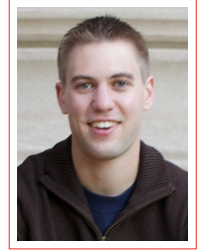


Brad Holschuh

Curriculum Vitae

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Education

- 2010–2014 **Ph.D., Aerospace Biomedical Engineering**
(minor in Aerospace Physiology),
Massachusetts Institute of Technology, Cambridge, MA.
- 2007–2010 **S.M., Aeronautics and Astronautics**,
Massachusetts Institute of Technology, Cambridge, MA.
- 2007–2010 **S.M., Technology and Policy**,
Massachusetts Institute of Technology, Cambridge, MA.
- 2003–2007 **S.B., Aerospace Engineering**
(minors in Psychology and Earth, Atmospheric and Planetary Science),
Massachusetts Institute of Technology, Cambridge, MA.

Appointments

- 2015–Present **Assistant Professor, Wearable Technology and Apparel Design**,
Co-director, Wearable Technology Laboratory,
Department of Design, Housing, and Apparel – College of Design,
University of Minnesota, Minneapolis, MN.
- 2015 **Lecturer**,
Department of Aeronautics and Astronautics – School of Engineering,
Massachusetts Institute of Technology, Cambridge, MA.
- 2014–2015 **Postdoctoral Associate**,
Man-Vehicle Laboratory (MVL),
Department of Aeronautics and Astronautics – School of Engineering,
Massachusetts Institute of Technology, Cambridge, MA.

Publications

Journal Articles

- 2015 **Holschuh, B.**, Gatto, G., Levrino, L., Bretl, K., and Newman, D. "Sustainable Counter-Pressure [upcoming] Production for Mechanical Counter-Pressure (MCP) Space Suits using Active Materials," under development and to be submitted for review to *Acta Astronautica*, October 2015.
- 2015 **Holschuh, B.**, and Newman, D. "Morphing compression garments for space medicine and extravehicular [upcoming] activity using active materials," submitted for review to *Aerospace Medicine and Human Performance*, July 2015.
- 2015 **Holschuh, B.**, and Newman, D. "[Two-Spring Model for Active Compression Textiles with Integrated NiTi Coil Actuators](#)," in *Smart Materials and Structures* 24(3)035011, 06 February 2015.
- 2014 **Holschuh, B.**, Obropta, E., and Newman, D. "[Low Spring Index NiTi Coil Actuators for Use in Active Compression Garments](#)," in *IEEE Transactions on Mechatronics* 20(3), p. 1264-1277, 25 June 2014.

Theses

- 2014 Ph.D. Dissertation: [Mechanical Counter-Pressure Space Suit Design using Active Materials](#), June 2014
- 2010 Dual Masters Thesis: [Space Exploration Challenges: Characterization and Enhancement of Space Suit Mobility and Planetary Protection Policy Analysis](#), June 2010.
- 2006 S.B Thesis (joint thesis with T. Gray): Golf Driver / Ball Impact Acoustic Measurement System, June 2006.

Invited Papers

- 2014 **Holschuh, B.**, and Newman, D. "[Low Spring Index, Large Displacement Shape Memory Alloy \(SMA\) Coil Actuators for Use in Macro- and Micro-Systems](#)," in *SPIE MOEMS-MEMS*, 897505, 10.1117-12.2044406, February 2014.

Conference Papers and Posters

- 2015 **Holschuh, B.**, and Newman, D. "Mechanical Counter-Pressure Space Suit Design using Active Materials," poster presented at *2015 NASA Human Research Program (HRP) Investigators' Workshop*, January 2015.
- 2015 **Holschuh, B.**, Gatto, G., Levrino, L., Bretl, K., and Newman, D. "Active Material Technology Development for Mechanical Counter-Pressure Space Suits using 3D-Printed Components," poster presented at *2015 NASA Human Research Program (HRP) Investigators' Workshop*, January 2015.
- 2013 **Holschuh, B.**, Obropta, E., and Newman, D. "[Shape Memory Alloy \(SMA\) Coil Actuators for Use in Controllable Mechanical Counter-Pressure \(MCP\) Space Suits](#)," poster presented at *2013 NASA Human Research Program (HRP) Investigators' Workshop*, February 2013.
- 2012 **Holschuh, B.**, Obropta, E., Buechley, L., and Newman, D. "[Materials and Textile Architecture Analyses for Mechanical Counter-Pressure Space Suits Using Active Materials](#)," technical manuscript presented at *AIAA Space 2012*, AIAA 2012-5206, September 2012.
- 2011 Meyen, F., **Holschuh, B.**, Kobrick, R., Jacobs, S., and Newman, D. "[Robotic Joint Torque Testing: A Critical Tool in the Development of Pressure Suit Mobility Elements](#)," technical manuscript presented at *41st International Conference on Environmental Systems (ICES)*, AIAA 2011-5105, July 2011.
- 2011 **Holschuh, B.**, and Newman, D. "Investigation of Compression Technologies using Advanced Materials for Mechanical Counter Pressure Planetary Exploration Suits," poster presented at *41st International Conference on Environmental Systems (ICES)*, July 2011.
- 2009 Newsome, S., Yamamoto, N., Grindle, A., **Holschuh, B.**, Ono, M., and Weigel, A. "[Analysis of US Policy Options for the Future of the International Space Station](#)," technical manuscript presented at *AIAA Space 2009*, AIAA 2009-6498, September 2009.
- 2009 **Holschuh, B.**, Waldie, J., Hoffman, J., and Newman, D. "[Characterization of Structural, Volume and Pressure Components to Space Suit Joint Rigidity](#)" technical manuscript presented at *39th International Conference on Environmental Systems (ICES)*, 2009-01-2535, July 2009.
- 2009 **Holschuh, B.**, Gray, T., and Blair, K. "Golf Driver/Ball Impact Acoustic Measurement System" technical manuscript presented at *4th Asia Pacific Congress on Sports Technology*, 287-291, September 2009.

Book Chapters

- 2015 **Holschuh, B.**, and Newman, D. "Extravehicular Activity (EVA)," a chapter to appear in the *Encyclopedia of Bioastronautics*, to be published by Springer, January 2017.
[upcoming]
- 2015 **Holschuh, B.**, and Newman, D. "Mechanical Counter-Pressure Space Suits," a chapter to appear in Section VI ("Space Suits and Extravehicular Activity") of the *Handbook of Life Support Systems for Spacecraft and Extraterrestrial Habitats*, to be published by Springer, Fall 2015.
[upcoming]

Patents

- 2014 **Holschuh, B.**, Gatto, G., Levrino, L., and Newman, D. "Wearable, Self-Locking Shape Memory Alloy (SMA) Actuator Cartridge," provisional patent application (US number 62/079,779), submitted 14 November 2014 (full patent application under development).
- 2014 **Holschuh, B.**, Obropta, E., and Newman, D. "Controllable Compression Textiles using Shape Memory Alloys and Associated Products," full patent application (US number 2014482373) submitted 16 September 2014 (under review).
- 2014 **Holschuh, B.**, Obropta, E., and Newman, D. "Controllable Compression Garments using Shape Memory Alloys and Associated Techniques and Structures," full patent application (US number 2014482365) submitted 11 September 2014 (under review).

Invited Talks and Lectures

- 2015 **Holschuh, B.** "Mechanical Counter-Pressure Space Suit Design using Active Materials," invited technology discussion, NASA Ames Research Center, Moffett Field, CA, 12 January 2015.
- 2014 **Holschuh, B.** "Advancing Space Suit Design," invited 5-minute lightning talk delivered for the [MIT Aero/Astro 100th Anniversary Symposium](#), Cambridge, MA, 24 October 2014.
- 2014 **Holschuh, B.** and Obropta, E. "Compression Garment Design using Active Materials," invited guest lecture delivered for *Textiles + Technology: Transforming Environments* (course 0197) at the Rhode Island School of Design (RISD), Providence, RI, 28 July 2014.
- 2013 **Holschuh, B.** and Newman, D. "[Advanced Space Suit Design at MIT](#)," invited presentation given at the American Textile History Museum (ATHM), Lowell, MA, 26 February 2013.
- 2012 **Holschuh, B.** and Obropta, E. "[Mechanical Counter-Pressure Space Suit Design using Active Materials](#)," invited presentation given at the *Industrial Fabrics Association International (IFAI) Expo*, Boston, MA, 09 November 2012.
- 2012 **Holschuh, B.** "Mechanical Counter-Pressure Space Suit Design using Active Materials," invited guest lecture delivered for *New Textiles* (course MAS.962) at MIT, Cambridge, MA, 06 March 2012.

Honors, Fellowships and Awards

- 2015 MIT Man-Vehicle Laboratory [Sherwood A. Modestino "Sherry" Award](#).
- 2015 First Place, [Post-Doctoral Poster Competition](#), given by the National Space Biomedical Research Institute (NSBRI) at the *2015 NASA Human Research Program (HRP) Investigators' Workshop*.
- 2011–2014 NASA Space Technology Research Fellowship (NSTRF). "[Development and Testing of Compression Technologies Using Advanced Materials for Mechanical Counter-Pressure Planetary Exploration Suits](#)".
- 2013 First Place, [Graduate Student Poster Competition](#), given by the National Space Biomedical Research Institute (NSBRI) at the *2013 NASA Human Research Program (HRP) Investigators' Workshop*.
- 2011 Third Place, Student Poster Competition, at the *41st International Conference on Environmental Systems (ICES)*.
- 2011 Nominated to receive the MIT School of Engineering Graduate Student Teaching and Mentoring Award.
- 2010 Massachusetts Space Grant Consortium Summer Fellowship. "Gas-Pressurized Space Suit Mobility: An Analysis of Industry Measurement Techniques, and a Specific Investigation of the Mobility Characteristics of a Full Body Space Suit Prototype Using Multiple Test Methods".
- 2009 Massachusetts Space Grant Consortium Summer Fellowship. "[Characterization and Mitigation of Space Suit Pressure Effects, and an Investigation of Commercial Space Planetary Protection Policy Issues](#)".
- 2009 MIT [Aero/Astro Teaching Assistantship Award](#)
- 2007 MIT [Aero/Astro Teaching Assistantship Award](#)
- 2007 MIT [Aero/Astro Apollo Award](#)

Teaching and Mentoring Experience

Teaching Positions

- 2015 **Lecturer**, Aerospace Biomedical and Life Support Engineering (MIT course 16.423) - graduate level.
- 2014-2015 **Instructor**, Bioengineering Journal Article Seminar (MIT course 16.459) - graduate level.
- 2007-2011 **Graduate Teaching Fellow**, Experimental Projects I-II (MIT courses 16.621-622) - undergraduate level.
- 2006-2007 **Undergraduate Teaching Assistant**, Experimental Projects I-II (MIT courses 16.621-622) - undergraduate level.

Mentored and Advised Students (15 since 2010)

- 2015 **Olivia Makepeace**. "Integration of Circuitry and Electronics into Flexible, Wearable Materials for use in Mechanical Counter-Pressure Space Suits" Undergraduate Research Opportunities Program. (Feb-May)
- 2015 **Jamie Voros**. "Active Closure Technologies for the NASA BioSleeve System" Undergraduate Research Opportunities Program. (Feb-May)
- 2015 **Antonis Michael**. "Mechanical Tensioning System for Compression Garments using the Lines of Non-extension (LoNE)" Undergraduate Research Opportunities Program. (Feb-May)
- 2015 **Timothy Nguyen**. "Thermal Insulation for 3D Printed Materials with Integrated SMA Actuators" Undergraduate Research Opportunities Program. (Jan-May)
- 2013-2015 **Katie Bretl**. "Rapid Prototyping of Shape Changing Compression Garments for Mechanical Counter-Pressure Space Suits." MIT Undergraduate Research Opportunities Program (UROP), Fall 2013 - Present.
- 2014 **Giacomo Gatto, Luca Levrino, and Eric Friedman**. "Large-Scale Manufacturing and Production of Shape Memory Alloy (SMA) Actuator Cartridges." Visiting graduate students, June 2014 - Present.
- 2014 **Nora Carlson-Strom**. "Nickel Titanium Coil Producer." Visiting undergraduate student, June 2014.
- 2012-2013 **Brian Wee**. "[Assessment and Preliminary Model Development of Shape Memory Polymers Mechanical Counter Pressure Space Suits](#)." MIT Undergraduate Research Opportunities Program, September 2012 - June 2013.
- 2012-2013 **Nora Newie**. "Investigation of Active Materials for Use in Mechanical Counter-Pressure Space Suits." Visiting graduate student, September 2012 - May 2013.
- 2011-2013 **Edward Obropta**. "The BioSuit System - Materials and Textile Development." MIT Undergraduate Research Opportunities Program (UROP), September 2011 - May 2013.
- 2012 **Andrea Messidoro**. "Dielectric Elastomers: Preliminary Assessment as Building Blocks of a Hybrid MCP Space Suit." Visiting graduate student, June - August 2012.
- 2011 **Dan Rankin**. "Active Material Development for the BioSuit System, and Real-Time Infrared Body Tracking Technology." MIT Undergraduate Research Opportunities Program (UROP), June - August 2011.
- 2010 **Forrest Meyen**. "Mobility Characterization of a S1034 Pilot Protective Assembly and the Development of Motion Capture Robotic Controls." MIT Summer Research Program (MSRP), June - August 2010.

Service and Outreach

- 2015 **Member**, Committee to Review NASA's Evidence Reports on Human Health Risks – Decompression sickness report lead, [Institute of Medicine](#), Washington, D.C.
- 2015 **Consultant**, Two-week studio on Space Suit Technologies, [NuVu Innovation Studio](#), Cambridge, MA.
- 2015 **Reviewer**, Journal of Mechanical Engineering Science (Proceedings of the Institution of Mechanical Engineers - Part C).
- 2015 **Reviewer**, 45th International Conference on Environmental Systems (ICES) Conference Proceedings.
- 2014 **Reviewer**, 44th International Conference on Environmental Systems (ICES) Conference Proceedings.

- 2011-2014 **Contributor**, [MIT K-12+ Educational Videos Program](#), MIT School of Engineering (8 videos).
2011-2014 **Graduate Resident Tutor**, MIT Baker House.
2009 **Discovery workshop co-organizer**, [Sally Ride Science Festival](#) / [Cambridge Science Festival](#).

Research and Work Experience

- 2006 **Research Associate**, NASA Academy, Goddard Space Flight Center (GSFC), Greenbelt MD.
2006 **Undergraduate Research Opportunities Program (UROP)**, MIT Space Systems Laboratory (SSL).
2005 **Summer Intern**, Engine Operability Division, General Electric (GE) Transportation - Aircraft Engines, Lynn, MA.

Activities and Affiliations

- 2015–Present **Faculty Affiliate**, MnDRIVE Initiative, University of Minnesota
2006–2014 **Member**, AIAA
2013–2014 **Member**, SPIE
2009–2014 **Assistant Coach**, MIT Club Ice Hockey Team
2004–2009 **Player**, MIT Varsity Ice Hockey Team
2003–2007 **Member**, Delta Tau Delta Fraternity
ResearcherID: [G-9553-2014](#), **ORCID**: [0000-0002-2054-3534](#)

Press Coverage

- 2015 Feature: “How to Build the Next Generation of Spacesuits”, [Popular Mechanics](#)
2015 Feature: “Why Can’t We Design the Perfect Spacesuit?”, [Universe Today](#)
2014 Feature: “Shrink-wrapping spacesuits”, [MIT News](#), [Gizmodo](#), [The Washington Post](#), [Discovery News](#), [FOX 25 Boston](#), [Boston Globe](#), [FOX News](#), [National Academy of Engineering](#), [Top Stories @ MIT 2014](#)
2014 Feature: “Next: Suited for Space”, [National Geographic Magazine](#), September 2014
2014 Miniseries: “Man vs. the Universe [episode 3] - Mars is Ours”, [The Science Channel](#)
2012 Feature: “The Deep-Space Suit”, [Popular Science](#)
2011 Guest Editorial (authored by B. Holschuh): “A Sunrise for Space Program”, [Fargo Forum](#), [NASA](#)
2010 Feature: “Skintight ‘superhero’ space suit aims to fight bone loss”, [CNN](#), [Popular Science](#)
2009 Engineering Outreach: [USA Today](#)

Updated 05 October 2015