BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Liao, Joseph C.

eRA COMMONS USER NAME (credential, e.g., agency login): JOSEPH.LIAO

POSITION TITLE: Kathryn Simmons Stamey Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Harvard University, Cambridge, MA	AB	06/1993	Biology
Stanford University, Stanford, CA	MD	06/1997	Medicine
UCLA Medical Center, Los Angeles, CA	Internship/Residency	06/1999	General Surgery
UCLA Medical Center, Los Angeles, CA	Residency	06/2003	Urology
UCLA Sch. Engineering & Applied Science	Fellowship	06/2005	Molecular Diagnostics
UCLA Medical Center, Los Angeles, CA	Fellowship	06/2006	Endourology & Minimally Invasive Surgery

A. Personal Statement

I am an established urologic surgeon, physician scientist, and educator. My laboratory focuses on development of precision diagnostics for early-stage disease detection and imaging technologies to enhance minimally invasive surgery. As a board-certified, fellowship-trained urologist, I maintain an active clinical practice and draw research inspiration from my patients and their unmet needs. Leveraging diverse tools from biomedical and engineering sciences, my lab has advanced urine-based diagnostics, optical imaging, and image-guided surgery including 1) development of molecular diagnostics for rapid profiling of resistant bacterial pathogens; 2) biomarker discovery and validation of urinary liquid biopsy technologies for urothelial cancer; and 3) development of optical molecular imaging technologies and minimally invasive surgical tools. I have received continuous federal funding support (NIH, VA) over the past 20 years, and published over 200 manuscripts in journals including *Science Translational Medicine, Nature Medicine, Cell, Nature Communications, Cancer Cell, Cancer Discovery,* and *European Urology.* I am experienced in leading multidisciplinary teams, conducting human subject research, and developing and maintaining a biospecimen repository.

Over the course of my career, I have mentored over 40 students and trainees in basic, translational, and engineering sciences including clinical residents, postdoctoral scholars, graduate students, medical students, and undergraduates from diverse backgrounds. Many of my trainees are pursuing research careers at leading academic institutions nationally (Harvard, Stanford, OHSU, USC), internationally (HKUST, Bern, Technion), as well as in industry (Google, Cepheid, IBM). At Stanford, I direct the NIDDK-sponsored multidisciplinary K12 Urologic Research (KURe) career development program and serve as the site director of a multi-institutional U2C-TL1 network award to train the next generation of urologic physician scientists and researchers. In my capacity as vice chair for academic affairs at Stanford Urology and previously chief of urology at VA Palo Alto, I have also provided mentorship and counseling for junior faculty within and outside of urology, particularly those in pursuit of a career as a physician scientist.

Ongoing and recently completed projects I would like to highlight include:

NIH/NIDDK K12DK137162
Liao/Brooks (Role: Contact PI)
8/01/23 – 7/31/27
Multidisciplinary K12 Urologic Research at Stanford (KUReS) Career Development Program

NIH/NIDDK U2C/TL1 DK133488
9/15/23 – 6/30/28
Ku/Sakamoto/Stoller (Role: Associate Site Lead of TL1)
The **L**earners to Le**A**ders in benign **U**rology, benign **N**ephrology, and non-**C**ancer **H**ematology (LAUNCH) Program

NIH/NCI R01CA260426
Liao/Xing (Role: Contact PI)
01/01/22-12/31/27
Intraoperative integration of artificial intelligence during cystoscopic surgery

VA BLR&D Merit Review I01 BX004962
Liao (Role: PI)
10/01/20-09/30/24
Personalized assessment of bladder cancer treatment response using urinary molecular biomarkers

NIH/NCI R01 CA244526
Diehn/**Liao**/Alizadeh (Role: MPI)
07/01/20-06/30/25
Analysis of urine tumor nucleic acids for detection and personalized surveillance of bladder cancer

NIH/NIDDK R21DK131776
Liao/Wang (Role: Contact PI)
09/01/21-08/31/23 (no cost extension)
MagSToNE – a magnetic system for kidney stone fragment elimination

NIH/NIAID R01AI153133
Yang/Wong (Role: Co-Investigator)
06/15/20-05/31/25
Changing Cultures in Sepsis: Rapid single cell pathogen identification and antibiotic susceptibility testing directly from whole blood

Department of Veterans Affairs I01 BX005598
Liao (Role: PI)
09/01/21-08/31/25
BCCMA: Basic and Translational Mechanisms of Cancer Initiation of the Urothelium in Veterans Exposed to Carcinogens: Leveraging Artificial Neural Networks to Enhance Detection of Carcinoma in situ

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2021–	Professor of Urology, Stanford University
2021–	Vice Chair for Academic Affairs, Department of Urology, Stanford University
2019–	Co-Director, Endourology Fellowship, Department of Urology, Stanford University
2018–	Director of Research, Department of Urology, Stanford University
2013–2021	Associate Professor of Urology (with tenure), Stanford University
2006–2021	Chief of Urology, Veterans Affairs Palo Alto Health Care System, Palo Alto, CA
2006–2013	Assistant Professor of Urology, Stanford University
2006–	Associate Member at Stanford Canary Center for Cancer Early Detection (2022); Maternal & Child Health Research Institute (2021); Center for Artificial Intelligence in Medicine and Imaging (2019); Institute of Immunity, Transplantation, and Infection (2009); Stanford Cancer Institute (2007); Bio-X Program (2006)
2006–2009	Clinical Instructor of Urology, UCLA Medical Center, Los Angeles, CA

Other Experience and Professional Memberships

2024–	Steering Committee, CAIRIBU: Collaborating for the Advancement of Interdisciplinary Research in Benign Urology

2024– Member, New Technologies & Imaging Committee, AUA Education Council
2023– National Co-Chair, VA Multi-Cancer Early Detection partnership with NCI Cancer Screening Research Network
2023-2024 Principal Entrepreneur, Stanford Biodesign – Fogarty Innovation Invention Accelerator Program
2023 President, Engineering and Urology Society
2023 Member, Board of Directors, Endourology Society
2022– Member, Department of Veterans Affairs Scientific Merit Review Board: Oncology A (2023); Surgery (2022)
2018 Organizing Committee, IEEE-International Conference on Nano/Molecular Medicine and Engineering (NANOMED)
2018– Review Committee, Bladder Cancer Advocacy Network Research Innovation Award
2017– Program Committee and Session Chair, SPIE Photonics West – Advanced Photonics in Urology
2016–2017 Steering Committee, Albert Institute Bladder Cancer Symposium
2015– Grant Reviewer: Emerson Collective (2020); Dutch Cancer Society (2019); Medical Research Council UK (2016); Cancer UK (2015); Austrian Science Fund (2013)
2011– Member, NIH Special Emphasis Panels: NCI SPORE (2024); NCI Early Detection Research Network (2021); Director's Early Independence Award (DP5) (2021); Cancer Translational Research (2020); Nursing and Related Clinical Sciences (2019); Member Conflict - Medical Imaging Investigations (2016); NIDDK P20 Developmental Centers for Benign Urology (2016); NIAID Clinical Trials Implementation Cooperative Agreement (2015); NIDDK U54 George M. O'Brien Urology Cooperative Research Centers (2013); Small Business – Biological Chemistry, Biophysics, and Drug Discovery applications (2012); NIAID Loan Repayment Program (2012); Partnership for Biodefense (2011); Partnership for Next Generation Biodefense Diagnostics (2011)
2010–2017 Member, NIH Instrumentation and Systems Development (ISD) Study Section: chartered (2013-2017); ad hoc (2010-2012)
2012 Fellow, American Urological Association/Chinese Urological Association Academic Exchange Program
2008 – Diplomate, American Board of Urology
2006 – Member, American Urological Association, Society of Urologic Oncology, Endourology Society, SPIE, World Molecular Imaging Society

Awards and Honors

2023 Kathryn Simmons Stamey Endowed Professorship, Stanford University
2022 Inducted Member, American Society for Clinical Investigation (ASCI)
2013 Best New Innovation Paper Award, World Congress of Endourology Annual Meeting
2009 First Prize, AUA Foundation Young Investigator Research Forum
2007 Stanford Cancer Center Development Research Award
2005 Best Paper, Engineering and Urology Society Annual Meeting
2003–2008 NIH/NIDDK Loan Repayment Program (LRP) Award
2003–2005 American Foundation for Urologic Disease Research Scholar
1994–1996 Medical Scholar Award, Stanford University School of Medicine
1993 *Magna cum laude* with Highest Honors, Harvard College

Patents

1. Haake DA, Churchill BM, **Liao JC**, Suchard MA, Li Y, Mastali M. Probes and methods for detection of pathogens and antibiotic resistance. US Patent No.: US 7,763,426 B2. July 27, 2010.
2. Chae J, Appel J, **Liao JC**. Method of Screening Cancer Cells Using Wrinkle Patterns on A Thin Membrane. US2017/0191989A1. Published Jul. 6, 2017.
3. Lurie K, Zlatev D, **Liao JC,** Bowden AK, Angst R. 3D reconstruction and registration of endoscopic data. US 10,198,872 B2. Published Feb. 5, 2019.
4. Yi Darvin, Chang TC, Liao, JC, Rubin DL. Systems and methods for clinical image classification. US 2018/0263568 A1. Sep. 20, 2018
5. **Liao JC**, Xing L, Shkolyar E, Jia X. Methods and Systems for Cystoscopic Imaging Incorporating Machine Learning. US 62/828,924. Provisional patent filed April, 10, 2019.
6. Ge TJ, Conti S, **Liao JC**, Sheth KR, Wang SX. Magnetic wire for retrieval and elimination of calculus from the urinary tract. US 2022/0160450 A1. May 26, 2022.

7. Ge, TJ, Conti S, **Liao JC**, Sheth KR, Wang SX, Roquero DM. Systems and methods for hydrogel-assisted urinary calculi capture. Filed May 5, 2023.

C. Contributions to Science

1. **Molecular diagnostics for rapid diagnosis of bacterial infections using biosensor technologies.** A major focus of my group has been the development of molecular diagnostics for urinary tract infections, the most common healthcare-associated infection and a significant source of multidrug resistant pathogens. We have developed biosensor platforms that enable rapid pathogen identification and antimicrobial susceptibility testing towards evidence-based utilization of antibiotics. We have made important advances in molecular probe design targeting bacterial 16S rRNA, sample preparation techniques to reduce matrix effects of biological samples, and clinical translation of integrated biosensor and microfluidics technologies.
   a. **Liao JC**, Mastali M, Li Y, Gau V, Suchard MA, Babbitt J, Gornbein J, Landaw EM, McCabe ER, Churchill BM, Haake DA. Development of an advanced electrochemical DNA biosensor for bacterial pathogen detection. J Mol Diag. 2007 Apr; 9 (2):158-68. PubMed PMID: 17384207; PubMed Central PMCID: PMC1867445.
   b. Gaster RS, Hall DA, Nielsen CH, Osterfeld SJ, Yu H, Mach KE, Wilson RJ, Murmann B, **Liao JC**, Gambhir SS, Wang SX. Matrix-insensitive protein assays push the limits of biosensors in medicine. Nat Med. 2009 Nov; 15 (11):1327-32. PubMed PMID: 19820717. PubMed Central PMCID: PMC4165514.
   c. Altobelli E, Mohan R, Mach KE, Sin MLY, Anikst V, Buscarini M, Wong PK, Gau V, Banaei N, **Liao JC.** Integrated biosensor assay for rapid uropathogen identification and phenotypic antimicrobial susceptibility testing. Eur Urol Focus. 2017 Apr;3(2-3):293-299. PMCID: PMC5538928.
   d. Kaushik AM, Hsieh K, Mach KE, Lewis S, Puleo CM, Carroll KC, **Liao JC,** Wang TH. Droplet-based single-cell measurements of 16S rRNA enable integrated bacteria identification and pheno-molecular antimicrobial susceptibility testing from clinical samples in 30 min. Adv Sci. 2021 Feb 1;8(6):2003419. PMCID: PMC7967084.

2. **Multimodal imaging and image-guided surgery.** Another major focus is the development and validation of enhanced and augmented imaging technologies (e.g., fluorescence, endomicroscopy, computer vision, and artificial intelligence) to improve the precision of urologic cancer surgery. We have pioneered the application of confocal laser endomicroscopy for intraoperative optical biopsy during urologic cancer surgery, particularly for urothelial cancer. For bladder cancer, we are developing computer vision and AI tools to improve endoscopic detection and tumor resection.
   a. Sonn GA, Jones SN, Tarin TV, Du CB, Mach KE, Jensen KC, **Liao JC**. Optical biopsy of human bladder neoplasia with in vivo confocal laser endomicroscopy. J Urol. 2009 Oct;182(4):1299-305. PMID: 19683270.
   b. Lurie KL, Angst R, Zlatev DV, **Liao JC***, Ellerbee Bowden AK*. 3D reconstruction of cystoscopy videos for comprehensive bladder records. Biomed Opt Express. 2017 Mar 8;8(4):2106-2123. PMCID: PMC5516821. (*equal contribution)
   c. Shkolyar E, Jia X, Chang TC, Trivedi D, Mach KE, Meng MQ, Xing L, **Liao JC**. Augmented Bladder Tumor Detection Using Deep Learning. Eur Urol. 2019 Dec;76(6):714-718. PMCID: PMC6889816.
   d. Kothapalli SR, Sonn GA, Choe JW, Nikoozadeh A, Bhuyan A, Park KK, Cristman P, Fan R, Moini A, Lee BC, Wu J, Carver TE, Trivedi D, Shiiba L, Steinberg I, Huland DM, Rasmussen MF, **Liao JC**, Brooks JD, Khuri-Yakub PT, Gambhir SS. Simultaneous transrectal ultrasound and photoacoustic human prostate imaging. Sci Transl Med. 2019 Aug 28;11(507). PubMed PMID: 31462508.

3. **Molecular imaging and therapeutic targets for bladder cancer.** To improve the precision of current strategies of bladder cancer imaging and therapy, we have collaborated with basic science colleagues to identify promising molecular imaging and therapeutic targets, and development of clinically relevant pre-clinical models using patient-derived tissue samples. Of particular interests are CD47, an innate immune checkpoint highly expressed by human bladder cancer, and the sonic hedgehog signaling pathway.
   a. Pan Y, Volkmer JP, Mach KE, Rouse RV, Liu JJ, Sahoo D, Chang TC, Metzner TJ, Kang L, van de Rijn M, Skinner EC, Gambhir SS, Weissman IL, **Liao JC**. Endoscopic molecular imaging of human bladder cancer using a CD47 antibody. Sci Transl Med. 2014 Oct 29;6(260):260ra148. PMID: 25355698.

b. Kiss B, van den Berg NS, Ertsey R, McKenna K, Mach KE, Zhang CA, Volkmer JP, Weissman IL, Rosenthal EL, **Liao JC**. CD47-targeted near-infrared photoimmunotherapy for human bladder cancer. Clin Cancer Res. 2019 Jun 15;25(12):3561-3571. PMCID: PMC7039531.
c. Shin K, Lim A, Zhao C, Sahoo D, Pan Y, Spiekerkoetter E, **Liao JC**, Beachy PA. Hedgehog signaling restrains bladder cancer progression by eliciting stromal production of urothelial differentiation factors. Cancer Cell. 2014 Oct 13;26(4):521-33. doi: 10.1016/j.ccell.2014.09.001. PMID: 25314078; PMCID: PMC4326077.
d. Neal JT, Li X, Zhu J, Giangarra V, Grzeskowiak CL, Ju J, Liu IH, Chiou SH, Salahudeen AA, Smith AR, Deutsch BC, Liao L, Zemek AJ, Zhao F, Karlsson K, Schultz LM, Metzner TJ, Nadauld LD, Tseng YY, Alkhairy S, Oh C, Keskula P, Mendoza-Villanueva D, De La Vega FM, Kunz PL, **Liao JC**, Leppert JT, Sunwoo JB, Sabatti C, Boehm JS, Hahn WC, Zheng GXY, Davis MM, Kuo CJ. Organoid Modeling of the tumor immune microenvironment. Cell. 2018 Dec 13;175(7):1972-1988.e16. doi: 10.1016/j.cell.2018.11.021. PubMed PMID: 30550791. PubMed Central PMCID: PMC6656687.

4. **Urine-based liquid biopsy for bladder cancer using tumor-derived nucleic acids.** Given its abundance and ease of sample collection, urine is ideally suited as the source for development of bladder cancer molecular diagnostics. We applied high throughput sequencing and multiplex quantitative PCR to identify cancer-specific and ultrasensitive detection of tumor-derived RNA and cell-free DNA.
   a. Sin MLY, Mach KE, Sinha R, Wu F, Trivedi DR, Altobelli E, Jensen KC, Sahoo D, Lu Y, **Liao JC**. Deep sequencing of urinary RNAs for bladder cancer molecular diagnostics. Clin Cancer Res. 2017 Jul 15;23(14):3700-3710. PMCID: PMC5873297.
   b. Wallace E, Higuchi R, Satya M, McCann L, Sin MLY, Bridge JA, Wei H, Zhang J, Wong E, Hiar A, Mach KE, Scherr D, Egerdie RB, Ohta S, Sexton WJ, Meng MV, Weizer AZ, Woods M, Jansz GK, Zadra J, Lotan Y, Goldfarb B, **Liao JC**. Development of a 90-minute integrated noninvasive urinary assay for bladder cancer detection. J Urol. 2018 Mar;199(3):655-662. PMID: 29061538.
   c. Dudley JC, Schroers-Martin J, Lazzareschi DV, Shi WY, Chen SB, Esfahani MS, Trivedi D, Chabon JJ, Chaudhuri AA, Stehr H, Liu CL, Lim H, Costa HA, Nabet BY, Sin MLY, **Liao JC**, Alizadeh AA, Diehn M. Detection and surveillance of bladder cancer using urine tumor DNA. Cancer Discov. 2018 Dec 21. pii: CD-18-0825. PMCID: PMC6467650
   d. Shkolyar E, Zhao Q, Mach KE, Teslovich NC, Lee TJ, Cox S, Skinner EC, Lu Y, **Liao JC**. Bladder cancer risk stratification using a urinary mRNA biomarker panel - A path towards cystoscopy triaging. Urol Oncol. 2021 Aug;39(8):497.e9-497.e15. PMID: 33766467.

5. **Translational and clinical research related to kidney stone disease.** More recently, we are engaging in development magnetic nanotechnology to improve kidney stone surgery, multiplex metabolite evaluation for stone risk stratification, and stone-related epidemiology research.
   a. Ge TJ, Roquero DM, Holton GH, Mach KE, Prado K, Lau H, Jensen K, Chang TC, Conti S, Sheth K, Wang SX, **Liao JC**. A magnetic hydrogel for the efficient retrieval of kidney stone fragments during ureteroscopy. Nat Commun. 2023 Jun 22;14(1):3711. doi: 10.1038/s41467-023-38936-1. PubMed PMID: 37349287; PubMed Central PMCID: PMC10287666.
   b. Li H, Shkolyar E, Wang J, Conti S, Pao AC, **Liao JC**, Wong TS, Wong PK. SLIPS-LAB-A bioinspired bioanalysis system for metabolic evaluation of urinary stone disease. Sci Adv. 2020 May;6(21):eaba8535. PMCID: PMC7244315.
   c. Dallas KB, Conti S, **Liao JC**, Sofer M, Pao AC, Leppert JT, Elliott CS. Redefining the Stone Belt: Precipitation Is Associated with Increased Risk of Urinary Stone Disease. J Endourol. 2017 Sep 21. doi: 10.1089/end.2017.0456. Epub 2017 Sep 21. PubMed PMID: 28830242. PubMed Central PMCID: PMC6016725.
   d. Ganesan C, Thomas IC, Song S, Sun AJ, Sohlberg EM, Kurella Tamura M, Chertow GM, **Liao JC**, Conti S, Elliott CS, Leppert JT, Pao AC. Prevalence of twenty-four hour urine testing in Veterans with urinary stone disease. PLoS One. 2019;14(8):e0220768. PMCID: PMC6687143.

Complete List of Published Work in MyBibliography:
https://www.ncbi.nlm.nih.gov/sites/myncbi/joseph.liao.1/bibliography/40621274/public/?sort=date&direction=descending