Ian Abbene (Summer 2016) – paid researcher
14. Gary Gates (Summer 2016) – paid researcher
15. Caitlin Reid (Summer 2016, Fall 2017, Winter 2018) – Johnson Intern 2016, DeLoach Work Scholarship Fall 2017, paid researcher in 2018
16. David Cornwell (Summer 2015, Summer 2016) – Johnson Intern 2015, Johnson Second-year Intern 2016
17. Anthony To (Summer 2015 – Summer 2016) – paid researcher in 2015 and 2016

18. Jessalyn Imdieke (Summer 2014 – Spring 2017) – Johnson Intern 2014, Johnson Second-year Intern 2015, and paid researcher in 2015, 2016, and 2017
19. Liam Wong (Summer 2014) – Johnson Second-year Intern 2014
20. Wyatt Self (Summer 2014 – Dec. 2015) – Johnson Second-year Intern 2014 and paid researcher in 2015
21. Dylan Hinson (January 2014 – July 2016) – URSA ENGAGE 2014, Bioenergy Scholarships 2014 and 2015, and paid researcher in 2016
22. Brittney McKenzie (Summer 2012, and two quarters during the academic year) – NASA SURP 2012 and UW Mary Gates Scholarship 2012
23. Jeff Yang (Summer 2013) – paid researcher
24. Jared Houghtaling (Summers 2011 and 2012, and seven quarters during the academic year) – paid researcher, UW Mary Gates Scholarship 2012 and 2013, UW Bioengineering Scholarship 2013, Washington Research Foundation Scholarship 2013
25. Tinny Liang (Summers 2010, 2011, and 2012, and seven quarters during the academic year) – paid researcher, UW Mary Gates Scholarship 2012 (2×), UW Bioengineering Scholarship 2012, and Levinson Scholarship 2012

B4.5. Postdoctoral Trainees

1. Lael Wentland, Ph.D., 2022
2. Corey Downs, Ph.D., 2021
3. Bhushan Toley, Ph.D., 2012 (co-mentored with Paul Yager and Barry Lutz while at UW)

B4.6. Other Advising

1. Faculty Advisor for OSU Honors College Thesis – Jade Minzlaff (Spring 2023)
2. Faculty Advisor for OSU Honors College Thesis – Natalie White (Spring 2022)
3. Faculty Advisor for OSU Honors College Thesis – Kian Patel (Spring 2021)
4. Faculty Advisor for OSU Honors College Thesis – Caitlin Reid (Fall 2019)
5. Faculty Advisor for OSU Honors College Thesis – David Cornwell (Spring 2018)
6. Faculty Advisor for OSU Honors College Thesis – Liam Wong (Spring 2017)
7. Faculty Advisor for OSU Honors College Thesis – Anthony To (Fall 2016)
8. Faculty Advisor for OSU Bioenergy Thesis – Dylan Hinson (Spring 2016)
9. Faculty Advisor for CBEE Undergraduates (Fall 2014 – 2018)
10. Faculty Advisor for UW Bioengineering Capstone Design Project – Kim De Los Reyes (Spring 2014)
11. Faculty Advisor for UW Bioengineering Capstone Design Project – Jeff Yang (Spring 2014)
12. Faculty Advisor for UW Bioengineering Capstone Design Project – Jared Houghtaling (Spring 2014)
13. Faculty Advisor for UW Bioengineering Capstone Design Project – Brittney McKenzie (Spring 2013)
14. Faculty Advisor for UW Bioengineering Capstone Design Project – Tinny Liang (Spring 2013)
15. Supervisor for Research Scientist Nikita Midamba (October 2012 – June 2013)

C. Scholarship and Creative Activity

C1. Publications

The candidate's role on joint publications is indicated as part of each entry; if nothing has been included, the candidate's involvement was minor. **The candidate should indicate in bold font students for which the candidate serves as a major advisor**.

C1.1. Refereed Books & Book Chapters

None, but please see invited book chapters under C1.6

C1.2. Refereed Journal Publications

1. A. Switalla, **L. Wentland**, and E. Fu, 3D printing-based microfluidic devices in fabric, *Journal of Micromechanics and Microengineering* (2023). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. A. Switalla was an undergraduate researcher in my group and L. Wentland obtained her Ph.D. under my supervision and was then a post-doc in my group.)
2. **L. Wentland**, J. Cook, J. Minzlaff, S. A. Ramsey, M. Johnston, and E. Fu, Field-use device for the electrochemical quantification of carbamazepine levels in a background of human saliva, *Journal of Applied Electrochemistry,* doi.org/10.1007/s10800-022-01785-9 (2022). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. L. Wentland was a Ph.D. student in my group and J. Minzlaff was an undergraduate researcher in my group.)
3. **L. Wentland**, **C. Downs**, and E. Fu, Comparison of signal enhancement strategies for carbamazepine detection in undiluted human saliva using an electrochemical sensor with stencil-printed carbon electrodes, *Analytical Methods* 14, 3103-3114 (2022). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. L. Wentland was a Ph.D. student in my group and C. Downs obtained his Ph.D. under my supervision and was then a post-doc in my group.)
4. E. Fu and **L. Wentland**, A survey of 3D printing technology applied to paper microfluidics, *Lab on a Chip* 22, 9-25 (2022). (A PhD student in my group, L. Wentland, and I shared co-first authorship. We both contributed to all aspects of this critical review, including curating the literature, writing critiques, making figures, and synthesizing our position statements.
5. **L. Wentland**, R. Polaski, and E. Fu, Dry storage of multiple reagent types within a paper microfluidic device for phenylalanine monitoring, *Analytical Methods* 13, 660-671 (2021). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. L. Wentland was a Ph.D. student in my group and R. Polaski was an undergraduate researcher in my group.)
6. **C. Downs**, M. Milovancev, and E. Fu, Rational design and characterization of a lateral flow assay for canine C-reactive protein in wound exudate, *Talanta* 220, 121319 (2020). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. C. Downs was a Ph.D. student in my group and M. Milovancev was our clinician collaborator in OSU Veterinary Medicine for this study.)
7. **L. Wentland**, R. Polaski, and E. Fu, Characterization methods in porous materials for the rational design of multi-step processing in the context of a paper microfluidic phenylalanine test, *Analytical Methods* 12, 768-780 (2020). (As senior author, I had a major role in

experimental design, analysis, interpretation, and writing. L. Wentland was a Ph.D. student in my group and R. Polaski was an undergraduate researcher in my group.)

8. **C. Downs**, A. Nejely, and E. Fu, Integrated wax valve for robust fluid control in an electrochemical fabric-based device, *Analytical Methods* 11, 5098-5017 (2019). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. C. Downs was a Ph.D. student in my group and A. Nejely was an undergraduate researcher in my group.)
9. **C. Downs**, A. Nejely, and E. Fu, Disposable fabric-based electrochemical sensors fabricated from wax-transfer-printed fluidic cells and stencil-printed electrodes, *Analytical Methods* 10, 3696-3703 (2018). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. C. Downs was a Ph.D. student in my group and A. Nejely was an undergraduate researcher in my group.)
10. C. Anderson, C. Holstein, E. Strauch, S. Bennett, A. Chevalier, J. Nelson, E. Fu, D. Baker, and P. Yager, A rapid diagnostic assay for intact influenza virus using a high affinity hemagglutinin binding protein, *Analytical Chemistry* 89, 6608-6615 (2017). (I provided input into the work described in this article, serving as a project manager under PI P. Yager and as a committee member of graduate student C. Holstein.)
11. J. Imdieke and E. Fu, Porous stamp-based reagent patterning for lateral flow assays, *Analytical Methods* 9, 2751-2756 (2017). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. J. Imdieke was an undergraduate researcher in my group.)
12. S. Huang, K. Abe, S. Bennett, T. Liang, P. Ladd, L. Yokobe, C. Anderson, K. Shah, J. Bishop, M. Purfield, P. Kauffman, S. Paul, A. Welch, B. Strelitz, K. Follmer, K. Pullar, L. Sanchez-Erebia, E. Gerth-Guyette, G. Domingo, E. Klein, J. Englund, E. Fu, and P. Yager, Disposable autonomous device for rapid swab-to-result diagnosis of influenza, *Analytical Chemistry* 89, 5776-5783 (2017). (I provided critical input into the work described in this article, serving as a project manager under PI P. Yager and as a co-author of the proposal associated with this work.)
13. A. To, **C. Downs**, and E. Fu, Wax transfer printing to enable robust boundary definition in devices based on non-standard porous materials, *Journal of Micromechanics and Microengineering* 27, 057001 (6pp) (2017). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. A. To was an undergraduate researcher/Honors College student in my group and C. Downs was a Ph.D. student in my group.)
14. E. Fu and **C. Downs**, Progress in the development and integration of fluid flow control tools in paper microfluidics, *Lab on a Chip* 17, 614-628 (2017). (As first author, I was the primary author of this critical review. C. Downs was a Ph.D. student in my group.)
15. **T. Liang**, **R. Robinson**, J. Houghtaling, G. Fridley, S. A. Ramsey, and E. Fu, Investigation of reagent delivery formats in a multivalent malaria sandwich immunoassay and implications for assay performance, *Analytical Chemistry* 88, 2311-2320 (2016). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. T. Liang and R. Robinson were graduate students in my group, and J. Houghtaling was an undergraduate researcher/capstone student in my group.)
16. **R. Robinson**, L. Wong, R. J. Monnat Jr., and E. Fu, Development of a whole blood paper-based device for phenylalanine detection in the context of PKU therapy monitoring, *Micromachines* 7, 28-37 (2016). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. R. Robinson was a graduate student in my group and L. Wong was an undergraduate researcher/Honors College student in my group.)

17. C. A. Holstein, A. Chevalier, S. Bennett, C. E. Anderson, K. Keniston, C. Olsen, B. Li, B. Bales, D. R. Moore, E. Fu, D. Baker, and P. Yager, Immobilizing affinity proteins to nitrocellulose: a toolbox for paper-based assay developers, *Analytical and Bioanalytical Chemistry* 408, 1335-1346 (2015). (I provided key input into the work described in this article, serving as a project manager under PI P. Yager and as a committee member of graduate student C. Holstein.)
18. B. Toley, J. Wang, M. Gupta. J. Buser, L. Lafleur, B. Lutz, E. Fu, and P. Yager, A versatile valving toolkit for automating fluidic operations in paper microfluidic devices, *Lab on a Chip* 15, 1432-1444 (2015). (I provided key input into the early work described in this article as a co-mentor to the post-doc B. Toley.)
19. **G. Thiessen**, **R. Robinson**, K. De Los Reyes, R. Monnat, and E. Fu, Conversion of a laboratory-based test for phenylalanine detection to a simple paper-based format and implications for PKU screening in low-resource settings, *Analyst* 140, 609-615 (2015). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. G. Thiessen and R. Robinson were graduate students in my group, and K. De Los Reyes was an undergraduate researcher/capstone student in my group.)
20. E. Fu, Enabling robust quantitative readout in an equipment-free model of device development, *Analyst* 139, 4750-4757 (2014). (I was the sole author of this article.)
21. S. Ramachandran, E. Fu, B. Lutz, and P. Yager, Long-term dry storage of an enzyme-based reagent system for ELISA in point-of-care devices, *Analyst* 139, 1456-1462 (2014). (I provided key input into the work described in this article, including on the topic of experimental design and analysis.)
22. B. Toley, B. McKenzie, T. Liang, J. Buser, P. Yager, and E. Fu, Tunable-delay shunts for paper microfluidic devices, *Analytical Chemistry* 85, 11545-11552 (2013). (As senior author, I had a major role in experimental design, analysis, interpretation, and editing. B. McKenzie and T. Liang were undergraduate researchers/capstone students in my group, and I co-mentored the post-doc B. Toley.)
23. J. Houghtaling, T. Liang, **G. Thiessen**, and E. Fu, Dissolvable bridges for manipulating fluid volumes in paper networks, *Analytical Chemistry* 85, 11201-11204 (2013). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. G. Thiessen was a graduate student in my group, and T. Liang and J. Houghtaling were undergraduate researchers/capstone students in my group.)
24. S. Byrnes, **G. Thiessen**, and E. Fu, Progress in the development of paper-based diagnostics for low-resource point-of-care settings, *Bioanalysis* 5, 2821-2836 (2013). (I co-wrote this article. G. Thiessen was a graduate student in my group.)
25. P. Spicar-Mihalic, B. Toley, J. Houghtaling, T. Liang, P. Yager, and E. Fu, CO_2 laser cutting and ablative etching for the fabrication of paper-based devices, *Journal of Micromachining and Microengineering* 23, 067003 (2013). (As senior author, I had a major role in experimental design, analysis, interpretation, and writing. J. Houghtaling and T. Liang were undergraduate researchers/capstone students in my group. B. Toley was a post-doc I co-mentored, and P. Spicar-Mihalic was a post-doc I worked closely with on the project.)
26. B. Lutz, T. Liang, E. Fu, S. Ramachandran, P. Kaffman, and P. Yager, Dissolvable fluidic time delays for programming multi-step assays in instrument-free paper diagnostics, *Lab on a Chip* 13, 2840-2847 (2013). (I provided key input into the work described in this article, and an undergraduate student under my supervision, T. Liang, performed some of the experiments.)
27. G. Fridley, H. Le, E. Fu, and P. Yager, Controlled release of dry reagents in porous media for tunable temporal and spatial distribution upon rehydration, *Lab on a Chip* 12, 4321-4327 (2012). (I provided key input into the work described in this article.)

28. E. Fu, T. Liang, P. Spicar-Mihalic, J. Houghtaling, S. Ramachandran, and P. Yager, A two-dimensional paper network format that enables simple multi-step assays for use in low-resource settings in the context of malaria antigen detection, *Analytical Chemistry* 84, 4574-4579 (2012). (As first author, I wrote the initial draft of the manuscript and had a major role in experimental design, collection, analysis, and interpretation. T. Liang and J. Houghtaling were undergraduate researchers/capstone students in my group.)
29. E. Fu, T. Liang, J. Houghtaling, S. Ramachandran, S. Ramsey, B. Lutz, and P. Yager, Enhanced sensitivity of lateral flow tests using a two-dimensional paper network format, *Analytical Chemistry* 83, 7941-7946 (2011). (As first author, I wrote the initial draft of the manuscript and had a major role in experimental design, collection, analysis, and interpretation. T. Liang and J. Houghtaling were undergraduate researchers/capstone students in my group.)
30. B. Lutz, P. Trinh, C. Ball, E. Fu, and P. Yager, Two-dimensional paper networks: programmable fluidic disconnects for multi-step processes in shaped paper. *Lab on a Chip* 11, 4274-4278 (2011). (I provided some input into the work described in this article. Overall, my role was minor.)
31. E. Fu, S. A. Ramsey, P. Kauffman, B. Lutz, and P. Yager, Transport in two-dimensional paper networks, *Microfluidics and Nanofluidics* 10, 29-35 (2011). (As first author, I wrote the initial draft of the manuscript and handled the experimental design, collection, analysis, and interpretation with some input from co-authors.)
32. J. Osborn, B. Lutz, E. Fu, P. Kauffman, D. Stevens, and P. Yager, Microfluidics without pumps: translating adjacent flows onto paper networks, *Lab on a Chip* 10, 2659-2665 (2010). (I provided some key input into the work described in this article.)
33. P. Kauffman, E. Fu, B. Lutz, and P. Yager, Visualization and measurement of flow in two-dimensional paper networks, *Lab on a Chip* 10, 2614-2617 (2010). (I had a major role in experimental design and the writing of the article.)
34. E. Fu, P. Kauffman, B. Lutz, and P. Yager, Chemical signal amplification in two-dimensional paper networks, *Sensors and Actuators B* 149, 325-328 (2010). (As first author, I wrote the initial draft of the manuscript and handled the experimental design, collection, analysis, and interpretation with some input from co-authors.)
35. E. Fu, B. Lutz, P. Kauffman, P. Yager, Controlled reagent transport in disposable 2D paper networks, *Lab on a Chip* 10, 918-920 (2010). (As first author, I wrote the initial draft of the manuscript and handled the experimental design, collection, analysis, and interpretation with some input from co-authors.)
36. E. Fu, K. E. Nelson, S. A. Ramsey, J. O. Foley, K. Helton, P. Yager, Modeling of a competitive microfluidic heterogeneous immunoassay: sensitivity of the assay response to varying system parameters, *Analytical Chemistry* 81, 3407-3413 (2009). (As first author, I wrote the initial draft of the manuscript and handled the experimental design, collection, analysis, and interpretation with assistance from co-authors.)
37. K. Helton, K. Nelson, E. Fu, and P. Yager, Conditioning saliva for use in a microfluidic sensor, *Lab on a Chip* 8, 1847-1851 (2008). (I provided some input to the work described in this article. Overall, my role was minor.)
38. M. Hasenbank, T. Edwards, E. Fu, R. Garzon, T. Kosar, M. Look, A. Mashadi-Hossein, and P. Yager, Demonstration of multi-analyte patterning using piezoelectric inkjet printing of multiple layers, *Analytica Chimica Acta* 611, 80-88 (2008). (I provided input to the work described in this article.)
39. J. Foley, A. Mashadi-Hossein, E. Fu, B. Finlayson, and P. Yager, Experimental and model investigation of the time-dependent 2-dimensional distribution of binding in a herringbone microchannel, *Lab on a Chip* 8, 557-564 (2008). (I helped supervise graduate student J. Foley and contributed input to the work described in the article.)
40. J. Foley, E. Fu, L. Gamble, and P. Yager, Microcontact printed antibodies on gold surfaces: Function, uniformity, and silicone contamination, *Langmuir* 24, 3628-3635 (2008). (I helped

supervise graduate student J. Foley and contributed input to the work described in the article.)

41. E. Fu, S. A. Ramsey, P. Yager, Dependence of the signal amplification potential of colloidal gold nanoparticles on resonance wavelength in surface plasmon resonance-based detection, *Analytica Chimica Acta* 599, 118-123 (2007). (As first author, I wrote the initial draft of the manuscript and handled the experimental design, collection, analysis, and interpretation with assistance from co-authors.)
42. M. Hasenbank, E. Fu, J. Nelson, D. Schwartz, and P. Yager, Investigation of heterogeneous electrochemical processes using multi-stream laminar flow in a microchannel, *Lab on a Chip* 7, 441-447 (2007). (I helped supervise graduate student M. Hasenbank and contributed to experimental design, analysis, interpretation, and writing of the article.)
43. K. Hawkins, M. Steedman, R. Baldwin, E. Fu, S. Ghosal, and P. Yager, A method for characterizing adsorption of flowing solutes to microfluidic surfaces, *Lab on a Chip* 7, 281-285 (2007). (I provided some input to the work described in this article. Overall, my role was minor.)
44. T. Chinowsky, M. Grow, K. Johnston, K. Nelson, T. Edwards, E. Fu, and P. Yager, Compact surface plasmon resonance imaging system for saliva-based medical diagnostics, *Biosensors and Bioelectronics* 22, 2208-2215 (2007). (I provided some input to the work described in this article. Overall, my role was minor.)
45. E. Fu, S. Ramsey, J. Chen, T. Chinowsky, B. Wiley, Y. Xia, and P. Yager, Resonance wavelength-dependent signal of absorptive particles in surface plasmon resonance-based detection, *Sensors and Actuators B* 123, 606-613 (2007). (As first author, I wrote the initial draft of the manuscript and handled the experimental design, collection, analysis, and interpretation with assistance from co-authors.)
46. M. Hasenbank, E. Fu, and P. Yager, Lateral spread of an amplification signal using an enzymatic system on a conductive surface, *Langmuir* 22, 7451-7453 (2006). (I helped supervise graduate student M. Hasenbank and contributed to experimental design, analysis, interpretation, and writing of the article.)
47. E. Fu, S. Ramsey, R. Thariani, and P. Yager, One-dimensional surface plasmon resonance imaging system using wavelength interrogation, *Review of Scientific Instruments* 77, 076106 (2006). (As first author, I wrote the initial draft of the manuscript and handled the experimental design, collection, analysis, and interpretation with assistance from co-authors.)
48. P. Yager, T. Edwards, E. Fu, K. Helton, K. Nelson, M. Tam, and B. Weigl, Microfluidic diagnostic technologies for global public health, *Nature* 442, 412-418 (2006). (I contributed key text to the article.)
49. M. S. Munson, M. S. Hasenbank, E. Fu, and P. Yager, Suppression of non-specific adsorption using sheath flow, *Lab on a Chip* 4, 438-445 (2004). (I contributed experimental work to the article.)
50. E. Fu, T. Chinowsky, J. Foley, J. Weinstein, and P. Yager, Characterization of a wavelength-tunable surface plasmon resonance microscope, *Review of Scientific Instruments* 75, 2300-2304 (2004). (As first author, I wrote the initial draft of the manuscript and handled the experimental design, collection, analysis, and interpretation with assistance from co-authors.)
51. E. Fu, J. Foley, and P. Yager, Wavelength-tunable surface plasmon resonance microscope, *Review of Scientific Instruments* 74, 3182-3184 (2003). (As first author, I wrote the initial draft of the manuscript and handled the experimental design, collection, analysis, and interpretation, with assistance from co-authors.)
52. E. S. Fu, X. S. Wang, and E. D. Williams, Characterization of structures fabricated by atomic force microscope lithography, *Surface Science* 438, 58-67 (1999). (This article is based on a chapter of my dissertation.)
53. C. J. Lanczycki, R. Kotlyar, E. Fu, Y.-N. Yang, E. D. Williams, and S. Das Sarma, Growth of Si on the Si(111) surface, *Physical Review B* 57, 13132-13148 (1998). (I helped collect data for the article.)

54. E. S. Fu, D.-J. Liu, M. D. Johnson, J. D. Weeks, and E. D. Williams, The effective charge in surface electromigration, *Surface Science* 385, 259-269 (1997). (As first author, I co-wrote the initial draft of the manuscript, collected and analyzed the experimental data, and had key input into the experimental design and interpretation.)
55. D.-J. Liu, E. S. Fu, M. D. Johnson, J. D. Weeks, and E. D. Williams, Relaxation of the step profile for different microscopic mechanisms, *Journal of Vacuum Science and Technology B* 14, 2799-2808 (1996). (I had a major role in the experimental work that is described in the article.)
56. E. S. Fu, M. D. Johnson, D.-J. Liu, J. D. Weeks, and E. D. Williams, Size-scaling in the decay of metastable structures, *Physical Review Letters* 77, 1091-1094 (1996). (As first author, I co-wrote the initial draft of the manuscript, collected and analyzed the experimental data, and had key input into the experimental design and interpretation.)
57. Y.-N. Yang, E. S. Fu, and E. D. Williams, An STM study of current-induced step bunching on Si(111), *Surface Science* 356, 101-111 (1996). (My role was minor.)
58. E. D. Williams, E. Fu, Y.-N. Yang, D. Kandel, and J. D. Weeks, Measurement of the anisotropy ratio during current-induced step bunching, *Surface Science* 336, L746-L752 (1995). (I collected and analyzed the experimental data, and contributed text to the article.)

C1.3. Peer-Reviewed Archival Conference Publications

Please note that conference publications are not emphasized in my subfield.

The following papers appeared in archival proceedings that were distributed to libraries (the next section covers other types of proceedings). The acceptance rate is indicated as part of the entry whenever the selection process was rigorous.

1. T. M. Chinowsky, T. Mactutis, E. Fu and P. Yager, Optical and electronic design for a high performance surface plasmon resonance imager, Proceedings SPIE 5261, 173-182, Smart Medical and Biomedical Sensor Technology, B. Cullum, ed. (2004). (I provided some input to the work described in this article. Overall, my role was minor.)
2. J. Schneir, T. McWaid, R. Dixson, V. Tsai, J. Villarrubia, E. D. Williams, and E. Fu, Progress on Accurate Metrology on Pitch, Height, Roughness, and Width Artifacts Using an Atomic Force Microscope, Proceedings SPIE 2439, 401-415, (1995). (My role was minor.)

C1.4. Other Peer-Reviewed Publications

The following papers appeared in proceedings that were distributed primarily to attendees (as CDs, printed volumes, availability through a public website, etc.).

1. M. Hasenbank, E. Fu, and P. Yager, Spreading small signals over large areas: electrochemical amplification in an SPR imaging sensor array, in Micro Total Analysis Systems 2006, T. Kitamori, H. Fujita, and S. Hasebe, eds., Society for Chemistry and Micro-Nano Systems, 1286-1288 (2006). (I helped supervise graduate student M. Hasenbank and contributed to experimental design, analysis, interpretation, and writing of the article.)
2. E. Fu, J. Foley, J. Chen, B. Wiley, Y. Xia, and P. Yager, Wavelength-dependent signal amplification potential of gold nanocage tags for surface plasmon resonance (SPR) imaging, in Micro Total Analysis Systems 2005, K. F. Jensen, J. Han, D. J. Harrison, and J. Voldman, eds., Transducer Research Foundation, 1510-1512 (2005). (As first author, I wrote the initial draft of the article and handled the experimental design, collection, analysis, and interpretation with assistance from co-authors.)
3. M. Hasenbank, E. Fu, and P. Yager, Investigation of a rapid microfluidic surface plasmon resonance imaging (SPRI) signal amplification scheme based on the rate of formation of an enzyme-catalyzed precipitate, in Micro Total Analysis Systems 2005, K. F. Jensen, J. Han, D. J. Harrison, and J. Voldman, eds., Transducer Research Foundation, 485-487 (2005). (I

helped supervise graduate student M. Hasenbank and contributed to experimental design, analysis, interpretation, and writing of the article.)

4. M. Blaylock, E. Fu, and P. Yager, Parallel microfluidic processing of protein assembly quantified using SPR microscopy, in Micro Total Analysis Systems 2004, T. Laurell, J. Nilsson, K. Jensen, D. J. Harrison, and J. Kutter, eds., The Royal Society of Chemistry, 354-356 (2004). (I helped collect experimental data for this article.)
5. J. Foley, E. Fu, and P. Yager, T-sensor generated refractive index gradients: calibration of a SPR microscope, in Micro Total Analysis Systems 2003, M. A. Northup, K. F. Jensen, and D. J. Harrison, eds., Mesa Monographs, 967-970 (2003). (I helped supervise graduate student J. Foley and contributed to experimental design, analysis, interpretation, and writing of the article.)
6. E. D. Williams, E. Fu, and B. Li, Evolution of Morphology During Etching of Si, Materials Research Society Symposium Proceedings 466, 157-166, (1997). (I contributed to the experimental work described in this article.)

C1.5. Papers Currently under Peer Review

E. Fu, **K. Khederlou**, **N. Lefevre**, S.A. Ramsey, M.L. Johnston, and **L. Wentland**, Progress on electrochemical sensing of pharmaceutical drugs in complex biofluids, submitted to *Chemosensors* (2023).

C1.6. Other Publications

1. E. Fu, Paper-based microfluidic devices for POC testing in low-resource settings, in Applications of Microfluidic Systems in Biology and Medicine, M. Tokeshi, ed., Springer, New York, NY, 325-352 (2019). (I was the sole author of this book chapter.)

2. T. Liang and E. Fu**,** High-performance paper microfluidic malaria test for low-resource settings, in Frugal Innovation in Bioengineering for the Detection of Infectious Diseases, A. Chavali and R. Ramji, ed., Springer International Publishing AG, Cham, Switzerland, 39-55 (2018). (As senior author, I made major contributions to the writing and editing of this book chapter. T. Liang was a graduate student in my group.)

3. E. Fu, B. Lutz, and P. Yager, Two-dimensional paper networks for automated multi-step processes in point-of-care diagnostics, in Microfluidics and Nanotechnology for Biosensing to the Single Molecule Limit, E. Lagally and K. Iniewski, ed., Taylor and Francis Group, Boca Raton, FL, 151-165 (2014). (This is the same contribution as in 4, and is noted in this book as reproduced from that earlier work.)

4. E. Fu, B. Lutz, and P. Yager, Two-dimensional paper networks for automated multi-step processes in point-of-care diagnostics, in Technologies for Smart Sensors and Sensor Fusion, K. Yallup and K. Iniewski, ed., Taylor and Francis Group, Boca Raton, FL, 47-60 (2014). (As first author, I wrote the initial draft of this book chapter and oversaw all subsequent versions that incorporated edits from my co-authors.)

5. E. Fu and B. Lutz, Diagnostics for Global Health, Global Health & Development Section, Project Syndicate, November 7, 2013. (As first author, I wrote the initial draft of this article and oversaw subsequent versions that incorporated edits from my co-author.)

6. E. Fu, P. Yager, P. N. Floriano, N. Christodoulides, and J. McDevitt, Perspective on Diagnostics for Global Health, *IEEE Pulse* November/December issue (2011). (As first author, I contributed about 50% of the text and oversaw the incorporation of text and edits from my co-authors.)

7. D. Stevens, K. Nelson, E. Fu, J. Foley, and P. Yager, Microfluidic Immunoassays, in Methods in Bioengineering: Microfabrication and Microfluidics, J. Zahn, ed., Artech House, Boston, MA, 225-244 (2010). (I co-wrote this book chapter that integrated two original manuscripts, one first-authored by D. Stevens and the other first-authored by K. Nelson.)

8. E. Fu, T. Chinowsky, K. Nelson, and P. Yager, SPR Imaging for Clinical Diagnostics, in SPR Handbook, R. Schasfoort and A. Tudos, eds., The Royal Society of Chemistry, Cambridge, UK, 313-331 (2008). (As first author, I wrote the initial draft of this book chapter, drawing from the previous work of my co-authors, and oversaw subsequent versions that incorporated edits from my co-authors.)

9. E. Fu, T. Chinowsky, K. Nelson, K. Johnston, T. Edwards, K. Helton, M. Grow, J. W. Miller, and P. Yager, An SPR imaging-based salivary diagnostics system for the detection of small molecule analytes, *Annals of the New York Academy of Sciences* 1098, 335-344 (2007). (As first author, I contributed significant text and oversaw the incorporation of text and edits from my co-authors.)

C2. Professional Meetings, Symposia, and Conferences

C2.1. Presentations to Professional Groups

My Presentations

- Presentation, Point-of-care Diagnostics for Global Health & Biodefense, Virtual format, "Point-of-care monitoring of therapeutic drug levels for optimal dosing," June 2023
- Contributed Talk, Microscale Separations and Bioanalysis Conference in Sensors and Biomarkers Session, Tallahassee, FL, "Signal to noise enhancement for carbamazepine detection in saliva: Progress in the development of a field-use device for the monitoring of epilepsy therapy drugs in saliva," May 2023
- Invited Talk, Hewlett Packard Microtech Affinity Group Tech Talk, Virtual format, "Progress in the Development of 'Paper' Microfluidic Devices for Precision Health Applications," September 2021
- Featured Presentation, Oregon Bioengineering Symposium 2019, Corvallis, OR, "Porous materials-based microfluidic sensors for field use in precision health applications," November 2019
- Invited Keynote Talk, Microscale Separations and Bioanalysis Conference in Microfluidic Systems Innovations Session, Corvallis, OR, "Development and applications of porous materials-based microfluidic devices," March 2019
- Invited Talk, American Chemical Society Conference in Paper Devices for Bioanalysis Session I, Boston, MA, "Development of porous materials-based microfluidic devices for precision health applications," August 2018
- Invited Talk, 101st Canadian Chemistry Conference in Stingy with Sample: Microfluidic Analysis Platforms Session, Edmonton, Alberta, "Development of porous materials-based microfluidic devices for precision health applications," May 2018
- Invited Talk, 3rd Microfluidics Congress: Utilizing microfluidic technologies as a tool for progressing medical research and patient care, London, England, "Development of porous microfluidic devices for precision health applications," December 2017
- Invited Talk, Plenary Session of the AES Electrophoresis Society, San Francisco, CA, "Engineering paper microfluidic sensors for point-of-care applications in low-resource settings," November 2016

- Invited Talk, SELECTBIO Point-of-care Diagnostics, Madrid, Spain, "Paper microfluidic sensors for point-of-care diagnostic applications in low-resource settings," March 2016
- Invited Talk, IEEE NanoMed, Honolulu, HI, "Paper microfluidics for the conversion of lab-based testing to the home; example of phenylalanine monitoring," November 2015
- Contributed Talk, *AVS Annual Meeting, San Jose CA* "Paper-based device for home phenylalanine monitoring from a sample of whole blood," October 2015
- Contributed Talk, *BMES Annual Meeting, Tampa FL* "Home phenylalanine monitoring for PKU therapy in a paper-based device from whole blood," October 2015
- Contributed Talk, *BMES Annual Meeting, San Antonio TX* "Conversion of a laboratory-based colorimetric assay to a field-use paper-based test for the detection of phenylketonuria in newborns," October 2014
- Invited Talk, Point-of-Care Diagnostics Seminar Series, Berkeley, CA, "Engineering paper networks for point-of-care diagnostic applications in low-resource settings," October 2013
- Contributed Talk, *BMES Annual Meeting, Seattle WA*, "Tunable time-delays for paper microfluidic devices," September 2013
- Invited Talk, CMOS Emerging Technologies Research, Whistler, British Columbia, "Paper microfluidic bioassays for point-of-care diagnostics," July 2013
- Invited Talk, Microwave Sensors and Biochips for Biomolecules and Cells Characterization Workshop at the IEEE International Microwave Symposium, Seattle, WA, "Microfluidics for point-of-care diagnostic applications in low-resource settings," June 2013
- Invited Talk with B. Lutz and P. Yager, GE Global Research, Niskayuna, NY, "Introduction to paper microfluidics," June 2012
- Contributed Talk, *BMES Annual Meeting, Hartford CT*, "Two-dimensional paper network format for amplified lateral flow assays," October 2011
- Contributed Talk, *BMES Annual Meeting, Austin TX*, "Engineering paper networks for improved assay performance," October 2010
- Invited Talk with B. Lutz and P. Yager, Naval Research Labs, Chemistry Division, Washington D.C., "Microfluidics 2.0," August 2010
- Invited Talk with B. Lutz and P. Yager, National Institute of Biomedical Imaging and Bioengineering, Bethesda, MD, "Microfluidics 2.0," August 2010
- Contributed Talk, *Oral-based Diagnostics Conference, Lake Lanier Islands GA*, "An SPR Imaging-Based Salivary Diagnostics System for the Detection of Small Molecule Analytes," October 2006
- Contributed Talk, *AVS National Meeting, Minneapolis MN*, "Study of the Decay of Metastable Structures on Silicon," October 1995

Graduate Student or Post-doc Presentations (presenting person's name is bolded)

- Contributed Poster and Lightning Talk, **L. Wentland**, J. Cook, J. Minzlaff, M. Johnston, S. Ramsey, and E. Fu, *Oregon Bioengineering Symposium*, Corvallis, OR, "Towards a field-use electrochemical sensor for carbamazepine quantification in saliva," October 2022

  (Lael won first-place in the lightning talk competition)

- Contributed Talk, **L. Wentland**, C. Downs, and E. Fu, *SWE Annual Conference,* Indianapolis, IN, "Electrochemical sensing in whole human saliva: Towards personalized drug dosage recommendations of carbamazepine" October 2021

- Contributed Talk, **L. Wentland**, C. Downs, and E. Fu, *BMES Annual Meeting*, Orlando, FL, "Carbamazepine detection in whole human saliva using an electrochemical sensor with stencil-printed electrodes," October 2021
- Contributed Talk, **L. Wentland**, C. Downs, and E. Fu, *Microscale Separations and Bioanalysis Conference (virtual)*, "Carbamazepine detection in whole human saliva using an electrochemical sensor with stencil-printed electrodes," July 2021
- Contributed Poster, **L. Wentland**, R. Polaski, and E. Fu, *BMES Annual Meeting (virtual)*, "Dry reagent storage in paper-based diagnostics: development towards a phenylalanine home monitor," October 2020
- Contributed Talk, **C. Downs** and E. Fu, *Pittcon Analytical Chemistry and Applied Spectroscopy Conference,* Chicago IL, "Enabling fluidic control in fabrics using a wax-based phase change valve with integrated heater," March 2020
- Contributed Talk and Poster, **L. Wentland**, R. Polaski, and E. Fu, *SWE Local Conference*, "Towards personal health monitoring: Optimizing reaction conditions in a paper-based phenylalanine test," January 2020
- Contributed Poster, **C. Downs**, A. Nejely, and E. Fu, *Microscale Separations and Bioanalysis Conference*, Corvallis, OR, "Electronically addressable wax-based phase-change valve for fabric-based microfluidic devices," March 2019
- Contributed Poster, **C. Downs**, A. Nejely, and E. Fu, *Oregon Bioengineering Symposium*, Corvallis, OR, "Towards Wearable Fabric Sensors: Enabling Fluidic Control in Fabrics Using a Wax-based Valve," November 2019
- Contributed Poster, **C. Downs**, A. Nejely, and E. Fu, *BMES Annual Meeting*, Phoenix, AZ, "Wax transfer printing-based fabrication of cloth electrochemical sensors," October 2017

Undergraduate Student Presentations (presenting person's name is bolded)

- Contributed Poster, **A. Switalla**, L. Wentland, and E. Fu, *BMES Annual Meeting*, San Antonio, TX, "3D printing-based microfluidic devices in fabric," October 2022
- Contributed Poster, **J. Minzlaff**, L. Wentland, and E. Fu, *BMES Annual Meeting*, San Antonio, TX, "Field use electrochemical sensor for detection of carbamazepine in water," October 2022
- Contributed Poster, **J. Imdieke** and E. Fu, *BMES Annual Meeting*, Tampa, FL, "Low-cost method for patterning antibodies onto nitrocellulose in lateral flow immunoassays," October 2015

C2.2. Participation at Invitational Workshops

- Panelist at the NSF-sponsored Workshop on Papertronics: Paper-based Electronics for the 21st Century, Arlington, VA, September 2016

C3. Patents Filed and In Process

1. Sequential delivery of fluid volumes and associated devices, systems and methods, U.S. Patent No. 11,098,346 B2 (with J. Bishop and 13 others).
2. Reagent patterning in capillarity-based analyzers and associated systems and methods, U.S. Patent No. 9,528,987 (with P. Yager, B. Lutz, G. Fridley, H. Le, and P. Kauffman).
3. Chemical sensor enhanced by direct coupling of redox enzyme to conductive surface; U.S. Patent No. 7,364,886, 2010 (with M. Hasenbank and P. Yager).

4. Signal amplification method for surface plasmon resonance-based chemical detection; U.S. Patent No. 7,405,054, 2008 (with M. Hasenbank, K. Nelson, and P. Yager).
5. Wavelength tunable surface plasmon resonance sensor; U.S. Patent No. 7,030,989, 2006 (with P. Yager).

D. Service

D1. University Service

- OSU COE FSC 2022-2023
- OSU Bioengineering Graduate Program Curriculum Committee, 2020-present
- OSU/UO Joint Bioengineering Graduate Program Executive Committee, 2020-present
- OSU CBEE Faculty Status Committee, 2019-2023
- OSU Humanitarian Engineering Undergraduate/Graduate Program Committee, 2017-present
- OSU Bioengineering Faculty Search Committee – Chair, 2020-2021
- OSU CBEE Ongoing Education Committee, 2020-2021
- OSU COE Orange & Black Day Volunteer, 2021, 2022, 2023
- OSU BMES Student Club Advisor, 2020-present
- OSU CBEE ABET Committee, 2019-2021 (period covers an evaluation year)
- OSU Search Advocate Training, 2020, Update Training in 2022
- OSU CBEE Teaching Task Force, 2019
- OSU COE Graduate Research Showcase Poster Judge, 2019
- OSU Bioengineering Faculty Search Committee, 2016-2017, 2018-2019, 2021-2022, 2023-
- OSU COE CIC Committee 2020
- OSU Bioengineering Admissions and Recruiting Committee, 2016-2017, 2018-2019
- OSU COE Change Team, 2016-2018
- OSU CBEE Inclusivity Committee, 2016
- OSU CHE Graduate Student Progression Subcommittee – Chair, 2015-2016
- OSU ADVANCE Seminar Participant, 2015
- OSU Chemical Engineering Graduate Committee, 2014-2016
- OSU COE Strategic Planning Task Force 2, 2014
- OSU CBEE Interim Head and Head Search Committee, 2014
- OSU Host Lab for SESEY Students, 2014, 2015, 2016, 2017, 2018, 2019, 2022
- UW Bioengineering Student Affairs Committee Member, 2011-2013
- UW Chemical Engineering Faculty Search Committee, 2011
- UW Bioengineering Safety Committee, 2004-2007
- UW Mary Gates Scholarship Reviewer, 2013
- UW Levinson Scholarship Reviewer, 2013
- UW Undergraduate Research Symposium Moderator, 2013
- UW Host for Board of Regents Bioengineering Lab Tour, 2012
- UW Engineering Discovery Days Participant, 2010, 2011
- University Seminars
    - OSU CBEE Seminar, "Progress in the Development of 'Paper' Microfluidic Devices for Precision Health Applications," May 2020

- Oregon University-Industry Bioscience Symposium, "Development of paper-based devices for precision health," June 2017
- OSU Veterinary Medicine Seminar, "Paper microfluidic sensors for point-of-care diagnostic applications in low-resource settings," January 2016
- OSU Pharmacy Seminar, "Paper microfluidic sensors for point-of-care diagnostic applications in low-resource settings," December 2015
- OSU Physics SSO Seminar, "Paper microfluidic sensors for point-of-care diagnostic applications in low-resource settings," May 2015
- OSU CBEE Seminar, "Engineering paper networks for point-of-care diagnostic applications in low-resource settings," January 2014
- UW Analytical Chemistry Seminar, "Engineering paper networks for point-of-care diagnostics in low-resource settings," May 2013

D2. Service to the Profession

D2.1. Journal Editorships

- PLOS ONE Editorial Board Academic Editor, February 2023-present

D2.2. Conference and Workshop Organization

- Member of the Organizing Committee, 5th Annual Oregon Bioengineering Symposium, Eugene, OR, 2023
- Co-chair of the BMES Nano and Micro Technologies Track, San Antonio, TX, October 2022 – Developed program for nine sessions within the track with my co-chair
- Co-chair of the 4th Annual Oregon Bioengineering Symposium, Corvallis, OR, October 2022 – Led program development and implementation for the in-person sessions (including presentations, posters, and industry panels) on the OSU campus and the associated virtual poster session
- Member of the Organizing Committee, Inaugural Oregon Bioengineering Symposium, Corvallis, OR, November 2019
- Member of the Conference Programming Committee, Microscale Separations and Bioanalysis, Corvallis, OR, March 2019
- Co-organizer, Capillarity-based Microfluidics for Bioanalysis Workshop, Seattle, WA, October 2011
- Member of the Local Organizing Committee, MicroTAS Conference, October 2011

D2.3. Conference Program Committees

- Session Chair, Innovations in Microfluidic Systems, Microscale Separations and Bioanalysis Conference, Virtual format, July 2021
- Session Chair, Bioanalytical Devices for Precision Health Applications, Microscale Separations and Bioanalysis Conference, Corvallis, OR, March 2019
- Session Chair, Case Studies and Applications in Medical Research, 3rd Microfluidics Congress: Utilizing microfluidic technologies as a tool for progressing medical research and patient care, London, England, December 2017

- Session Discussion Leader, Living Systems, Microfluidics, Physics and Chemistry of Forces, Fields, and Flows in Biological, Energy, and Manufacturing Applications of Microfluidics Gordon Research Conference, Barga, Italy, June 2017
- Session Co-Chair, Global Health II Session, BMES Annual Meeting, San Antonio, TX, October 2014
- Session Co-Chair, Emerging Technologies II Session, BMES Annual Meeting, Seattle, WA, September 2013
- Session Co-Chair, Sensors Session, CMOS Emerging Technologies Research, Whistler, British Columbia, July 2013

D2.4. Reviewing

- NIH proposal reviewing:
    - NIH BBBT Special Emphasis Panel: Special Topics in Instrumentation and Systems Development, ZRG1 BBBT-D(81), Video conference, November 2022
    - NIH Instrumentation and Systems Development (ISD) Study Section, Video conference, February 2022
    - NIH NCI Special Emphasis Review Panel, Novel Technologies for Global Health, ZCA1 TCRB-Q(J2), Video conference, November 2021
    - NIH PAR Panel: Technology Development and Research for Coronavirus Disease 2019 (Agenda Seq Num - 404451), Video conference, September 2020
    - NIH Interdisciplinary Molecular Sciences and Training (IMST)-J (10) Small Business: Biological Chemistry, Biophysics, and Assay Development Study Section, Video conference, July 2020
    - NIH Instrumentation and Systems Development (ISD) Study Section, Chevy Chase, MD, October 2019
    - NIH Instrumentation and Systems Development (ISD) Study Section, Chevy Chase, MD, October 2018
    - NIH Interdisciplinary Molecular Sciences and Training (IMST) Integrated Review Group ZRG1 Cellular and Molecular Technologies F (01)Q, Bethesda, MD, October 2017
    - NIH NHLBI Special Emphasis Review Panel, Onsite Tools and Technologies for Heart, Lung, and Blood Clinical Research Point-of-Care, ZHL1 CSR-O (O2) R, Bethesda, MD, July 2015
    - NIH NHLBI Special Emphasis Review Panel, Neonatal and Pediatric Blood Testing, ZHL1 CSR-C (O1) 1, Teleconference, June 2015
    - NIH Small Business: Basic and Integrative Bioengineering Special Emphasis Review Panel, ZRG1 IMST-M (13), Chevy Chase, MD, November 2014
    - NIH NHLBI Special Emphasis Review Panel, Microfluidic Blood Assays, ZHL1 CSR-C (S1), Bethesda, MD, June 2014
    - NIH NHLBI Special Emphasis Review Panel, Sickle Cell Disease Diagnostics, ZHL1 CSR-C (M1), Potomac, MD, March 2014
    - NIH SBIR/STTR Proposals, Stage One, Special Emphasis Panels, ZRG1 IMST 13, February 2013, May 2012, February 2012, October 2011
- NSF proposal reviewing:
    - Biosensing Program Panel, P190709, Video conference, February 2019
- Other proposal/project reviewing:

    - NIH-funded Atlanta Center for Microsystems-Engineered Point of Care Technologies, 2019
    - Pennsylvania Department of Health, 2017, 2020
    - Florida Department of Health, 2016
    - Thiel Foundation Breakout Labs, 2016
    - European Union Project Proposals for Horizon 2020, 2014
- Journal article reviewing:

  ACS Sensors, Analyst, Analytical and Bioanalytical Chemistry, Analytical Chemistry, Analytical Methods, Analytica Chimica Acta, Bioanalysis, Biomicrofluidics, Biosensors and Bioelectronics, Globalization and Health, Lab on a Chip, Nature Nanotechnology, Proceedings of the National Academy of Sciences, Review of Scientific Instruments, Sensors and Actuators B, Trends in Biotechnology
- Conference abstract reviewing:
    - Biomedical Engineering Society Annual Symposium Abstracts, 2023
    - Biomedical Engineering Society Annual Symposium Abstracts, 2022
    - Biomedical Engineering Society Annual Symposium Abstracts, 2021
    - Biomedical Engineering Society Annual Symposium Abstracts, 2020
    - Biomedical Engineering Society Annual Symposium Abstracts, 2017
    - Biomedical Engineering Society Annual Symposium Abstracts, 2014
    - Biomedical Engineering Society Annual Symposium Undergraduate Abstracts, 2014

E. Awards

- Warwick Family Faculty Scholar, Oregon State University, 2022-2025 ($30K over three years)
- Valley Foundation Biohealth Fellow, Oregon State University, 2022
- Carter Award (in recognition of outstanding and inspirational teaching), College of Engineering, Oregon State University, 2022
- Bioengineering Special Award, Department of Bioengineering, University of Washington, 2006