

## SCOTT L. THOMSON

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### RESEARCH INTERESTS

*General areas of interest:* Experimental & computational fluid dynamics; fluid-structure interactions; flow-induced vibration; instrumentation; mechanical engineering education.

*Specific applications:* Biomechanics of voice production; biological fluid-structure interactions.

### EDUCATION

**Ph.D., Purdue University**, Mechanical Engineering, 2004

**M.S., Brigham Young University**, Mechanical Engineering, 2000

**B.S., Brigham Young University**, Mechanical Engineering, Magna Cum Laude, 1999

**Assoc., Ricks College**, General Studies, 1996

### PROFESSIONAL POSITIONS

**Professor**, Brigham Young University, Sep 2018 - Present

**Associate Professor**, Brigham Young University, Sep 2010 - Aug 2014; Jun 2016 - Aug 2018

**Full-time Faculty**, Brigham Young University-Idaho, Aug 2014 - May 2016

**Visiting Faculty**, Friedrich-Alexander University Erlangen-Nürnberg (Germany), Jul 2011 - Jul 2012

**Visiting Faculty Researcher**, Wright-Patterson Air Force Base, Jun 2008 - Aug 2008

**Assistant Professor**, Brigham Young University, Aug 2004 - Aug 2010

### EXTERNAL RESEARCH AWARDS

14. **National Institutes of Health**, R01 DC018577, *Bioprintable composite materials and microfluidic tools for vocal fold restoration and repair*, L Mongeau (PI), N Li-Jessen, SL Thomson, P Wiseman, J Li, AK Miri. 1/21-12/25. SL Thomson BYU subaward lead. Subaward portion approx. \$669,000.
13. **National Institutes of Health**, R01 DC009616, *Imaging and influence of glottic and subglottic anatomy in healthy and stenotic patients*, SL Thomson (PI), K Tanner, JJ Wisco, JM Barkmeier-Kraemer, ME Smith, EJ Hunter, EVR DiBella, and JR Hadley. 9/18-8/23. \$3,079,131.
12. **National Institutes of Health**, R56 DC009616, *Imaging and influence of glottic and subglottic anatomy in healthy and stenotic patients*, SL Thomson (PI), NK Bangerter, K Tanner, JJ Wisco, JM Barkmeier-Kraemer, ME Smith, and EJ Hunter. 9/17-8/18. \$720,178.
11. **Zodiac Waste and Water Systems**, *Phase II: Revolution Toilet Noise Reduction*, K Gee (PI), S Sommerfeldt, S Thomson. 10/16-10/17. \$69,500.
10. **Gordon and Betty Moore Foundation**, GBMF4498, *The origin and evolution of bird vocalization*, second-tier subaward through Midwestern University (prime award to University of Texas at Austin, Clarke PI). 11/14-10/15 (NCE to 9/18). SL Thomson subaward lead. Subaward portion approx. \$46,600.

9. **National Institutes of Health**, R01 DC005788, *Design, construction, and evaluation of implants for vocal fold alteration and reconstruction*, L Mongeau (PI), P Wiseman, C Mandato, N Li, SL Thomson. 8/14-7/19 (NCE to 7/20). SL Thomson subaward lead. Subaward portion approx. \$316,990.
8. **National Science Foundation**, CMMI-1126862, *MRI: Development of a multi-camera synthetic aperture technique for measuring high-speed, unsteady, three-dimensional velocity flow fields*, TT Truscott (PI), K Solen, RD Maynes, SL Thomson. 9/11-8/14. \$410,000.
7. **Air Force Office of Scientific Research**, FA9550-10-1-0334, *Experimental analysis of intermittent flapping flight*, SL Thomson (PI), MB Colton, CA Mattson. 7/10-6/13. \$309,445.
6. **National Institutes of Health**, R01 DC009616, *Influence of subglottic anatomy on voice production*, SL Thomson (PI), EJ Hunter, M Smith, S Thibeault. 7/09-6/14 (no-cost extension to 6/16). \$1,775,268. PI role transferred to Dr. JJ Wisco (BYU) when Dr. Thomson moved to BYU-Idaho in 2014, with subsequent subaward of \$69,520 to Dr. Thomson at BYU-Idaho from 10/14-5/16.
5. **National Institutes of Health**, R01 DC005788, *Design, construction, and evaluation of vocal folds implants for partial or total laryngeal reconstruction*, L Mongeau (PI), M Sivasankar, SL Thomson, RW Chan, SJ Daniel. 8/08-8/13. SL Thomson subaward lead. BYU subaward portion approx. \$340,000.
4. **National Institutes of Health**, R03 DC008200 S1, *Equipment supplement for Influence of surface adhesion forces on vocal fold stress and function*, SL Thomson (PI). 7/09-1/10. \$42,000.
3. **National Institutes of Health**, R03 DC008200, *Influence of surface adhesion forces on vocal fold stress and function*, SL Thomson (PI). 2/07-1/10. \$225,000.
2. **National Institutes of Health**, R01 DC005788, *Development of synthetic and computational multi-layer self-oscillating vocal fold models*, subcontract to BYU through Purdue University (Mongeau PI), 11/05-6/07. SL Thomson subaward lead. BYU subaward portion \$67,900.
1. **Tri-Mast International**, *Analysis and development of a throat microphone*, SL Thomson (PI), TW Leishman (Co-PI). 11/04-8/05. \$18,350.

#### INTERNAL RESEARCH AWARDS

**BYU Mentoring Environment Grant**, \$19,500, 12/12-8/14, *Fluids and Elasticity in Nature*, SL Thomson (PI), TT Truscott.

**BYU College Research Initiation Grant**, \$10,000, 7/12-7/13, *Development of high spatial and temporal resolution MRI of the larynx for the study of vocal and speech disorders*, Neal Bangerter (PI), SL Thomson (Co-PI).

**BYU Mentoring Environment Grant**, \$19,920, 4/07-12/08, *Development of a synthetic model of the human larynx for use in voice production research*, SL Thomson (PI).

Other internal research initiation grants totaling over \$65,000.

#### PUBLICATIONS AND PRESENTATIONS

##### Journal Publications (published or in press)

40. Romero RGT, Colton MB, Thomson SL. In press. 3D-printed synthetic vocal fold models. *J Voice*.
39. Greenwood TE, Thomson SL. 2021. Embedded 3D printing of multi-layer, self-oscillating vocal fold models. *J Biomechanics* 121:110388.
38. Bodaghi D, Xue Q, Zheng X, Thomson S. 2021. Effect of subglottic stenosis on vocal fold vibration and voice production using fluid-structure-acoustics interaction simulation. *Applied Sciences* 11(3):1221.
37. Greenwood TE, Hatch SE, Colton MB, Thomson SL. 2021. 3D printing low-stiffness silicone within a curable support matrix. *Additive Manufacturing* 37:101681.

36. Rose MT, Pielstick BD, Jones ZT, Sommerfeldt SD, Gee KL, Thomson SL. 2020. Case study: Noise reduction of a vacuum-assisted toilet. *Noise Control Engineering Journal* 68(4):294-302.
35. Taylor CJ, Tarbox GJ, Bolster BD, Bangerter NK, Thomson SL. 2019. MRI-based measurement of internal deformation of vibrating vocal fold models. *J Acoustical Society of America* 145(2):989-997.
34. Riede T, Thomson SL, Titze IR, Goller F. 2019. The evolution of the syrinx: An acoustic theory. *PLoS Biology* 17(2): e2006507.
33. Kingsley EP, Eliason CM, Riede T, Li Z, Hiscock TW, Farnsworth M, Thomson SL, Goller F, Tabin CJ, Clarke JA. 2018. Identity and novelty in the avian syrinx. *Proceedings of the National Academy of Sciences (PNAS)* 115(41):10209-10217.
32. Pan Z, Kiyama A, Tagawa Y, Daily DJ, Thomson SL, Hurd R, Truscott TT. 2017. Cavitation onset caused by acceleration. *Proceedings of the National Academy of Sciences (PNAS)* 114(32):8470-8474.
31. Syndergaard KL, Dushku S, Thomson SL. 2017. Electrically-conductive synthetic vocal fold replicas for voice production research. *J Acoustical Society of America* 142(1):EL63-EL68.
30. Latifi N, Heris HK, Thomson SL, Taher R, Kazemirad S, Sheibani S, Li-Jessen NYK, Vali H, Mongeau L. 2016. A flow perfusion bioreactor system for vocal fold tissue engineering applications. *Tissue Engineering Part C: Methods* 22(9):823-838.
29. Pan Z, Whitehead J, Thomson SL, Truscott TT. 2016. Error propagation dynamics of PIV-based pressure field calculations: How well does the pressure Poisson solver perform inherently? *Measurement Science and Technology* 27:084012.
28. Stevens KA, Jette ME, Thibeault SA, Thomson SL. 2016. Quantification of porcine vocal fold geometry. *J Voice* 30(4):416-426.
27. Langley K, Hardester E, Thomson SL, Truscott TT. 2014. Three dimensional flow measurements on flapping wings using synthetic aperture PIV. *Experiments in Fluids* 55:1831.
26. Verkerke GJ, Thomson SL. 2014. Sound-producing voice prostheses: 150 years of research. *Annual Review of Biomedical Engineering* 16:215-45.
25. Murray PR, Thomson SL, Smith ME. 2014. A synthetic self-oscillating vocal fold model platform for studying augmentation injection. *J Voice* 28(2):133-143.
24. Shurtz TE, Thomson SL. 2013. Influence of numerical model selections on the flow-induced vibration of a computational vocal fold model. *Computers and Structures* 122:44-54.
23. Truscott TT, Nielson JR, Daily DJ, Thomson SL, Belden J. 2013. Determining 3D flow fields via light field imaging. *J Visualized Experiments* 73:e4325.
22. Smith SL, Thomson SL. 2013. Influence of subglottic stenosis on the flow-induced vibration of a computational vocal fold model. *J Fluids & Structures* 38:77-91.
21. Daily DJ, Thomson SL. 2013. Acoustically-coupled flow-induced vibration of a computational vocal fold model. *Computers and Structures* 116:50-58.
20. Weiß S, Thomson SL, Lerch R, Döllinger M, Sutor A. 2013. Pipette aspiration applied to the characterization of nonhomogeneous, transversely isotropic materials used for vocal fold modeling. *J Mechanical Behavior of Biomedical Materials* 17:137-151.
19. Murray PR, Thomson SL. 2012. Vibratory responses of synthetic, self-oscillating vocal fold models. *J Acoustical Society of America* 132(5):3428-3438.
18. Shaw SM, Thomson SL, Dromey C, Smith S. 2012. Frequency response of synthetic vocal fold models with linear and nonlinear material properties. *J Speech, Language, and Hearing Research* 55(5):1395-1406.
17. Smith SL, Thomson SL. 2012. Effect of inferior surface angle on the self-oscillation of a computational vocal fold model. *J Acoustical Society of America* 131(5):4062-4075.

16. George RB, Colton MB, Mattson CM, Thomson SL. 2012. A differentially driven flapping wing mechanism for force analysis and trajectory optimization. *Int. J Micro Air Vehicles* 4(1):31-49.
15. Murray PR, Thomson SL. 2011. Synthetic, multi-layer, self-oscillating vocal fold model fabrication. *J Visualized Experiments* 58:e3498.
14. Kniesburges S, Thomson SL, Barney A, Triep M, Sidlof P, Horacek J, Brücker C, Becker S. 2011. In vitro experimental investigation of voice production. *Current Bioinformatics* 6(3):305-322.
13. Farley J, Thomson SL. 2011. Acquisition of detailed laryngeal flow measurements in geometrically realistic models. *J Acoustical Society of America* 130(2):EL82-EL86.
12. Pickup BA, Thomson SL. 2011. Identification of geometric parameters influencing the flow-induced vibration of a two-layer self-oscillating computational vocal fold model. *J Acoustical Society of America* 129(4):2121-2132.
11. Pickup BA, Thomson SL. 2010. Flow-induced vibratory response of idealized vs. magnetic resonance imaging-based synthetic vocal fold models. *J Acoustical Society of America* 128(3):EL124-EL129.
10. Pickup BA, Thomson SL. 2009. Influence of asymmetric stiffness on the structural and aerodynamic response of synthetic vocal fold models. *J Biomechanics* 42(14):2219-2225.
9. Munger JB, Thomson SL. 2008. Frequency response of the skin on the head and neck during production of selected speech sounds. *J Acoustical Society of America* 124(6):4001-4012.
8. Riede T, Tokuda I, Munger JB, Thomson SL. 2008. Mammalian laryngeal air sacs add variability to the vocal tract impedance: Physical and computational modeling. *J Acoustical Society of America* 124(1):634-647.
7. Drechsel JS, Thomson SL. 2008. Influence of supraglottal structures on the glottal jet exiting a two-layer synthetic, self-oscillating vocal fold model. *J Acoustical Society of America* 123(6):4434-4445.
6. Thomson SL, Tack JW, Verkerke GJ. 2007. A numerical study of the flow-induced vibration characteristics of a voice-producing element for laryngectomized patients. *J Biomechanics* 40:3598-3606.
5. Decker GZ, Thomson SL. 2007. Computational simulations of vocal fold vibration: Bernoulli vs. Navier-Stokes. *J Voice* 21(3):273-284.
4. Thomson SL, Mongeau L, Frankel SH. 2007. Flow over a membrane-covered, fluid-filled cavity. *Computers and Structures* 85:1012-1019.
3. Thomson SL, Mongeau L, Frankel SH. 2005. Aerodynamic transfer of energy to the vocal folds. *J Acoustical Society of America* 118(3):1689-1700.
2. Zhang Z, Mongeau L, Frankel SH, Thomson SL, Park JB. 2004. Sound generation by steady flow through glottis-shaped orifices. *J Acoustical Society of America* 116:1720-1728.
1. Thomson SL, Maynes D. 2001. Spatially resolved temperature measurements in a liquid using laser induced phosphorescence. *J Fluids Engineering* 123(2):293-302.

#### **Peer-Reviewed Conference Publications**

5. Nielson JR, Daily DJ, Truscott TT, Luegmair G, Döllinger M, Thomson SL. 2013. Simultaneous tracking of vocal fold superior surface motion and glottal jet dynamics. *2013 ASME International Mechanical Engineering Congress & Exposition*, San Diego, CA.
4. Weiß S, Thomson SL, Sutor A, Rupitsch SJ, Lerch R. 2013. Influence of pipette geometry on the displacement profile of isotropic materials used for vocal fold modeling. *6<sup>th</sup> International Conference on Biomedical Electronics and Devices*, Barcelona, Spain.
3. Daily DJ, Thomson SL. 2009. A study of vocal fold vibration using a slightly compressible fluid domain. *2009 ASME International Mechanical Engineering Congress & Exposition*, Lake Buena Vista, FL.

2. Thomson SL, Maynes D. 2001. Simultaneous measurements of temperature and velocity in water using molecular tagging velocimetry-thermometry. *Proceedings of the 2001 ASME Fluids Engineering Division Summer Meeting*, New Orleans, LA; Vol. 1, pp. 111-120.
1. Thomson SL, Maynes D. 2000. Advances in molecular tagging thermometry. *Proceedings of the 2000 ASME Fluids Engineering Division Summer Meeting*, Boston, MA; Vol. 2, pp. 205-212.

#### **Abstract-Reviewed Conference Publications**

11. Rose M, Pielstick D, Jones Z, Gee K, Thomson S, Sommerfeldt S. 2018. Noise reduction of a vacuum-assisted toilet. *INTER-NOISE and NOISE-CON Congress and Conference Proceedings, InterNoise 18, Institute of Noise Control Engineering*, Chicago, IL, Vol. 258, No. 3, pp. 4726-4735.
10. Fassmann WN, Thomson SL. 2014. An experimental study of stroke kinematics and wing planform design for slow forward flapping flight. *AIAA SciTech 2014*, National Harbor, MD.
9. Thomson SL. 2012. Acoustical coupling in self-oscillating computational vocal fold models. *Proceedings of the Acoustics 2012 Nantes Conference (Joint Meeting of the 11th Congrès Français d'Acoustique and the 2012 Annual Institute of Acoustics Meeting)*, Nantes, France.
8. Thomson SL, Murray PR. 2011. Self-oscillating, multi-layer numerical and artificial vocal fold models with thin epithelial and loose cover layers. *Proceedings of the 7<sup>th</sup> International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, Florence, Italy.
7. George RB, Thomson SL. 2010. High-speed, three-dimensional quantification of ladybug (*Hippodamia convergens*) flapping wing kinematics during takeoff. *48<sup>th</sup> AIAA Aerospace Sciences Meeting*, Orlando, FL.
6. Thomson SL. 2010. Shape optimization and fluid dynamic analysis of a translating flexible body. *48<sup>th</sup> AIAA Aerospace Sciences Meeting*, Orlando, FL.
5. Thomson SL, Mattson CA, Colton MB, Harston SP, Carlson DC, Cutler M. 2009. Experiment-based optimization of flapping wing kinematics. *47<sup>th</sup> AIAA Aerospace Sciences Meeting*, Orlando, FL.
4. Thomson SL, Mongeau L, Frankel SH, Neubauer J, Berry DA. 2004. Self-oscillating laryngeal models for vocal fold research. *Proceedings of the 8<sup>th</sup> International Conference on Flow-Induced Vibrations*, Ecole Polytechnique, Paris, France, Vol. 2, pp. 137-142.
3. Thomson SL, Mongeau L, Frankel SH. 2003. Physical and numerical flow-excited vocal fold models. *Proceedings of the 3<sup>rd</sup> International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, Florence, Italy.
2. Thomson SL. 1999. Development of a temperature profile measurement technique based on molecular tagging velocimetry. *ASME IMECE, Fluids Engineering Division*, Nashville, TN; Fluids Engineering Division Vol. 250, pp. 183-187.
1. Thomson SL, Maynes D. 1999. Temperature profile measurements using molecular tagging velocimetry. *30<sup>th</sup> AIAA Fluid Dynamics Conference*, Norfolk, VA; AIAA 99-3601.

#### **Extended Abstracts**

5. Greenwood TE, Colton MB, Thomson SL. 2020. 3D printed synthetic, self-oscillating vocal fold models and subglottic airway. *Summer Biomechanics, Bioengineering, and Biotransport Conference (online video presentation due to COVID-19)*, Vail, CO.
4. Drechsel JS, Munger JB, Pulsipher AA, Thomson SL. 2007. Development and response of materially-nonlinear, multi-layer synthetic models of the human vocal folds. *ASME 2007 Summer Bioengineering Conference*, Keystone, CO.

3. Decker GZ, Thomson SL. 2006. Modeling liquid-mediated adhesion between the human vocal folds. *ASME 2006 Summer Bioengineering Conference*, Amelia Island, FL.
2. Thomson SL, Frankel SH, Mongeau L. 2003. A physical model of the vocal folds. *ASME IMECE Bioengineering Division*, Washington, D.C.
1. Thomson SL, Frankel SH, Mongeau L. 2003. Response of a compliant beam in a constricted channel wall. *ASME IMECE Bioengineering Division*, Washington, D.C.

#### **Abstract-Reviewed Conference Presentations, Posters, and Videos**

57. Romero RGT, Greenwood TE, Young CA, Hatch S, Boehm N, Colton MB, Thomson SL. 2021. 3D-printed synthetic vocal fold models. *Voice Foundation 50th Anniversary Symposium*, Philadelphia, PA (online due to COVID-19).
56. Greenwood TE, Thomson SL. 2020. Fabrication of synthetic, multi-material vocal fold models via embedded 3D printing. *12<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, Grenoble, France (online due to COVID-19).
55. Vaterlaus AC, Thomson SL. 2019. Genetic algorithm-based optimization of synthetic vocal fold models. Technical presentation, *ASME IMECE*, Salt Lake City, UT.
54. Young C, Thomson SL. 2019. 3D printing ultra-soft, multi-layer organ phantoms. Technical presentation, *ASME IMECE*, Salt Lake City, UT.
53. Hatch S, Thomson SL. 2019. Systematic study of process parameters for 3D printing liquid silicone. Undergraduate Research Poster, *ASME IMECE*, Salt Lake City, UT.
52. Taylor C, Vaterlaus A, Farnsworth M, Thomson SL. 2019. Synthetic vocal fold model closed quotient optimization. Presentation at the pre-conference workshop of the *13<sup>th</sup> International Conference on Advances in Quantitative Laryngology, Voice and Speech Research*. Montreal, CA.
51. Hilton BA, Thomson SL. 2018. Aerodynamic, acoustic, and vibratory consequences of subglottic stenosis in a model of the respiratory airway containing self-oscillating vocal fold replicas. *71<sup>st</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics*. Atlanta, GA.
50. Romero RGT, Greenwood TE, Young CA, Hatch S, Colton MB, Thomson SL. 2018. Development and analysis of 3D-printed synthetic vocal fold models. *11<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, East Lansing, MI.
49. Hilton B, Thomson SL. 2018. Effect of subglottic stenosis on acoustical output of synthetic vocal fold models. Poster, *11<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, East Lansing, MI.
48. Tarbox G, Taylor C, Bolster BD, Thomson S, Bangerter N. 2018. Pressure-triggered gated MRI acquisition of a vibrating scaled vocal fold model. *Proceeding of the 26<sup>th</sup> Annual Meeting of the ISMRM*.
47. Terry AD, Ricks MT, Thomson SL. 2017. Modeling vocal fold intravascular flow using synthetic replicas. *70<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics*. Denver, CO.
46. Farnsworth MS, Riede T, Thomson SL. 2017. Parametric study of wall shear stress in idealized avian airways. *70<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics*. Denver, CO.
45. Taylor CJ, Tarbox G, Hartley R, Bangerter NK, Thomson SL. 2017. Magnetic resonance imaging of vibrating synthetic vocal fold replicas. *12<sup>th</sup> International Conference on Advances in Quantitative Laryngology, Voice and Speech Research*. Hong Kong.
44. Wisco JJ, Tanner K, Wang H, Miller R, Kaggie J, Robison S, Thomson S, Hunter E, Bangerter NK, Mason NL. 2016. Ex-vivo high-resolution MRI of the porcine larynx and segmentation of neurovascular structures. *14<sup>th</sup> Biennial Phonosurgery Symposium*. Madison, WI.

43. Hunter EJ, Thomson SL, Wisco J, Tanner K. 2016. National repository for laryngeal data. *14<sup>th</sup> Biennial Phonosurgery Symposium*. Madison, WI.
42. Groom TB, Riede T, Thomson SL. 2016. Acoustical and vibratory characteristics of a synthetic mallard syrinx replica. *171<sup>st</sup> Meeting of the Acoustical Society of America*. Salt Lake City, UT.
41. Alvarez EJ, Thomson SL. 2016. Simulations of three-dimensional, self-oscillating vocal fold replicas with liquid-filled cavities. *171<sup>st</sup> Meeting of the Acoustical Society of America*. Salt Lake City, UT.
40. Oakey RM, Thomson SL. 2016. Models and methods for exploring anisotropy and inhomogeneity in vibrating vocal fold tissue. *171<sup>st</sup> Meeting of the Acoustical Society of America*. Salt Lake City, UT.
39. Syndergaard KL, Warner S, Dushku S, Thomson SL. 2016. Measuring contact area in synthetic vocal fold replicas using electrical resistance. *171<sup>st</sup> Meeting of the Acoustical Society of America*. Salt Lake City, UT.
38. Smith ME, Tanner K, Dromey C, Berardi ML, Mattei LM, Wisco JJ, Hunter EJ, Thomson SL. 2016. Effects of Subglottic Stenosis and Cricotracheal Resection on Voice Production in Adult Females. *Combined Otolaryngology Spring Meetings (COSM) 2016*. Chicago, IL.
37. Latifi N, Dushku S, Heris HK, Mongeau L, Thomson SL. 2015. Hybrid synthetic-biological vocal fold replicas for bioreactor studies. *11<sup>th</sup> International Conference on Advances in Quantitative Laryngology, Voice and Speech Research*. London, United Kingdom.
36. Thomas DC, Gee KL, Neilsen TB, Leishman TW, Sommerfeldt SD, Blotter JD, Thomson SL, Strong WJ. 2014. Roots and branches of the acoustics program at Brigham Young University. *166<sup>th</sup> Meeting of the Acoustical Society of America*. San Francisco, CA.
35. Thomson SL, Seegmiller J. 2013. Flow in a geometrically-realistic, vibrating model of the human vocal tract. *66<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics*. Pittsburgh, PA.
34. Daily DJ, Langley K, Thomson SL, Truscott TT. 2013. Catastrophic cracking courtesy of quiescent cavitation. Award-winning video entry, *66<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics*. Pittsburgh, PA.
33. Fassmann WN, McDonald SJ, Thomson SL, Fish FE. 2013. Hydrodynamics of a digitized humpback whale flipper. *66<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics*. Pittsburgh, PA.
32. Stevens KA, Jette M, Thibeault S, Thomson SL. 2013. Quantification of porcine vocal fold geometry in three dimensions. *165<sup>th</sup> Meeting of the Acoustical Society of America, Montreal, Canada*.
31. Ward SC, Thomson SL. 2013. Effects of stiffness asymmetry in synthetic vocal fold models with MRI-based geometry. *10<sup>th</sup> International Conference on Advances in Quantitative Laryngology, Voice and Speech Research*, Cincinnati, OH.
30. Shurtz TE, Thomson SL. 2013. Influence of numerical model selections on the flow-induced vibration of a computational vocal fold model. *7<sup>th</sup> M.I.T. Conference on Computational Fluid and Solid Mechanics*, Boston, MA; Paper published in *Computers and Structures* 122:44-54 (cited above).
29. Nielson JR, Truscott TT, Daily DJ, Luegmair G, Doellinger M, Thomson SL. 2012. Whole-field 3D characterization of the glottal jet using synthetic aperture particle image velocimetry. *8<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, Erlangen, Germany.
28. Weiß S, Thomson S, Sutor A, Lerch R. 2012. Pipette aspiration applied to the measurement of anisotropic materials used for vocal fold modeling. *8<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, Erlangen, Germany.
27. Daily J, Nielson J, Belden J, Thomson SL, Truscott TT. 2011. 3D synthetic aperture PIV measurements from artificial vibrating vocal folds. *64<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics*. Baltimore, MD.

26. Farley J, Thomson SL. 2011. Flow field measurements in geometrically-realistic larynx models. *9<sup>th</sup> Pan European Voice Conference*, Marseille, France.
25. Murray PR, Thomson SL, Smith ME. 2011. Quantifying the influence of implants on voice production through the use of self-oscillating synthetic vocal fold models. *Voice Foundation 40th Annual Symposium*, Philadelphia, PA.
24. Daily J, Truscott T, Thomson SL. 2011. Three-dimensional whole field measurements of pulsatile glottal jets using synthetic aperture particle image velocimetry. *161<sup>st</sup> Meeting of the Acoustical Society of America*, Seattle, WA.
23. Smith S, Thomson SL. 2010. Effect of subglottic stenosis on the flow-induced vibration of a self-oscillating computational vocal fold model. *63<sup>rd</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics*, Long Beach, CA.
22. George R, Thomson SL, Mattson C, Colton M, Tree M. 2010. Optimization of kinematics of a flapping wing mechanism. *63<sup>rd</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics*, Long Beach, CA.
21. Pickup BA, Thomson SL. 2010. Identification of geometric parameters influencing the flow-induced vibration of a two-layer computational vocal fold model. *7<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, Madison, WI.
20. Smith S, Thomson SL. 2010. Sensitivity of vocal fold vibration to subglottic geometry. *7<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, Madison, WI.
19. Lo Forte D, Thomson SL. 2009. Experimental study of squeeze-film flow related to human voice production. *62<sup>nd</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics*, Minneapolis, MN.
18. Shaw S, Smith S, Thomson SL. 2009. Frequency response of vocal fold models with linear and nonlinear material properties. *158<sup>th</sup> Meeting of the Acoustical Society of America*, San Antonio, TX.
17. Pickup B, Thomson SL. 2009. Response of synthetic vocal fold models with geometry based on visible human project data. *157<sup>th</sup> Meeting of the Acoustical Society of America*, Portland, OR.
16. Daily DJ, Lo Forte D, Thomson SL. 2009. Effects of the airway surface liquid on vocal fold vibration. *157<sup>th</sup> Meeting of the Acoustical Society of America*, Portland, OR.
15. Thomson SL. 2008. Flow-induced vibrations of the human vocal folds. *5<sup>th</sup> International Bio-Fluid Symposium and Workshop*, Pasadena, CA.
14. Daily DJ, Lo Forte D, Thomson SL. 2008. Glottal airway surface liquid dynamics during vocal fold collision. *6<sup>th</sup> International Conference on Voice Physiology and Biomechanics: Voice Source Analysis*, Tampere, Finland.
13. Thomson SL, Pickup B, Gollnick P. 2007. Glottal jet measurements in synthetic, MRI-based human vocal fold models. *60<sup>th</sup> Annual Meeting of the American Physical Society Division of Fluid Dynamics*, Salt Lake City, UT.
12. Duke CR, Thomson SL, Sommerfeldt SD, Gee KL, Duke CV, Krueger DW. 2007. Near field placement of error sensors in an ANC application of axial cooling fans using flow visualization techniques. *153<sup>rd</sup> Meeting of the Acoustical Society of America*, Salt Lake City, UT.
11. Drechsel JS, Hamilton B, Jepsen A, Munger J, Pickup B, Pulsipher A, Thomson SL. 2007. Multi-component synthetic model of the human larynx for investigating laryngeal fluid-structure interactions. *153<sup>rd</sup> Meeting of the Acoustical Society of America*, Salt Lake City, UT.
10. Thomson SL, Balling RJ, Tack JW, Verkerke GJ. 2006. A genetic algorithm-based approach to optimization of a voice-producing element. *5<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, Tokyo, Japan.



9. Pence BL, Munger J, Ard J, Thomson SL. 2006. Measurements of the frequency response of skin on the head and neck during speech. *5<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, Tokyo, Japan.
8. Teichert KB, Thomson SL. 2006. Simulating stress-induced human vocal ligament morphogenesis. Poster, *5<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, Tokyo, Japan.
7. Monson BB, Thomson SL. 2006. Modeling the influence of vocal nodules on vocal fold vibration. *Voice Foundation 35<sup>th</sup> Annual Symposium*, Philadelphia, PA.
6. Decker G, Thomson SL. 2005. Computational simulations of vocal fold vibration: Bernoulli vs. Navier-Stokes. *Voice Foundation 34<sup>th</sup> Annual Symposium*, Philadelphia, PA.
5. Thomson SL, Mongeau L, Frankel SH. 2004. Energy flow analysis of vocal fold models. *4<sup>th</sup> Int. Conf. on Voice Physiology and Biomechanics*, Marseille, France.
4. Thomson SL, Suh S, Frankel SH, Mongeau L. 2004. Computational simulations of the aerodynamics and structural dynamics of static and self-oscillating vocal fold models. *Voice Foundation 33<sup>rd</sup> Annual Symposium*, Philadelphia, PA.
3. Mongeau L, Zhang Z, Thomson SL, Frankel SH. 2002. Verification of the quasi-steady approximation for sound generation by confined pulsating jets. *3<sup>rd</sup> International Conference on Voice Physiology and Biomechanics*, Denver, CO.
2. Mongeau L, Zhang Z, Thomson SL, Frankel SH. 2002. Experimental verification of the quasi-steady assumption for flow through the larynx. *Voice Foundation 31<sup>st</sup> Annual Symposium*, Philadelphia, PA.
1. Thomson SL, Mongeau L, Frankel SH. 2002. Aerodynamic studies of self-oscillating laryngeal models. Poster, *Voice Foundation 31<sup>st</sup> Annual Symposium*, Philadelphia, PA.

## Theses

- Thomson SL, 2004. *Fluid-Structure Interactions Within the Human Larynx*, Ph.D. Thesis, Purdue University, West Lafayette, IN.
- Thomson SL. 2000. *Simultaneous Measurements of Velocity and Temperature in Water using Molecular Tagging Velocimetry-Thermometry*, M.S. Thesis, Brigham Young University, Provo, UT.

## INVITED TALKS AND SEMINARS

14. Thomson SL. 2021. Recent advances in synthetic vocal fold modeling. *Invited talk, 5<sup>th</sup>-6<sup>th</sup> ASTFE Thermal and Fluids Engineering Conference* (virtual due to COVID-19).
13. Thomson SL. 2019. Physical and computational models for studying the biomechanics of voice production. *Invited seminar, Federal University of Santa Catarina*, Florianopolis, Brazil.
12. Thomson SL. 2018. Physical and computational models for studying voice production biomechanics. *Keynote address, 11<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, East Lansing, MI.
11. Thomson SL. 2018. Physical and computational models for studying the biomechanics of voice production. *Invited lecture, Laser Microbeam and Medical Program (LAMMP) Seminar Series*, UC Irvine Beckman Laser Institute, Irvine, CA.
10. Thomson SL. 2017. Modeling voice production. *Invited seminar, University of Nevada Las Vegas School of Medicine*, Las Vegas, NV.
9. Thomson SL. 2017. Flow and elasticity in nature. *Invited seminar, Penn State University Fluid Dynamics Research Consortium*, Penn State University, State College, PA.

8. Oakey RM, Alvarez EJ, Thomson SL. 2016. Simultaneously modeling of multiple fluid-structure interaction subsystems of the human vocal folds. *Invited talk, 5<sup>th</sup> Joint Meeting of the Acoustical Society of America and Acoustical Society of Japan*, Honolulu, HI.
7. Thomson SL. 2016. Simulations of vocal fold replicas containing liquid-filled cavities. *Invited talk, 10<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, Viña del Mar, Chile.
6. Thomson SL. 2015. Investigating coupled flow-structure-acoustic interactions of human vocal fold flow-induced vibration. *Invited talk, 170<sup>th</sup> Meeting of the Acoustical Society of America*, Jacksonville, FL.
5. Thomson SL. 2012. Optical methods used to quantify fluid and solid dynamics of voice production. *Invited seminar, Erlangen Graduate School in Advanced Optical Technologies*, Erlangen, Germany.
4. Thomson SL. 2012. Acoustical coupling in self-oscillating computational vocal fold models. *Invited talk, Acoustics 2012 (Joint Meeting of the 11<sup>th</sup> Congrès Français d'Acoustique and the 2012 Annual Institute of Acoustics Meeting)*, Nantes, France.
3. Thomson SL. 2011. Fluid-structure interactions within the human larynx, *Invited seminar, GIPSA-Lab*, Grenoble, France.
2. Thomson SL. 2010. Simulating the flow-induced vibration of a human vocal fold model containing an injected liquid region, *Invited talk, 6<sup>th</sup> World Congress on Biomechanics*, Singapore.
1. Thomson SL. 2009. Synthetic and computational vocal fold modeling: Advances and issues, *Invited talk, 158<sup>th</sup> Meeting of the Acoustical Society of America*, San Antonio, TX.

## COURSES TAUGHT

**BYU, Undergraduate:** Fluid Mechanics; Elementary Instrumentation; Engineering Measurements.

**BYU, Graduate:** Intermediate Fluid Mechanics; Computational Fluid Dynamics and Heat Transfer; Experimental Fluid Mechanics.

**BYU-Idaho, Undergraduate:** Engineering Computation I; Engineering Mechanics: Dynamics; Materials Lab; Electro-Mechanical Devices II; Fluid Mechanics.

**Purdue University, Undergraduate:** Engineering Mechanics I: Statics and Particle Dynamics.

## HONORS AND AWARDS

BYU Ira A. Fulton College of Engineering Faculty Development Fellowship, 2021-2022.

BYU University Technology Transfer Award (with KL Gee and SD Sommerfeldt), 2020.

Milton van Dyke Award, Gallery of Fluid Motion, 66<sup>th</sup> Annual Meeting of the Division of Fluid Dynamics of the American Physical Society (with DJ Daily, K Langley, and TT Truscott), 2013.

BYU Ira A. Fulton College of Engineering & Technology Faculty Research Fellowship, 2013-2014.

2<sup>nd</sup> Place, Acoustical Society of America Gallery of Acoustics (with DJ Daily and TT Truscott), 2011.

BYU Mechanical Engineering Department Outstanding Faculty Award, 2009.

ASME Graduate Teaching Fellowship, 2002-2004.

Purdue University Andrews Fellowship, 2003-2004.

NSF Graduate Research Fellowship, 2000-2003.

3<sup>rd</sup> Place, ASME Bioengineering Division Ph.D.-Level Student Paper Competition, 2003.

NASA Space Grant Consortium Graduate Fellowship, 1999-2000.

1<sup>st</sup> Place, ASME Fluids Engineering Division Young Engineers Paper Contest, 1999.

Brigham Young University Edwin Smith Hinckley scholarship, 1998.

Brigham Young University Alvina S. Barrett scholarship, 1997.

## **INTELLECTUAL PROPERTY**

Howell, LL, Thomson, S, Briscoe, JA, Parise, JJ, Lorenc, S, Larsen, JB, Huffmire, CR, Burnside, N, Gomm, TA. *Compliant, Ortho-Planar, Linear Motion Spring*. U.S. Patent No. 6,983,924, issued January 10, 2006, assigned to Brigham Young University.

## **PROFESSIONAL SERVICE – CONFERENCES AND SOCIETIES**

Session Chair, *12<sup>th</sup> International Conference on Voice Physiology and Biomechanics (ICVPB)*, 2020.

International Advisory Board, *Advances in Quantitative Laryngology* conference series, 2010-present.

Speech Communication Technical Committee, *Acoustical Society of America*, term 2009-2015.

Organizing Committee, *9<sup>th</sup> International Conference on Voice Physiology and Biomechanics*, 2014.

Special Session Organizer and Chair, Speech Communication: Flow, Structure, and Acoustic Interactions During Voice Production, *21<sup>st</sup> International Congress on Acoustics and 165<sup>th</sup> Meeting of the Acoustical Society of America*, 2013. Full-day session included 8 invited & 8 contributed papers.

Workshop Co-Organizer (with S. Becker and S. Kniesburges), Experiments with Synthetic Vocal Fold Models, *8<sup>th</sup> International Conference on Voice Physiology and Biomechanics (ICVPB)*, 2012.

Session Chair, *8<sup>th</sup> International Conference on Voice Physiology and Biomechanics (ICVPB)*, 2012.

Special Session Co-Organizer (with C. Brücker), Computational and Experimental Vocal Fold Modeling, *7<sup>th</sup> International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications (MAVEBA)*, 2011.

Local Organizing Committee, *153<sup>rd</sup> Meeting of the Acoustical Society of America*, 2007.

Session Chair, *Fourth M.I.T. Conference on Computational Fluid and Solid Mechanics*, 2007.

## **PROFESSIONAL SERVICE – JOURNALS AND TEXTBOOKS**

Associate Editor, *Journal of Speech, Language, and Hearing Research*, term 12/2011-11/2014

Reviewer of over 60 manuscripts for the following journals: *Acta Acustica; Additive Manufacturing; AIAA Journal; Annals of Biomedical Engineering; Annals of Otolaryngology, Rhinology, & Laryngology; ASME J. Biomechanical Engineering; Computers & Structures; Experiments in Fluids; International J. Heat & Fluid Flow; Int. J. Mechanical Sciences; J. Acoustical Society of America; J. Biomechanics; J. Fluids & Structures; J. Royal Society Interface; J. Sound & Vibration; J. Speech, Language, & Hearing Research; Mechanics Research Communications; Medical Engineering & Physics; PLoS One; Scientific Reports; The Laryngoscope*

Reviewer of textbooks/textbook proposals, including: *Measurement and Instrumentation: Theory and Application; Fundamentals of Computational Fluid Dynamics; Computational Fluid Dynamics: A Practical Approach*

## **PROFESSIONAL SERVICE – FUNDING AGENCIES**

Ad Hoc Reviewer, National Institutes of Health:

- P50 Proposal, NIH/NIDCD: 5/2021
- R01 Proposals, NIH/NIDCD: 3/2014, 10/2014, 1/2016, 11/2016, 6/2018 (R01 & R15), 11/2018, 7/2021
- Voice, Speech, and Language Fellowship Proposals, NIH/NIDCD: 12/2013, 2/2014, 10/2014
- Cardiovascular and Surgical Device Small Business Proposals, NIH: 6/2013

## **PROFESSIONAL SERVICE – OTHER**

Member, BYU-Idaho Mechanical Engineering Program Advisory Board, 2019-Present.

## **UNIVERSITY SERVICE (BYU)**

Chair, Department Advancement in Rank Committee, 2018-Present.

Member, University Academic Review Committee, 2017-2020.

Member, University Graduate Council, 2017-2019.

Member, Department Assessment Committee, 2016-2018.

Department Assessment and ABET Coordinator, 2012-2014.

Member, Department Fluids, Heat Transfer & Measurements Curriculum Sub-Committee, 2013-2014.

Reviewer, University Scholarly and Creative Work Grants (John A. Widtsoe Grants), 2012.

Member, College Leadership Committee, 2010-2011.

Member, Department Advancement in Rank Committee, 2010-2011.

Member, Department Faculty Search Committee, 2008-2010.

Member, NASA Space Grant Consortium Fellowship Selection Committee, 2008.

Member, Department Graduate Committee, 2005-2008.

Reviewer, Undergraduate Research Award Proposals, 2005, 2012.

Member, Fluid Dynamics Ph.D. Qualifying Examination Committee, 2004-2014; 2016-Present.

## **UNIVERSITY SERVICE (BYU-IDAHO)**

Coordinator, Department Mechanical Engineering Advisory Council, 2015-2016.

Member, ME 142 Curriculum Committee, 2015-2016.

Member, Department Writing Committee, 2014-2015.

## **STUDENT ADVISEMENT**

### **Graduate Students, In Progress (BYU)**

Clayton Young, M.S. Multi-material silicone 3D printing. Began 4/2019.

Joseph Seamons, M.S. Flow through vibrating vocal fold blood vessels. Began 8/2020.

Cooper Thacker, M.S. Began 4/2021.

### **Graduate Students, Completed (BYU)**

21. Austin Vaterlaus, M.S. Development of a 3D Computational Vocal Fold Model Optimization Tool. 2020.

20. Benjamin Hilton, M.S. The Effect of Subglottic Stenosis on the Aerodynamic, Acoustical, and Vibratory Output of Synthetic Vocal Fold Models. 2019.

19. Ryan Romero, M.S. Development and Analysis of 3D-Printed Synthetic Vocal Fold Models. 2019.

18. Michael Farnsworth, M.S. Wall Shear Stress in Simplified and Scanned Avian Respiratory Airways. 2018.

17. Cassandra Taylor, M.S. Internal Deformation Measurements and Optimization of Synthetic Vocal Fold Models. 2018.

16. Aaron Terry, M.S. Modeling Vocal Fold Intravascular Flow with Synthetic Replicas. 2018.

15. Kimberly Stevens, M.S. Geometry and Material Properties of Vocal Fold Models. 2015.

14. Ward, Shelby, M.S. Refinement and Characterization of Synthetic Vocal Fold Models. 2014.

13. Jayrin Seegmiller (Farley), M.S. Development of a Complex Synthetic Larynx Model and Characterization of the Supraglottal Jet. 2014.
12. Wesley Fassmann, M.S. An Experimental Study of Bio-inspired Force Generation by Unsteady Flow Features. 2014.
11. Jesse Daily, Ph.D. Fluid-Structure Interactions with Flexible and Rigid Bodies. 2013.
10. Steve Naegle, M.S. Force Optimization and Flow Field Characterization from a Flapping Wing Mechanism. 2012.
9. Tim Shurtz, M.S. Influence of Supraglottal Geometry and Modeling Choices on the Flow-Induced Vibration of a Computational Vocal Fold Model. 2011.
8. Simeon Smith, M.S. Influence of Subglottic Geometry on Computational and Synthetic Vocal Fold Model Vibration. 2011.
7. Preston Murray, M.S. Flow-Induced Responses of Normal, Bowed, and Augmented Synthetic Vocal Fold Models. 2011.
6. Ryan George, M.S. Design and Analysis of a Flapping Wing Mechanism for Optimization. 2011.
5. Dan Lo Forte, M.S. Experimental Study of Liquid Squeeze-Flow as it Relates to Human Voice Production. 2011.
4. Brian Pickup, M.S. Influence of Material and Geometric Parameters on the Flow-Induced Vibration of Vocal Fold Models. 2010.
3. Jacob Munger, M.S. Frequency Response of the Skin on the Head and Neck During Production of Selected Speech Sounds. 2009.
2. James Drechsel, M.S. Characterization of Synthetic, Self-Oscillating Vocal Fold Models. 2007.
1. Gifford Decker, M.S. Thesis: Modeling the Mechanical Effects of Liquid Mediated Adhesion between the Human Vocal Folds. 2006.

#### **Undergraduate Students with ORCA Mentored Research Awards (BYU)**

Nelson Warner. Research of baleen whale bioacoustics using a synthetic whale larynx model, 2014.

Mitchell Hortin. Vapor deposition methods for synthetic vocal fold modeling, 2013.

Ryan Jenkins. Influence of intermediate lamina propria composition on synthetic vocal fold vibration, 2013.

Kimberly Stevens. Asymmetric synthetic vocal fold model vibration, 2012.

Michael Tree. Flapping flight, 2011.

Preston Murray. Non-Newtonian squeeze film flow between vocal fold models, 2010.

Ryan George. High-speed imaging of ladybug flight, 2009.

Paul Gollnick. Asymmetric synthetic vocal fold model testing, 2007-2008.

Brianne Hamilton. MRI-based synthetic vocal fold model development, 2006-2007.

Allyson Pulsipher. Development of nonlinear materials for vocal fold models, 2006-2007.

Britton Olson. Simulating voice-producing voice prostheses, 2006-07.

Kendall Teichert. Stress-induced development of human vocal fold morphology, 2005-2006.

Todd Groesbeck. Scar effects on vocal fold vibration, 2005-2006.

Ben Pence. Frequency response of head and neck skin vibration during speech, 2005-2006.

Jason Schulthess. Correlating skin vibration with radiated sound during speech, 2004-2005.

Todd Groesbeck. Development of synthetic vocal fold models, 2004-2005.

Daniel Andelin. Signal processing to improve throat microphone speech quality, 2004-2005.

**Undergraduate Students with Mentored Research Projects (BYU-Idaho)**

Kyle Syndergaard. Resistance measurements in vocal fold replicas. 1/2015-4/2015; 9/2015-7/2016.

Ryan Oakey. Fibers for creating material anisotropy in synthetic vocal fold replicas. 1/2015-6/2016.

Eduardo Alvarez. 3D computational model of vocal fold flow-induced vibration. 4/2015-6/2016.

Taylor Groom. Design and fabrication of a synthetic replica of a bird syrinx. 4/2015-5/2016.

Josh Watson. Fibers for creating material anisotropy in synthetic vocal fold replicas. 1/2016-5/2016.

Chantelle Johanson. Reconstructing 3D morphology of avian specimen wings. 4/2015-4/2016.

Stephen Warner. Resistance measurements in vocal fold replicas. 1/2015-1/2016.

Drew Ellington. Fabrication of synthetic vocal tract for vocal fold replica studies. 4/2015-12/2015.

John Tobiasson. Computer hardware framework for voice production models. 1/2015-4/2015.