Qian Xue

Assistant Professor, Department of Mechanical Engineering, University of Maine
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Research Interests

Computational fluid dynamics, fluid-structure-acoustics interaction, biomedical fluid mechanics, bio-inspired and bio-mimetic flows, micro-fluidics and biomechanics.

Education

Ph.D.	01/2012	Fluid Mechanics, Johns Hopkins University, Baltimore, MD, US
M.S.	07/2007	Thermal Engineering, Southeast University, Nanjing, China
B.S.	07/2004	Thermal Engineering, Southeast University, Nanjing, China

Work Experience

09/2016-Present	Assistant Professor Mechanical Engineering Department, University of Maine
09/2013-08/2-16	Research Assistant Professor Mechanical Engineering Department, University of Maine
01/2012-09/2012	Adjunct Assistant Professor Goodwin College of Professional Studies, Drexel University
06/2010-08/2010	Fluid Engineer GE Global Research Center Headquarters

Research Experience

09/2013-Present Mechanical Engineering Department, University of Maine

- Computational modeling and analysis of hydrodynamic sensing of seal whisker during fluid-structure interactions.
- Computational modeling and analysis of fluid-structure-acoustics interactions in flexible flapping wings/fins.
- Computational modeling of fluid-structure-acoustics interaction in voice production.
- Numerical study of inertial focusing of blood cells in microchannels for cell sorting.

09/2007 – 09/2011 Flow Simulation and Analysis Group
Johns Hopkins University & The George Washington University

- Development of a high performance fluid-structure interaction computational solver for simulating flow-induced vibration of viscoelastic materials.

- Numerical study of fluid-structure interaction during phonation in healthy and diseased larynges

06/2010-08/2010 Fluid Engineer
GE Global Research Center Headquarters

- Development of a novel non-invasive hemodynamic monitoring device

Teaching Experience

09/2013- Present Instructor, University of Maine
Undergraduate Course: Statics, Thermodynamics I &II, Fluid Mechanics
Graduate Courses: Advanced Fluid Mechanics

01/2012-09/2012 Instructor, Goodwin College of Professional Studies, Drexel University
Undergraduate Course: Thermodynamics I

09/2009-05/2010 Substitute Instructor/Teaching Assistant, Johns Hopkins University
Undergraduate Course: Thermodynamics
Graduate Course: Bio-fluid

Grant Awarded

1. Development of an Accurate and Real-Time Voice Simulator for Voice Disorders. NIH/NIDCD R21. $406,804. 08/2018 – 07/2020. PI.
2. Numerical Investigation of Effects of Inner Anatomical Structure and Material Property of Vocal Fold on Phonation. NIH/NIDCD R03. $421,632. 09/2015 – 08/2019. Co-PI.
3. The Relationship between Vortices, Acoustics and Vibration in Vocal Fold Asymmetry. Co-PI. NIH/NIDCD R01 Subaward. $224,034. 04/2017 – 03/2020. Co-PI.
4. Low-Cost Breathing Simulator for Medical Training. University of Maine Research Reinvestment Fund Undergraduate Assistantship. $7,000. 09/01/2017 – 08/31/2018. Co-PI.
5. UMaine Bangor Savings Bank Faculty Development Fund. $1,500. 2016. PI.
6. Development of a fast, accurate, low-cost, easy-to-use complete blood count technology for at home health monitoring. UMaine 2015 Aging Research and Technologies Seed Grant Program. $37,980. 06/2015 – 05/2016. PI.
7. Numerical investigation of flow-structure interaction during voice production. XSEDE, 0.75 M CPU hours ($36,871 value). 01/2017-12/2017. PI.
8. Numerical Investigation of Effects of Inner Anatomical Structure and Material Property of Vocal Fold on Phonation. XSEDE, 0.75M CPU hours ($36,871 value). 01/2016-12/2016. PI.

Department/Campus/College Service

1. Search Committee for MEE Advanced Manufacturing faculty position.
2. Search committee for MEE Dynamics and Controls faculty position.

3. University Graduate Curriculum Committee

Professional Service and Affiliations

1. Member of American Physical Society, American Society of Mechanical Engineer and American Institute of Aeronautics and Astronautics
2. Reviewer for Journals: Journal of the Acoustical Society of America, Journal of Biomechanical Engineering, Advances in Engineering Software, Biomedical Microdevices, International Journal of Heat and Fluid Flow, Journal of Voice, Biomechanics and Modeling in Mechanobiology, Journal of Speech, Language and Hearing Research, Speech Communication
3. Session chair, 2017 AIAA AVIATION Forum, Session FD-14, New models for high-speed flows.

Journal Articles

1. Pham, N., Xue, Q. and Zheng, X. (2018). "Coupling between a Fiber-Reinforced Model and a Hill-Based Contractile Model for Passive and Active Tissue Properties of Laryngeal muscle" a Finite Element Study," *JASA-EL.* 144(3) 248-253.
2. Jiang, W., Zheng, X., and Xue, Q. (2018). "Effect of Longitudinal Variation of Vocal Fold Inner Layer Thickness on Flow-Structure Interaction during Phonation," *J. of Biomech. Eng* 140(12), 121008.
3. Geng, B., Xue, Q. and Zheng, X. (2018). "Sound generation of the flapping wings and the scaling of aerodynamic forces with dynamic pressure force – implications for flapping kinematics," *Fluids*. 4(3) 87.
4. Geng, B., Xue, Q. and Zheng, X. (2017). "The effect of wing flexibility on sound generation of flapping wings," *Bioinspiration Biomim.* 13, 016010.
5. Geng, B., Xue, Q. and Zheng, X. (2017). "A finite element study on the cause of vocal fold vertical stiffness variation," *J. Acoust. Soc. Am.*141 (4), EL351-EL356.
6. Jiang, W., Zheng, X. and Xue, Q. (2017). "Computational modeling of fluid-structure-acoustics interaction during voice production," *Front. Bioeng. Biotechnol*. 5(7), 1-10.
7. Xue, Q. and Zheng, X. (2017). "The effect of false vocal folds on laryngeal flow resistance in a tubular three-dimensional computational laryngeal model," *J. Voice.* 31(3), 275-281.
8. Geng, B., Xue, Q. and Zheng, X. (2016). "The effect of vocal fold vertical stiffness variation on voice production," *J. Acoust. Soc. Am.* 140(4), 2856-2866.
9. Xue, Q. and Zheng, X. (2014). "Intraglottal Flow Behavior in a CT-Based Laryngeal Model," *Austin Otolaryngology*, 1(4), 1-7.
10. Xue, Q., Zheng, X., Mittal, R. and Bielamowicz, S. (2014). "Computational Study of Effects of Tension Imbalance on Phonation in a Three Dimensional Tubular Larynx Model,"*J. Voice*. 28(4), 411-419.

11. Xue, Q., Zheng, X., Mittal, R. and Bielamowicz, S. (2014) “Subject-Specific Computational Modeling of Human Phonation,” *J. Acoust. Soc. Am.* 135(2), 1445-1456.
12. Zheng, X., Xue, Q. and Mittal, R. (2014) “Computational Study of Hemodynamic Effects of Abnormal E/A ratio on LV Filling,” *J. Biomech Eng*, 136(6), 061005-1-10.
13. Xue, Q., Mittal, R., Zheng, X. and Bielamowicz, S. (2012) “Computational Modeling of Phonatory Dynamics in a Tubular Three-Dimensional Model of the Human Larynx,” *J. Acoust. Soc. Am.* 132(3), 1602-1613.
14. Xue, Q., Zheng, X., Mittal, R., and Bielamowicz, S. (2011) “Sensitivity of Vocal-Fold Vibratory Modes to their Three-Layer Structure: Implication for Simulation Based Phonosurgical Planning,” *J. Acoust. Soc. Am.* 130(2), 965-976.
15. Zheng, X., Mittal, R. and Xue, Q. (2011)“ Direct-Numerical Simulation of the Glottal Jet and Vocal-Fold Dynamics in a Three-Dimensional Laryngeal Model," *J. Acoust. Soc. Am.* 130(1), 404-415.
16. Mittal, R., Zheng, X. Bhardwaj, R., Seo, J., Xue, Q. and Bielamowicz, S. (2011) “Towards A Simulation-Based Tool for the Treatment of Vocal Fold Paralysis,” *Frontiers in Computational Physiology and Medicine*, 2, 19-1-15.
17. Xue, Q., Mittal, R., Zheng, X. and Bielamowicz, S. (2010), "A Computational Study of the Effect of Vocal-fold Asymmetry on Phonation," *J. Acoust. Soc. Am.*128 (2), 818-827.
18. Zheng,X., Xue, Q., Mittal, R. and Bielamowicz, S. (2010) "A Coupled Sharp-Interface Immersed-Boundary-Finite-Element Method for Flow-Structure Interaction with Application to Human Phonation,"*J. Biomech. Eng.* 132(11), 111003-1-12.
19. Xue, Q., Zhou, K. and Xu, X. (2006). “Dynamicsof Single-phase Flow in Supercritical and Ultra-Supercritical Boilers”, *Journal of Power Engineering* (China), 26(1), 27-31.

Journal Articles under review

1. Liu, G., Geng, B., Zheng, X., Xue, Q., Dong, H. and Lauder, G.V. (2018) “An Integrated Computational Approach to Inversely Determine in vivo Material Properties and Model Flow-Structure Interactions of Fish Fins Based on High-Speed Photogrammetry,” *J. Comput. Phys.*, in review.
2. Liu, G., Xue, Q. and Zheng, X. (2018). “Phase-Difference on Seal Whisker Surface Induces Hairpin Vortices in the Wake to Suppress Vortex-Induced Vibrations,” *J. Fluid Mech.* in review.

Conference Proceedings and Abstracts

1. Pham, N., Geng, B., Xue, Q., and Zheng, X. “A Finite Element Study of A Realistic Vocal Fold Posturing Model and Its Coupling With 1D Flow Structures Interaction,” Proc. 11th Int. Conf. Voice Physiol. Biomech., East Lansing, Michigan, 2018.
2. Jiang, W., Zheng, X., Xue, Q., Wang, X., Oren, L., De Luzan, C. F., Gutmark, E., et al. “Flow-Structure Interaction Simulation of A Canine Laryngeal Model,” Proc. 11th Int.

Conf. Voice Physiol. Biomech., East Lansing, Michigan, 2018.

3. Jiang, W, Xue, Q, Zheng, X, and Elemans, C. “High-fidelity fluid-sttrucutre interaction modeling of bird Vocalization in Syrinx”, AIAA 2018-0578
4. Liu, G, Geng, B, Zheng, X., Xue, Q. “An Integrated High-fidelity Approach for Modeling Flow-structure Interaction in Biological Propulsion and its Strong Validation”, AIAA 2018-1543
5. Jiang, W., Zheng, X. and Xue, Q. “New Insights into Myoelastic-Aerodynamic Mechanism of Vocalization in Birds --- Fluid-Structure-Acoustics Interaction Simulation in Syrinx,” The 12th International Conference on Advances in Quantitative Laryngology, Voice and Speech Research, Hong Kong, China, October, 2017.
6. Jiang, W., Zheng, X. and Xue, Q. “Influence of Cover Layer Thickness on Vocal Fold Dynamics during Fluid-structure interaction,” The 12th International Conference on Advances in Quantitative Laryngology, Voice and Speech Research, Hong Kong, October, 2017.
7. Jiang, W., Zheng, X. and Xue, Q. “New Insights into Myoelastic-Aerodynamic Mechanism of Vocalization in Birds --- Fluid-Structure-Acoustics Interaction Simulation in Syrinx”, ASME Summer Fluid Engineering Conference, Waikoloa, Hawaii, July, 2017.
8. Geng, B., Xue, Q., Zheng, X. , Liu, G. and Dong, H. “Sound Generation of the Flapping Wings and the Scaling of Aerodynamic Forces with Dynamic Pressure Force – Implications for Flapping Kinematics,” ASME Summer Fluid Engineering Conference, Waikoloa, Hawaii, July, 2017
9. Xue, Q., Zheng, X., and Geng, B. “New insights into insect’s silent flight. Part II: sound source and noise control,” APS DFD 69th Annual Meeting, Portland, Oregon, 2016.
10. Geng, B, Xue, Q., and Zheng, X. “A finite element study on the cause of vocal fold vertical stiffness variation,” APS DFD 69th Annual Meeting, Portland, Oregon, 2016.
11. Jiang, W, Zheng, X., and Xue, Q. “Flow-Structure-Acoustic Interaction Simulation of Vocalization of a Non-song Bird,” APS DFD 69th Annual Meeting, Portland, Oregon, 2016.
12. Jiang, W, Zheng, X and Xue, Q., “Flow-Structure-Acoustic Interaction Computational Modeling of Voice Production inside an Entire Airway,” Proceeding of the 10th International Conference on Voice Physiology and Biomechanics, Vina del Mar Chile, March, 2016.
13. Geng, B, Xue, Q and Zheng, X. “The Effects of Vocal Fold Vertical Stiffness Gradient on Sound Production,” Proceeding of the 10th International Conference on Voice Physiology and Biomechanics, Vina del Mar Chile, March, 2016
14. Geng, B, Xue, Q, and Zheng, X., “The effect of vocal fold vertical stiffness gradient on sound production”, APS DFD 68th Annual Meeting, Boston, MA, 2015.

15. Jiang, W, Zheng, X., and Xue, Q, “Flow-Structure-Acoustic Interaction Computational Modeling of Voice Production inside an Entire Airway”, APS DFD 68th Annual Meeting, Boston, MA, 2015.
16. Farrar, L, Zheng, X., and Xue, Q, “Numerical investigation of vortex ring formation through a moving valve,” APS DFD 67th Annual Meeting, San Francisco, CA, 2014.
17. Xue, Q., and Zheng, X., “Computational Modeling and Analysis of Effects of Tension Imbalance on Phonation,” Proceeding of the 9th International Conference on Voice Physiology and Biomechanics, Salt Lake, Utah, April, 2014.
18. Zheng, X., and Xue, Q., “Patient specific modeling of human pronation: A full continuum based flow-structure interaction study”, Proceeding of the 9th International Conference on Voice Physiology and Biomechanics, Salt Lake, Utah, April, 2014.
19. Xue, Q., and Zheng, X., “Patient-Specific Computational Modeling of Human Phonation,” Proceeding of APS DFD 66nd Annual Meeting, Pittsburg, PA, 2013.
20. Zheng, X., and Xue, Q., “Computational Study of the Effect of Dynamic Wall Confinement on Ventricular Filling,” Proceeding of APS DFD 66nd Annual Meeting, Pittsburg, PA, 2013.
21. Zheng, X., Mittal, R., and Xue, Q., “Computational Modeling and Analysis of Hemodynamic Effects of Diastolic Heart Dysfunction During the Whole Heart Cycle,” Proceeding of the 2013 Summer Bioengineering Conference, SBC2013-14050, Sunriver, Oregon, June, 2013.
22. Zheng, X., Mittal, R., Xue, Q. and Seo, J., “A High-fidelity 3D Coupled Flow-Structural-Acoustic(FSA) Model of Phonation”, Proceeding of the 7th International Conference on Voice Physiology and Biomechanics(ICVPB), Madison, Wisconsin, July 6-8 2010.
23. Xue, Q., Zheng, X., Mittal, R., and Bielamowicz, S., “Computational Modeling and Analysis of Phonation in a Diseased Larynx”, Proceedings of APS DFD 62nd Annual Meeting, Minneapolis, Minnesota, 2009.
24. Zheng,, X., Xue, Q., Mittal, R. and. Bielamowicz, S., “Flow Induced Vibration and Glottal Aerodynamics in a Three-Dimensional Laryngeal Model” Proceedings of APS DFD 62nd Annual Meeting, Minneapolis, Minnesota, 2009.
25. Mittal, R., Zheng, X., Xue, Q., and Bielamowicz, S. “Toward High-Fidelity Computational Fluid Dynamics Based Tools for Phonosurgery”, Proceedings of 158th Meeting of Acoustical Society of America (ASA), San Antonio, TX, 2009.
26. Xue, Q., Zheng, X., Mittal, R., “A Method for Computational Modeling of Fluid-Structure Interaction in Surgically Altered Vocal Folds”, XVIth International Conference on Mechanics in Medicine and Biology, Pittsburg PA, 2008.
27. Xue, Q., Zheng, X., Mittal, R., and Bielamowicz, S, “Computational Modeling of Fluid-Structure Interaction in Surgically Altered Vocal Folds”, Proceedings of Society of Engineering Science 45th Annual Technical Meeting University of Illinois at Urbana-Champaign, 2008.

Invited talk

1. Geng, B., Xue, Q., Zheng, X., Liu, G., and Dong, H. “On the sound production and radiation of bio-inspired propulsors,” 47th AIAA Fluid Dynamics Conference, AIAA Aviation Forum. AIAA 2017-3818, Denver, CO, 2017.
2. Jiang, W., Zheng, X. and Xue, Q. “New Insights into Myoelastic-Aerodynamic Mechanism of Vocalization in Birds --- Fluid-Structure-Acoustics Interaction Simulation in Syrinx,” The 11th International Seminar on Speech Production. Tian Jin, China, October, 2017.
3. Jiang, W., Zheng, X. and Xue, Q. “High-fidelity computational modeling of flow-structure-acoustics interaction during voice production,” The 11th International Seminar on Speech Production. Tian Jin, China, October, 2017.