

CURRICULUM VITAE

Kristen L. Billiar

Professor and Head
Department of Biomedical Engineering
Worcester Polytechnic Institute

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SUMMARY STATEMENT

The focus of Dr. Billiar's research is Tissue Mechanics and Mechanobiology. His lab studies the physical properties of biological tissues and the way in which mechanical forces regulate the development and healing of tissues and the pathogenesis of disease with applications in heart valves, skin, lung, and sternum. Dr. Billiar has been the PI of over \$5 million in funding of grants from The Whitaker Foundation, American Heart Association (AHA), National Institutes of Health (NIH), and the National Science Foundation (NSF) and co-PI of grants from AHA, NIH, NSF, and the DoD totaling over \$13 million. He is currently the PI of three active grants. He has published over 80 peer-reviewed articles in high-impact journals and book chapters with over 4500 citations (h-index 35; 9/19/22), and he has authored or co-authored in excess of 180 conference presentations and given 45 invited seminars including international talks in Ireland, Italy, China, Australia, and the Netherlands. He has mentored 18 postdocs/graduate students and over 70 undergraduate/high-school students in his laboratory. Dr. Billiar serves as Associate Editor for the BMES Biomedical Engineering Education Journal, Frontiers in Bioengineering and Biotechnology, and recently for the ASME Journal of Biomechanical Engineering, reviews for over 20 journals, and regularly serves on grant panels for the NSF, and NIH and the American Heart Association.

Dr. Billiar has developed and taught 12 courses from 1st year through graduate-level, advised 52 senior design team projects (of which four were awarded the Provost's Award). And co-advised 21 junior-level societal-impact projects. He has been awarded the Trustees' Award for Academic Advising and the Romeo L. Moruzzi Young Faculty Award for Innovation in Undergraduate Education at WPI. Dr. Billiar has organized many educational workshops at national and international engineering conferences and regularly presents his innovative project-based teaching methods on campus and at scientific and education conferences. He has published his educational work in peer-reviewed journals and served as the inaugural editor for the Education Issue of the Journal of Biomechanical Engineering. Dr. Billiar was Track Chair for "Learning Environments and Evidence-based Practices", one of four tracks, for the recent Biomedical Engineering Education Summit run by the Council of Chairs.

Dr. Billiar has served as chair of technical committees in his professional societies and has been very active in Faculty Governance at WPI since he started in 2002. He is currently Department Head of Biomedical Engineering, Co-Director of the WPI-UMass Medical School Joint PhD Program, and Inclusion Partner representing Engineering for the SIE efforts at WPI, and the lead of the Diversity Advocate Program for faculty searches. He has served as a member of the Academic Planning Committee (APC) of the WPI Board of Trustees, the Chair of the Committee on Governance (COG), the Chair of the Undergraduate Outcomes and Assessment Committee, and co-chair for the search for the Dean of Engineering. He was faculty advisor to the BMES student chapter and to Lambda Chi Alpha Fraternity for over 10 years each. Professionally, he co-chair of the 2022 BMES Annual meeting and has recently stepped down as President of the SB3C Foundation as Chair of the American Society of Mechanical Engineers (ASME) Bioengineering Division (BED) and served on the Executive Board for six years prior to being elected Chair. For the Biomedical Engineering Society (BMES), he serves as Chair of the Education Committee, was on the Board of Directors from 2012-2015, and previously served as Chair of the Membership Committee, Chair of the Student Affairs Committee, and as a member of the Long-range Planning Committee. He is active in the Council of Chairs of BME/BioE departments and has served as secretary for the Long-range Planning Committee of the CoC. Dr. Billiar is a Fulbright Scholar, an ASME Fellow, an AIMBE Fellow, and a BMES Fellow.

BACKGROUND

EDUCATION

- 1998 Ph.D. University of Pennsylvania, Philadelphia, PA**
 School of Engineering and Applied Science, Department of Bioengineering
 Doctorate of Philosophy, Bioengineering
 Dissertation: *A structurally guided constitutive model for aortic valve bioprostheses: Effects of glutaraldehyde treatment and mechanical fatigue.*
 Advisor: Michael S. Sacks, Ph.D.
- 1992 M.S. University of Pennsylvania, Philadelphia, PA**
 School of Engineering and Applied Science, Department of Bioengineering
 Master of Science in Engineering, Bioengineering
 Advisor: Lawrence E. Thibault, Sc.D. (deceased)
- 1991 B.S. Cornell University, Ithaca, NY**
 Bachelor of Science in Engineering, Mechanical Engineering
 Completed Cooperative Education Program. Graduated with Distinction.

WORK EXPERIENCE

- 2015- **Department Head**, Department of Biomedical Engineering, WPI, Worcester, MA
- 2014- **Full Professor**, Department of Biomedical Engineering, WPI, Worcester, MA
- 2002- **Affiliated Professor**, Department of Mechanical Engineering, WPI, Worcester, MA
- 2003- **Affiliated Professor**, Bioengineering Institute, WPI, Worcester, MA
- 2003- **Adjunct Professor**, Department of Surgery, University of Massachusetts Medical School, Worcester, MA
- 2005- **Adjunct Lecturer in Biomedical Engineering**, Department of Mechanical and Biomedical Engineering, National University of Ireland, Galway, Ireland
- 2008-2014 **Associate Professor with Tenure**, Department of Biomedical Engineering, WPI, Worcester, MA
- 2002-2008 **Assistant Professor**, Department of Biomedical Engineering, WPI, Worcester, MA
- 1998-2002 **Staff Engineer**, Research and Development, Organogenesis, Inc., Canton, MA
- 1995-1998 **Visiting Research Fellow**, Department of Biomedical Engineering, University of Miami, Coral Gables, FL
- 1991-1995 **Graduate Research Fellow**, Department of Bioengineering, University of Pennsylvania, Philadelphia, PA
- 1989-1990 **Research and Development Engineer**, Student CO-OP program, Hewlett-Packard, Medical Products Division, Andover, MA

SCHOLARSHIP

HIGHLIGHTS

- Elected as a Fellow of the Biomedical Engineering Society (BMES) in 2018
- Elected as a Fellow of the American Society of Mechanical Engineers (ASME) in 2013
- Elected as a Fellow of the American Institute for Medical and Biological Engineering (AIMBE) in 2016
- Coleman Faculty Entrepreneurship Fellow 2013-2015
- Fulbright Scholar, 2009-2010
- Inducted into Sigma Xi, The Scientific Research Society, in 2005
- Awardee of The Whitaker Foundation 2003

- \$5 million in grant funding from The Whitaker Foundation, AHA, NIH, and NSF as PI; co-PI of grants from AHA, NIH, NSF, and the DoD totaling over \$13 million.
- Over 80 manuscripts (most with graduate student authors, six with undergraduate authors, many with WPI and international collaborators), and 170 conference presentations (citations available upon request).
- Manuscript selected as a 2012 Journal of Biomechanical Engineering Editors' Choice Paper
- Over 40 invited talks including Ireland, The Netherlands, Italy, China, Australia, Canada (titles and locations available upon request)
- Seven patents granted.
- Citation indices from Google Scholar (as of 9/19/22)

	All	Since 2017
Citations	4688	2057
h-index	35	27
i10-index	65	51

Complete List of Published Work in MyBibliography:

<http://www.ncbi.nlm.nih.gov/sites/myncbi/1hcwqA8XB7jQf/bibliography/43004728/public/?sort=date&direction=ascending>

PUBLICATIONS (LAST 5 YEARS)

(In reverse chronological order. *Undergraduates in italics*, graduate students underlined.)

1. Jebeli M, Lopez S, Goldblatt Z, McCollum D, Mana-Capelli S, Wen Q, Billiar K, "Multicellular Aligned Bands Disrupt Global Collective Cell Behavior", *BioRxiv* <https://biorxiv.org/cgi/content/short/2022.05.30.494066v1>
2. Ashouri Choshali H, Billiar K, Rahbar N, "Anisotropy profoundly alters stress fields within contractile cells and cell aggregates," *Biomechanics and Modeling in Mechanobiology*, Accepted for publication
3. Lei Y, Bortolin L, Benesch-Lee F, *Oguntolu T, Dong Z, Bondah N*, Billiar K. "Hyaluronic Acid Regulates Heart Valve Interstitial Cell Contraction in Fibrin-based Scaffolds." *Acta Biomater*. 2021 Sep 27;S1742-7061(21)00641-3.
4. Yu H, Del Nido PJ, Geva T, Yang C, Wu Z, Rathod RH, Huang X, Billiar KL, Tang D., "A Novel Pulmonary Valve Replacement Surgery Strategy Using Contracting Band for Patients With Repaired Tetralogy of Fallot: An MRI-Based Multipatient Modeling Study." *Front Bioeng Biotechnol*. 2021 May 19;9:638934.
5. Goldblatt ZE, Cirka HA, Billiar KL., "Mechanical Regulation of Apoptosis in the Cardiovascular System." *Ann Biomed Eng*. 2020
6. Goldblatt ZE, Ashouri Choshali H, Cirka HA, Liang V, Wen Q, McCollum D, Rahbar N, Billiar KL., "Heterogeneity Profoundly Alters Emergent Stress Fields in Constrained Multicellular Systems.," *Biophys J*. 2020 Jan 7;118(1):15-25. doi: 10.1016/j.bpj.2019.11.018. Epub 2019 Nov 22, PMID: 31812354
7. Yu H, Tang D, Geva T, Yang C, Wu Z, Rathod RH, Huang X, Billiar KL, Del Nido PJ. "Ventricle stress/strain comparisons between Tetralogy of Fallot patients and healthy using models with different zero-load diastole and systole morphologies." *PLoS One*. 2019 Aug 14;14(8):e0220328. doi: 10.1371/journal.pone.0220328.
8. Wang Q, Tang D, Wang L, Canton G, Wu Z, Hatsukami TS, Billiar KL, Yuan C. "Combining morphological and biomechanical factors for optimal carotid plaque progression prediction: An MRI-based follow-up study using 3D thin-layer models," *Int J Cardiol*. 2019 Oct 15;293:266-271. doi: 10.1016/j.ijcard.2019.07.005.
9. Yu H, Del Nido PJ, Geva T, Yang C, Tang A, Wu Z, Rathod RH, Huang X, Billiar KL, Tang D. "Patient-specific in vivo right ventricle material parameter estimation for patients with tetralogy of Fallot using MRI-based models with different zero-load diastole and systole morphologies." *Int J Cardiol*. 2019 Feb 1;276:93-99. doi: 10.1016/j.ijcard.2018.09.030.
10. Wang Q, Tang D, Canton G, Hatsukami TS, Billiar KL, et al. Impact of Patient-Specific In Vivo Vessel Material Properties on Carotid Atherosclerotic Plaque Stress/Strain Calculations. *International Journal of Computational Methods*. 2018 January 05; 16(3):1842002.
11. Wang L, Tang D, Maehara A, Wu Z, Yang C, Muccigrosso D, Zheng J, Bach R, Billiar KL, Mintz GS., "Fluid-structure interaction models based on patient-specific IVUS at baseline and follow-up for prediction of coronary

- plaque progression by morphological and biomechanical factors: A preliminary study.” J Biomech. 2018 Feb 8;68:43-50.
12. Dutta S, Mana-Capelli S, Paramasivam M, Dasgupta I, Cirka H, Billiar K, McCollum D. “TRIP6 inhibits Hippo signaling in response to tension at adherens junctions.” EMBO Rep. 2018 Feb;19(2):337-350. doi: 10.15252/embr.201744777.
 13. Hoffman AH, Teng Z, Zheng J, Wu Z, Woodard PK, Billiar KL, Wang L, Tang D. “Stiffness Properties of Adventitia, Media, and Full Thickness Human Atherosclerotic Carotid Arteries in the Axial and Circumferential Directions.” J Biomech Eng. 2017 Dec 1;139(12). doi: 10.1115/1.4037794
 14. Wang Q, Canton G, Guo X, Hatsukami TS, Billiar KL, Yuan C, Wu Z, Tang D. “MRI-based patient-specific human carotid atherosclerotic vessel material property variations in patients, vessel location and long-term follow up.” PLoS One. 2017 Jul 17;12(7):e0180829. doi: 10.1371/journal.pone.0180829.
 15. Guo X, Zhu J, Maehara A, Monoly D, Samady H, Wang L, Billiar KL, Zheng J, Yang C, Mintz GS, Giddens DP, Tang D. Quantify patient-specific coronary material property and its impact on stress/strain calculations using in vivo IVUS data and 3D FSI models: a pilot study. Biomech Model Mechanobiol. 2017 Feb;16(1):333-344. doi: 10.1007/s10237-016-0820-3. Epub 2016 Aug 25. PubMed PMID: 27561649; PubMed Central PMCID: PMC5288279.
 16. Pfeifer, G., Billiar, K., “Teaching Ethics in the Context of Engineering Courses: A Blended Approach of Theory and Practice,” 2017 ASEE Annual Conference & Exposition, Columbus, Ohio, <https://peer.asee.org/28916>
 17. Billiar, K.L., Marengo, K.A. “Canine hip forces: The ups and downs of project-based learning of static equilibrium,” 2017 ASEE Annual Conference & Exposition, Columbus, Ohio, <https://peer.asee.org/28006>
 18. Dueñas-García OF, Sullivan GM, Leung K, Billiar KL, Flynn MK. “Knot integrity using different suture types and different knot-tying techniques for reconstructive pelvic floor procedures.” Int Urogynecol J. 2017 Jun 20. doi: 10.1007/s00192-017-3393-5.
 19. Cirka HA, Uribe J, Liang V, Schoen FJ, Billiar KL, “Reproducible in vitro model for dystrophic calcification of cardiac valvular interstitial cells: insights into the mechanisms of calcific aortic valvular disease.” Lab Chip. 2017 17(5):814-829. doi: 10.1039/c6lc01226d
 20. Aghvami M, Billiar KL, Sander EA. “Fiber Network Models Predict Enhanced Cell Mechanosensing on Fibrous Gels.” J Biomech Eng. 2016 Oct 1;138(10). doi: 10.1115/1.4034490. ***Editor’s choice: on of top 10 articles of the year.*
 21. Clyne AM, Billiar KL. Implementing problem-based learning in biomechanics courses: a practical approach. J Biomech Eng. 2016 May 23. doi: 10.1115/1.4033671. PubMed PMID: 27210616. *** Editor’s choice: on of top 10 articles of the year.*
 22. Billiar K., “Special Section: Annual Education Issue: Let the Wild Rumpus of Education Start!” (Editorial) J Biomech Eng. 2016 Jul 1;138(7). doi: 10.1115/1.4033584.
 23. Cirka, H., Monterosso, M., Diamantides, N., Favreau, J., Wen, Q. and Billiar, K. "Active traction force response to long-term cyclic stretch is dependent upon cell prestress," Biophysical Journal. 2016 Apr 26;110(8):1845-57. doi: 10.1016/j.bpj.2016.02.036.
 24. Tang D, Del Nido PJ, Yang C, Zuo H, Huang X, Rathod RH, Gooty V, Tang A, Wu Z, Billiar KL, Geva T., “Patient-Specific MRI-Based Right Ventricle Models Using Different Zero-Load Diastole and Systole Geometries for Better Cardiac Stress and Strain Calculations and Pulmonary Valve Replacement Surgical Outcome Predictions.” PLoS One. 2016 Sep 14;11(9):e0162986. doi: 10.1371/journal.pone.0162986.
 25. Guo X, Zhu J, Maehara A, Monoly D, Samady H, Wang L, Billiar KL, Zheng J, Yang C, Mintz GS, Giddens DP, Tang D., “Quantify patient-specific coronary material property and its impact on stress/strain calculations using in vivo IVUS data and 3D FSI models: a pilot study.” Biomech Model Mechanobiol. 2016 Aug 25.
 26. *Jackson, X., Jasensky, Z., Liang, V., Moore, M., Rogers, J., Pfeifer, G., Billiar, K.L., “A Joint-Venture Approach in Teaching Students How to Recognize and Analyze Ethical Scenarios”, Ethics in Biology, Engineering and Medicine, pp. 197-209 DOI: 10.1615/EthicsBiologyEngMed.2016014325*
 27. Kural, M.H. and Billiar, K.L., “Myofibroblast Persistence with Real-Time Changes in Boundary Stiffness,” Acta Biomaterialia, 2016 Mar 1;32:223-30. doi: 10.1016/j.actbio.2015.12.031.
 28. Tang D, Yang C, Del Nido PJ, Zuo H, Rathod RH, Huang X, Gooty V, Tang A, Billiar KL, Wu Z, Geva T., “Mechanical stress is associated with right ventricular response to pulmonary valve replacement in patients with

- repaired tetralogy of Fallot." *J Thorac Cardiovasc Surg*. 2016 Mar;151(3):687-94.e1-3. doi: 10.1016/j.jtcvs.2015.09.106.
29. Wang L, Zheng J, Maehara A, Yang C, Billiar KL, Wu Z, Bach R, Muccigrosso D, Mintz GS, Tang D., "Morphological and Stress Vulnerability Indices for Human Coronary Plaques and Their Correlations with Cap Thickness and Lipid Percent: An IVUS-Based Fluid-Structure Interaction Multi-patient Study." *PLoS Comput Biol*. 2015 Dec 9;11(12):e1004652. doi: 10.1371/journal.pcbi.1004652. eCollection 2015 Dec.
 30. Mullen, C., Vaughan, T., Billiar, K, and McNamara, L, "The Effect of Substrate Stiffness, Thickness and Crosslinking Density on Osteogenic Cell Behaviour," *Biophysical Journal* 2015 108(7):1604-12. doi: 10.1016/j.bpj.2015.02.022.
 31. Cirka, H.A., Kural, M.H., and Billiar, K.L., "Mechanoregulation of Aortic Valvular Interstitial Cell Life and Death" *Journal of Long-term Effects of Medical Implants*, 2015;25(1-2):3-16. DOI: 10.1615/JLongTermEffMedImplants.2015011759
 32. Wang L, Wu Z, Yang C, Zheng J, Bach R, Muccigrosso D, Billiar K, Maehara A, Mintz GS, Tang D., "IVUS-Based FSI Models for Human Coronary Plaque Progression Study: Components, Correlation and Predictive Analysis," *Ann Biomed Eng*. 2014 Sep 23.
 33. Zhang, W., Billiar, K.L., and Sacks, M.S., "A generalized method for the analysis of planar biaxial mechanical data," *J Biomech Eng*. 2015 Jun;137(6):064501. doi: 10.1115/1.4029266.
 34. Fan R., Tang D., Yang C., Zheng J., Bach R., Wang L., Muccigrosso D., Billiar K., Zhu J., Ma G., Maehara A., Mintz S G., "Human coronary plaque wall thickness correlated positively with flow shear stress and negatively with plaque wall stress: an IVUS-based fluid-structure interaction multi-patient study," *BioMedical Engineering OnLine*, 13(32), 2014.
 35. Kural, M.H. and Billiar, K.L., "Mechanoregulation of valvular interstitial cell phenotype in the third dimension," *Biomaterials*, Jan;35(4):1128-37, 2014. doi: 10.1016/j.biomaterials.2013.10.047.
 36. Billiar, K., Oliva, T.*, Hubelbank, J., and Camesano, T., "Teaching STEM by Design," *Advances in Engineering Education*, V4(1) Winter 2014. *Chosen as lead article and featured in the ASEE PRISM magazine. *Middle-school teacher.*

Book Chapters and Invited Papers published (last 10 years)

1. Lei, Y., Goldblatt, Z., Billiar, K.L., "Micromechanical Design Criteria For Tissue Engineering Biomaterials," in *Biomaterials Science: An Introduction to Materials in Medicine, 4th edition*, Eds. Wagner, Sakiyama-Elbert, Zhang & Yaszemski. 2020.
2. Tang, D., Wang, L., Guo, X., Maehara. A., Molony, D., Samady, H., Zheng, J., Yang, C., Zhu, J., Ma, G., Jia, H., Billiar, K., Matsumura, M., Mintz, G., Giddens, D., "Prediction of the coronary plaque growth and vulnerability change by using patient-specific 3D fluid-structure interaction models based on intravascular ultrasound and optical coherence tomography follow-up data," *Biomechanics of Living Organs – Elsevier, Volume 3: Biomechanics of Coronary Atherosclerotic Plaque: From Model to Patient*, 2019.
3. Billiar, K.L. "The mechanical environment of cells in collagen gel models: Global and local effects in three-dimensional biological hydrogels" in *Cellular and Biomolecular Mechanics and Mechanobiology*, Springer, 2010.

FELLOWSHIPS AND GRANTS RECEIVED

Funding - Current

1. National Science Foundation, EEC- 1559819 REU Site: Integrated Bioengineering Research, Education, and Outreach Experiences for Females and Underrepresented Minorities at WPI," PI: J. Coburn Co-PI: **K. Billiar**, \$359,854, 9/22-8/25
2. American Heart Association, 20AIREA35120448, "The role of mechanically induced apoptosis in calcific aortic of heart valve disease", PI: K. Billiar, \$154,000, 1/1/20-12/31/21
3. National Science Foundation, CMMI-1761432 "Collaborative Research: Mechanical regulation of programmed cell death," PI: **K. Billiar**, PI: McCollum; Co-PIs Rahbar, Wen. \$446,563, 7/1/18-6/30/21
4. ARMI BiofabUSA T0137, "Opto-mechanical characterization of engineering tissues for non-contact in-line process monitoring" PI: **K. Billiar**, Co-PI: Cosme Furlong, Dmitry Korkin. \$1,409,724, 10/1/19-9/30/22

Funding – Completed (last 5 years)

1. National Science Foundation, EEC- 1559819 REU Site: Integrated Bioengineering Research, Education, and Outreach Experiences for Females and Underrepresented Minorities at WPI,” PI: **K. Billiar**, co-PI: A. Reidinger \$359,854, 9/16-8/20
2. National Institutes of Health, R15 (AREA), 2R15HL087257-02A1 “Combatting Retraction in Tissue Engineered Heart Valves.” Funding Agency: NHLBI PI: K. Billiar, 08/1/2014 – 07/31/2018, \$450,593, 8.3% effort.
3. National Science Foundation, DGE-1144804, ”IGERT: Training Innovative Leaders in Biofabrication” PI: T. Camesano, Co-PIs: **K. Billiar**, G. Gaudette, M. Rolle, F. Hoy. \$3,000,000. 7/12-6/18
4. National Science Foundation, EEC-1156821 REU Site: Integrated Bioengineering Research, Education, and Outreach Experiences for Females and Underrepresented Minorities at WPI,” PI: **K. Billiar**, co-PI: H. Vassallo 3/12-2/29/16, \$399,674.
5. National Science Foundation, EEC- 1135628 “RET Site: Inquiry-based Bioengineering Research and Design Experiences for Middle-School Teachers,” PI: T. Camesano, Co-PI: **K. Billiar**, 9/1/2011-8/31/2014, \$374,818.
6. American Heart Association Northeast Affiliate, Predoctoral Fellowship for Heather Cirka, 14PRE18310016 “Mechanical Regulation of Apoptosis,” \$42,000, 01/01/2014-12/31/16
7. U.S. Army Medical Research and Materiel Command (USAMRC), “Neuroprosthetics: Development of Tissue Integration, Control and Sensory Feedback Solutions for Neural-Enabled Prosthetic Devices,” Grant 10161005. PI: Lambert, C., Co-PIs: **Billiar, K.** (5% effort, \$48,400 direct), Clancy, E., Page, R., Pins, G., 9/5/11-10/4/14, \$1,398,000 (total budget).

PATENTS

1. “In vitro calcification model for drug screening,” Cirka, H. and Billiar, K. Provisional submitted
2. “Fibrin microthreads” KG Cornwell, GD Pins, K Billiar, US Patent 9,662,415, May 30, 2017
3. “Bone fixture assembly” Raymond Dunn, Kristen Billiar, Janice Lalikos, Alexander Christakis, John Dieselman., U.S. Patent No. 9,566,098B2 on February 14, 2017
4. “Methods and systems for viscoelastic characterization of anisotropic biological samples,” U.S. Patent No. 9,423,333 B2, issued Aug. 23, 2016.
5. “A Novel Screw/Plate Design for Osteoporetic Bone and Other Applications,” Billiar, K., Dunn, R., Christakis, A., Ahn, J., Dieselman, J., Sandefer, A., US Patent #8,690,927 B2, April 8, 2014.
6. “Collagen and Fibrin Microthreads in a Discrete Thread Model of In Vitro ACL Scaffold Regeneration,” Cornwell, K.G., Billiar, K. L. and Pins, G. D., US Patent # 8,865,869, Oct. 21, 2014.
7. “Device and Method for Quantifying Edema,” K. Billiar and R. Dunn, US Patent #8,147,428, April 3, 2012
8. “System and Method for Forming Bioengineered Tubular Graft Prostheses,” Cosman, Billiar, Mercer, and Miller, US Patent # 2,471,703 C, 2011

SERVICE**HIGHLIGHTS**

- Co-chair of BMES 2022 Annual Meeting
- President of the SB3C Foundation 2021-2022
- Chair of the ASME Bioengineering Division 2019-2020
- Biomedical Engineering Society (BMES) Board of Directors 2012-2015
- ASME Bioengineering Division Executive Committee, 2012-2015 & 2015-2018
- Active member of six professional societies and three honorary societies including serving on committees
- Serve on national and international engineering conference organizing committees including Track Chair of the 2018 World Congress of Biomechanics and Track Chair of the 2019 Biomedical Engineering Education Summit.

- Associate Editor for the BMES Biomedical Engineering Education Journal (BIEE)
- Associate Editor for the ASME Journal of Biomechanical Engineering (JBME) (2013-2019)
- Reviewer for over 20 professional journals within my fields of research (J Biomech, Biophys J, Biomaterials, JBME, Annals of BME, Langmuir, Acta Biomaterialia, Biomech Mod Mechanobio, etc.)
- Regularly serve on grant panels for NIH, AHA, Fulbright, and NSF (including GRFP and ERC); Co-chaired AHA Bioengineering Panel
- Co-chaired WPI Dean of Engineering Search
- Participated in multiple BME and other departmental faculty search committees and the presidential search co-committee.

MEMBERSHIPS AND OFFICES HELD IN PROFESSIONAL SOCIETIES

Boards

1. Biomedical Engineering Society (BMES) Member of the Board of Directors, Fall 2012-2015
2. Chair, American Society of Mechanical Engineers (ASME) Bioengineering Division Executive Committee, (2019-2020); Secretary (2019-20); Member in charge of: Student Affairs, Summer 2012-2015 and Technical Committees (2015-2018).

Committee chair positions

1. Chair of the Education Committee, BMES, 2018-2021
2. Chair of the Membership Committee, BMES, 2015-2018
3. Chair of the Student Affairs Committee, BMES, Fall 2008-Fall 2011
4. Chair of the Education Committee, ASME Bioengineering Division, 2012-2013; Vice Chair 2009-2012

Society and committee memberships

1. Biomedical Engineering Society, 1995-present
 - Long-range Planning Committee, Member, 2018-2021
 - Membership Committee, Member, Fall 2014-2017 (appointed)
 - Education Committee, Member, Fall 2014-2017 (appointed)
 - Student Affairs Committee, Member, Spring 2006-2013 (appointed)
2. American Society of Mechanical Engineers, 1989-present
 - Cell and Tissue Engineering Committee, Member, 2007-present
 - Solids Committee, 2007-present
 - Education Committee, Member, 2006-present
3. American Heart Association, 2006-2010, 2012-present
4. American Society for Engineering Education, 2013-present
5. Biophysical Society, 2012-present
6. Tissue Engineering Society International, 200, 2012, 2015
7. Society for Biomaterials, 1999-2005
8. American Society of Biomechanics, 1994-2004
9. Cornell Society of Engineers, 1991-present
10. Sigma Xi, The Scientific Research Society, inducted 2005
11. Tau Beta Pi, National Engineering Honor Society, New York Delta, inducted 1990
12. Pi Tau Sigma, Honorary Mechanical Engineering Fraternity, New York Pi, inducted 1990

21. EDITORIAL, CONFERENCE ORGANIZATION, AND REFEREE SERVICES

Conference organization

1. Co-Chair, 2022 Biomedical Engineering Society Annual Meeting

2. Track Chair, 2019 Biomedical Engineering Education Summit, Cleveland
3. Track Chair, 2018 World Congress of Biomechanics (WCB2018), Dublin
4. Program Chair Liaison, 2014 World Congress of Biomechanics, Boston, MA (WCB2014), in conjunction with ASME Summer Bioengineering Conference
5. Publications Chair, 2012 ASME Bioengineering Conference, Puerto Rico (SBC2012)
6. Information Chair, 2009 ASME Bioengineering Conference, Lake Tahoe, CA (SBC2009)
7. Copyright Management Chair, 2007 ASME Bioengineering Conference, Keystone, CO (SBC2007)

Grant review

1. NSF Engineering Center site reviewer 2019, 2020, 2021, 2022; NSF Panel reviewer (2X) 2020
2. American Heart Association, Bioengineering Section Reviewer, Spring 2010, Spring 2011, Spring 2012, Spring 2013, Spring 2014, Spring/Fall 2015; also AHA Established Investigator Award Reviewer, 2013; co-chair 2016
3. NIH Panel (R01, R21) 2015 (Feb), 2015 (Sept), 2016 (Feb)
4. NIH SBIB-SRO Reviewer, 2015
5. NIH AREA Reviewer, 2013, 2014 (March, June, December)
6. NSF GRFP Review, 2013-14
7. Fulbright Scholar Review Committee member, 2013-2015
8. NIH Surgical Science and Bioengineering Study Section, June 2012
9. NSF REU Program Reviewer 2012
10. NIH Special Panel, October 2011
11. NIH P01 Review, January 2011
12. Ad Hoc Grant review, Wellness Trust, January 2010
13. NSF RET Program Reviewer 2010
14. *Ad Hoc* Reviewer for the Cooperative Grants Program (CGP) of the U.S. Civilian Research and Development Foundation (CRDF) (one review, Oct 2006)

Peer-Reviewed Journals (> 150 manuscripts reviewed in over 20 journals)**22. SERVICE TO DEPARTMENT AND UNIVERSITY (WPI Committee and Administrative Assignments)****Departmental Service**

1. Department Head, 2015-present
2. Chair, Biomedical Engineering Projects and Professional Development Committee, 2002-Present
3. Chair, Biomedical Engineering Undergraduate Curriculum Committee, 2011-Present
4. Chair, BME faculty search committee, 2010-2011, 2012-13
5. Member, Biomedical Engineering Department Faculty Search Committee, 2004-06, 2011-12
6. Undergraduate Program Review Committee, Fall 2002-present
7. Biomedical Engineering Society WPI Chapter, Faculty Advisor 2002-present
8. BME Tenure and Promotion Committee, Fall 2010-2012; 2015-present

TEACHING**HIGHLIGHTS**

- Developed and taught 12 courses from the freshman to graduate level at WPI, most of which include problem-based learning, team projects, and oral presentations. Three are designated writing-intensive, and many include ethics and computation.
- Served as thesis advisor for eight Doctoral and six Masters students and consistently advise more than 40 undergraduate students.
- Granted the Trustees' Award for Academic Advising in 2008.

- Awarded the Romeo L. Moruzzi Young Faculty Award for Innovation in Undergraduate Education in 2005
- Advised over 170 students for their senior capstone design (Major Qualifying Project, MQP) with 4 teams winning the Provost's Award (top honor), 6 winning Honorable Mentions, 3 published manuscripts, and two were awarded patents.
- Advised over 70 students for their junior-level Interactive Qualifying Projects (IQPs) including 11 off-campus teams in Venice and Melbourne.
- Presented over 15 conference abstracts, posters, or presentations related to innovations in teaching and student training from middle school to graduate school.
- Manuscript on developing K-12 lessons using the engineering design process was chosen as lead article in *Advances in Engineering Education* and featured in the *ASEE PRISM* magazine (2014).

EDUCATIONAL PUBLICATIONS AND CONFERENCE PROCEEDINGS (OF >25)

1. Pfeiffer, G., and Billiar, K.L., "Teaching ethics in the context of engineering courses: A blended approach," ASEE Annual Meeting, Columbus, OH, July 2017 (full-length paper)
2. Billiar, K.L. and Marengo, K.A., "Canine hip forces: The ups and downs of project-based learning of static equilibrium," ASEE Annual Meeting, Columbus, OH, July 2017 (full-length paper)
3. Billiar, K.L., "Encouraging an entrepreneurial mindset in biomechanics," Summer Biomechanics, Bioengineering, and Biotransport Conference (SB3C), Tucson, AZ, June 2017.
4. Billiar, K., and Gaudette, G., "Project-based biomechanics laboratories: theory and practice" Summer Biomechanics, Bioengineering and Biotransport Conference (SB3C), Maryland, June 2016.
5. Billiar, K., Hubelbank, J., Oliva, T., Quinn, J., Rolle, M., and Camesano, T., "Participating in authentic engineering projects improves teachers' ability to teach the design process to middle school students." ASEE Annual Meeting, New Orleans, June 2016. Poster presentation – full-length paper also accepted.
6. McKinzie, Z., Kamran, W., Hobson, J., Renshaw, D., Billiar, K., and Pfeifer, G., "Sustaining Ethics Education in Engineering: A Blended Approach to Ethics Instruction," ASEE Northeast Regional Meeting, University of Rhode Island, April 2016 (full length paper)
7. Liang, V., Moore, M., Rogers, J., Pfeifer, G, and Billiar, K. "Teaching Engineering Students How to Recognize and Analyze Ethical Scenarios." ASEE Annual Meeting, New Orleans, June 2016. Poster presentation – full-length paper also accepted.
8. Jackson, X, Jasensky, Z, Liang, V, Moore, M, Rogers, J, Pfeifer, G, and Billiar, K. "Teaching Ethics in Biomedical Engineering: A Joint-Venture Approach," 8th International Conference on Ethics in Biology, Engineering & Medicine, SUNY Downstate, Brooklyn NY, April 2015.
9. Reyer, K, Cantwell, M, Lam, P, Rafferty, R, Kristen Billiar, "Ethics in Engineering Education," Biomedical Engineering Society Annual Fall Meeting, San Antonio, TX, 2014.
10. Billiar, K.L. "Teaching Entrepreneurship in Biomechanics," 7th World Congress of Biomechanics, Boston, MA, July 2014. (Invited talk)
11. Billiar, K., "A Student-Centered Laboratory Approach for Teaching Tissue Mechanics," Mechanics Education Symposium, Society of Engineering Science 50th Annual Technical Meeting/ASME-AMD Summer, Brown University, July 2013.
12. Billiar, K. "Cell and Tissue Engineering Labs," Teaching Cell and Tissue Engineering Workshop, ASME Summer Bioengineering Conference, Fajaro, Puerto Rico, June 2012.
13. Billiar, K. and Pins, G, "Graduate-level Tissue Engineering Teaching Lab: Development of Collagen Scaffolds," Tissue Engineering and Regenerative Medicine International Society (TERMIS) Conference, Galway, Ireland, June 2010.
14. Brown, D., Scarrell, R., Rolle, M., Page, R. Camesano, T., and Billiar, K.L., "Fibrin Microthread Mechanical Stimulator: A K-12 Teacher Outreach Design Project," Tissue Engineering and Regenerative Medicine International Society (TERMIS) Conference, Galway, Ireland, June 2010.

15. Billiar, K.L., Belisle, R., Cezar, T., Fusco, M., Gray, C., Oliva, T., Tate, V., Hubelbank, J., Camesano, T., "K12 Outreach: Using Biomechanical Engineering Design Projects To Teach Difficult STEM Concepts To Middle School Students," ASME Summer Bioengineering Conference (SBC2009), Lake Tahoe, CA, June 2009.
16. Camesano, T., Billiar, K., Rolle, M., "REU site: Integrated bioengineering research, education, and outreach experiences for females and underrepresented minorities at WPI," NSF EEC Awardees Conference 2009, Reston, VA, February 2009.
17. Billiar, K., Camesano, T., Rolle, M., "RET site: Inquiry-based bioengineering research and design experiences for middle-school teachers," NSF EEC Awardees Conference 2009, Reston, VA, February 2009.
18. Camesano, T., DiBiasio, D., Billiar, K., Rolle, M., Zhou, S. Integrated research, education, and outreach experiences for undergraduates at Worcester Polytechnic Institute. Proceedings of 2008 ASEE Annual Conference.
19. Organized and presented in educational workshop "Biomechanics laboratories 'on a shoestring'" at ASME Summer Bioengineering Conference, Marco Island, FL, June 2008.
20. Camesano, T., DiBiasio, D., Billiar, K., Rolle, M., Zhou, S. Integrated research, education, and outreach experiences for undergraduates at Worcester Polytechnic Institute. Proceedings of 2008 ASEE Annual Conference, June 22-25, 2008, Pittsburgh, PA.
21. Billiar, K.L., "Tissue mechanics lab: pros and cons of an inquiry approach for juniors," ASME Summer Bioengineering Conference, Keystone, CO, June 2007.

GRADUATE THESES AND DISSERTATIONS ADVISED AT WPI

Postdoctoral Fellows

1. Ying Liu, Postdoctoral Fellow, 2018-present
2. Heather Cirka, Postdoctoral Fellow, 2016-2017
3. Ngozi Eze, Postdoctoral Fellow, 2015-2016

Doctoral Students

1. Rozanne Mungai, Doctoral Candidate, Biomedical Engineering, expected May 2024 (Funded by NSF)
2. Juanyong Li, Doctoral Candidate, Biomedical Engineering, expected May 2022 (Funded by ARMI)
3. Mahvash Jebeli, Doctoral Candidate, Biomedical Engineering, expected May 2022 (Funded by AHA)
4. Zachary Goldblatt, Doctoral Candidate, Biomedical Engineering, 2014-2020 (Funded by NSF)
5. Mehmet Kural, 2010-2014 (Funded by NIH R15)
6. Heather Cirka, 2010-2016 (Funded by WPI Fellowship 1st year, IGERT, AHA)
7. Angela Throm, 2003- 2012 (Funded by GAANN through 6/06; then by American Heart Association grant)
8. Jenna Balestrini, 2003- 2009 (Funded by Whitaker grant through 8/06)

Masters Students

1. Colin Coutts, MS Candidate, BME, expected August 2021
2. Leo Sutter, MS Candidate, BME, August 2020
3. Frank Benesch-Lee, MSE, Biomedical Engineering, May 2019
4. Luciano Bortolin, MS, Biomedical Engineering, May 2016
5. Mathilda Rudnicki, Spring 2012
6. John Dieselman, Spring 2012
7. Jeffrey John, Fall 2005-N/A
8. Shruti Pai, Graduated August 2005
9. Jan-Eric Ahlfors, Graduated May 2004