YUQIANG BAI, Ph.D.

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EDUCATION

2014 **Ph.D. Biomedical Engineering**, Texas A&M University, TX, USA (Advisor: Dr. Alvin Yeh)
2002 **M.S. Optics**, Shanghai Jiaotong University, Shanghai, China
1995 **B.S. Physics**, Shanxi University, Shanxi, China

RESEARCH EXPERIENCE

Assistant Professor (October 2023 – present)
Department of Ophthalmology, Morsani College of Medicine, University of South Florida
Affiliate Assistant Professor (December 2023 – present)
Department of Medical Engineering, College of Engineering, University of South Florida

- Taking advantage of advances in optics, photonics, electronics, etc, to develop and refine highly effective optical imaging techniques and instrumentation systems.
- Interdisciplinary research in science and engineering addresses unmet needs in ocular surface biology and related diseases, such as dry eye disease and meibum gland dysfunction.

Researcher (June 2016 – October 2023)
School of Optometry, University of Alabama at Birmingham, Birmingham, AL

- Development of advanced optical microscopy, interferometer, and OCT systems to understand the dynamic tear film processes at the healthy and diseased ocular surface.

Postdoctoral Researcher (June 2014 – May 2016)
Department of Biomedical Engineering, Florida International University, Miami, FL

- Designed and constructed a novel instrument that combines Mueller matrix polarimetry and polarization-sensitive optical coherence tomography (PS-OCT) for the polarimetric characterization of biological tissues.

Graduate Research Trainee (Jan 2006- May 2014)
Department of Biomedical Engineering, Texas A&M University, College Station, TX

- Developed a multimodal imaging platform that integrates multiphoton microscopy (MPM) with optical coherence tomography (OCT) techniques for 3D intravital studies of biological processes and responses within living tissues.
- Constructed a novel custom culture chamber system (e.g., Bioreactor) to conduct longitudinal studies of tissue response, enabling sequential imaging that provides for precise control of the mechanical environment.
- Conduced pioneering studies to decipher dynamic cell matrix interactions and gain new insights into the mechanisms that enhance or inhibit tissue growth.

Lab Instructor (Jan 2000- Dec 2001)
Physics laboratory, Shanghai Jiaotong University, Shanghai, China

- Instructor for a college-level experimental physics course.

INDUSTRY EXPERIENCE

Optics Engineer (April 2002 –Dec 2005)
Division of Optical Transmission, ZTE, Shenzhen, China

- Scientific support for marketing and sales of fiber-optic communicating devices.

PEER-REVIEWED PUBLICATIONS

1. Niklason LE, Yeh AT, Calle EA, **Bai Y**, Valentin A, Humphrey JD. Enabling tools for engineering collagenous tissues integrating bioreactors, intravital imaging, and biomechanical modeling. Proc Natl Acad Sci. 2010;107(8):3335-3339.
2. Lee PF, **Bai Y**, Smith RL, Bayless KJ, Yeh AT. Angiogenic responses are enhanced in

mechanicallyand microscopically characterized, microbial transglutaminase crosslinked collagen matrices with increased stiffness. Acta Biomaterialia. 2013;9(7):7178-7190.
3. Gibbs HC, **Bai Y**, Lekven AC, Yeh AT. Imaging embryonic development with ultrashort pulse microscopy. Opt Eng. 2013;53(5):051506.
4. **Bai Y**, Lee PF, Gibbs HC, Bayless KJ, Yeh AT. Dynamic multicomponent engineered tissue reorganization and matrix deposition measured with integrated NLOM-OCM system. J Biomed Opt. 2014;19(3):36014.
5. **Bai Y**, Lee PF, Humphrey JD, Yeh AT. Intravital characterization of engineered tissues by multimodal optical imaging and biaxial mechanical testing. Ann Biomed Eng. 2014;42(9):1791-1805.
6. Gibbs HC, Dodson CR, **Bai Y**, Lekven AC, Yeh AT. Combined lineage mapping and gene expression profiling of embryonic brain patterning using ultrashort pulse microscopy and image registration. J Biomed Opt. 2014;19(12):126016.
7. Chue-Sang J, **Bai Y**, Stoff S, Straton D, Ramaswamy S, Ramella-Roman J. Use of combined polarization-sensitive optical coherence tomography and Mueller matrix imaging for the polarimetric characterization of excised biological tissue. J Biomed Opt. 2016;21(7):071109.
8. Chue-Sang J, **Bai Y**, Stoff S, et al. Use of Mueller matrix polarimetry and optical coherence tomography in the characterization of cervical collagen anisotropy. J Biomed Opt. 2017;22(8):086010.
9. **Bai Y**, Nichols JJ. Advances in thickness measurements and dynamic visualization of the tear film using non-invasive optical approaches. Prog Retin Eye Res. 2017;58:28-44.
10. **Bai Y**, Ngo W, Gu B, Zhang Y, Nichols JJ. An imaging system integrating optical coherence tomography and interferometry for in vivo measurement of the thickness and dynamics of the tear film. Biomed Eng Online. 2018;17(1):164.
11. **Bai Y**, Ngo W, Nichols JJ. Characterization of the thickness of the tear film lipid layer using high resolution microscopy. Ocul Surf. 2019;17(2):356-359.
12. **Bai Y**, Nichols JJ. In vivo thickness measurement of the lipid layer and the overall tear film by interferometry. Opt Lett. 2019;44(10):2410-2413.
13. **Bai Y**, Ngo W, Khanal S, Nichols KK, Nichols JJ. Human precorneal tear film and lipid layer dynamics in meibomian gland dysfunction. Ocul Surf. 2021;21:250-256.
14. Khanal S, **Bai Y**, Ngo W, Nichols KK, Wilson L, Barnes S, Nichols JJ. Human meibum and tear film derived (O-acyl)-omega-hydroxy fatty acids as biomarkers of tear film dynamics. Invest Ophthalmol Vis Sci. 2021;62 (9):13.
15. Khanal S, **Bai Y**, Ngo W, Nichols KK, Wilson L, Barnes S, Nichols JJ. Human meibum and tear film derived cholesteryl and wax esters in meibomian gland dysfunction and tear film structure. Ocul Surf. 2022;23:12-23.
16. **Bai Y**, Ngo W, Khanal S, Nichols KK, Nichols JJ. Characterization of the thickness of the tear film lipid layer in meibomian gland dysfunction using high resolution optical microscopy. Ocul Surf. 2022;24:34-39.

CONFERENCE PRESENTATIONS

1. Bai Y, Humphrey JD, Yeh AT. “Characterization of Engineered Tissue Development with Biaxial Mechanical Testing and Microscopy.” Annual Meeting of the Biomedical Engineering Society, Austin, TX, October 2010.
2. Huang AH, Bai Y, Wagner H, Yeh AT, Humphrey JD, Niklas LE. “A Novel Approach to Study ECM Remodeling and Deposition of Tissue-Engineered Vessels in a Mechanically Controlled Environment.” Annual Meeting of the Biomedical Engineering Society, Hartford, CT, October 2011.
3. Bai Y, Chue-Sang J, Ramella-Roman JC. “Integrated Polarization-Sensitive Optical Coherence Tomography and Stokes Imaging Polarimeter for Birefringent Tissues.” SPIE Photonics West, San Francisco, CA, February 2016.
4. Bai Y, Nichols JJ. “A Novel Imaging System Integrating with Optical Coherence Tomography and Interferometric Principles for Thickness Measurement and Dynamics Visualization of the Tear Film.” The Association for Research in Vision and Ophthalmology Annual Meeting, Baltimore, MD,

May 2017.

RESEARCH SUPPORT

NIH NEI R01 EY026947; Nichols, Jason (PI)
9/1/2016-8/31/2021
The role of (O-acyl)-omega-hydroxy fatty acids in human lipid layer structure and function in health and meibomian gland dysfunction
Meibomian gland dysfunction (MGD) is a significant public health problem, and alteration of meibomian gland lipids leads to structural and functional changes in the tear film. The goal of this work is to determine if alterations to these lipids can lead to targeted therapeutics to mitigate the disease.
Role: Investigator

NIH NEI R21 EY033029; **Yuqiang Bai (PI)**
8/1/2011-7/31/2023
Development of a supercontinuum laser source interferometer with sub-micron resolution to understand tear film structure and function in dry eye disease
The long-term goal is to develop a novel, high-resolution imaging system with a state-of-the-art supercontinuum light source that yields high signal detection efficiency for use in human tear film assessment and disease diagnosis and management.

NIH NEI R01 EY034990; **Yuqiang Bai (PI)**
5/1/2023-4/31/2028
Correlating the microstructural thickness variations of the tear film lipid layer with clinical characteristics of dry eye with a novel optical method
The long-term goal of this proposal is to characterize the microstructural thickness variations of the tear film lipid layer and their association with clinical characteristics of dry eye disease.

JOURNAL REVIEWER

Optics Letters
Biomedical Optics Express
Lasers in Surgery & Medicine
Journal of Biophotonics
Journal of Photochemistry and Photobiology B: Biology
Journal of Biomedical Optics
Journal of Selected Topics in Quantum Electronics
IEEE Photonics Journal
Journal of Clinical Research and Ophthalmology
Transactions on Image Processing
Eye & Contact Lens