

## Curriculum Vitae

### Michael Bottlang, Ph.D.

Research Director  
Legacy Biomechanics Laboratory  
Clinical Research and Technology Center  
1225 NE 2<sup>nd</sup> Avenue  
Portland, Oregon 97208  
Phone: (503) 413-5457  
Fax: (503) 413-4942  
email: Mbottlan@lhs.org

Date of Birth: November 2, 1967  
Place of Birth: Radolfzell, Germany  
Citizenship: German

### Education

Dipl. Ing. (FH), Biomedical Technology, Polytechnic University Ulm, Germany 1994  
Ph.D., Biomedical Engineering, University of Iowa, Iowa City, IA, USA. 1998

### Government & Foundation Grants Awarded:

NIH / NINDS 2R42 NS074734-02, “Advanced Bicycle Helmet Technology for Prevention of Traumatic Brain Injury, PI,  
\$1,837,143 06/30/16 - 06/30/19

NIH / NINDS 2R42 NS074734-02, “Advanced Bicycle Helmet Technology for Prevention of Traumatic Brain Injury, PI,  
\$723,863 03/15/14 - 02/29/16

NIH/NAIMS 2R42AR059433-02 “A Cost-effective Bioreactor to Advance Functional Tissue Engineering of Cartilage”, PI  
\$595,571 09/01/2012-8/31/2014

NIH/ NIAMS 1R41AP061201-01A1, “ Advanced Plate Osteosynthesis Technology to Promote Healing of Bone Fractures” PI  
\$148,448 06/01/2012-5/31/2013

NIH / NINDS 1R41 NS074734-01, “Advanced Bicycle Helmet Technology for Prevention of Traumatic Brain Injury” PI, \$ 144,932	09/15/11 - 09/15/12
OTC Foundation (Osteosynthesis & Trauma Care, Zuchwil, Switzerland), “Can multi-planar fixation improve the strength of locked plating constructs?” PI \$43,000	07/30/08 - 07/30/09
NIH / NEI, R01 EY018926-A1 (Downs, JC and Girkin, CA) Age-related Changes in Optic Nerve Head Structure and Biomechanics Role: Consultant (5% effort)	04/01/08 - 03/31/12
NIH / NIAMS 1R21 AR053611-01, “Evaluating and Improving an Emergent Technology for Fixation of Bone Fractures” P.I., \$ 426,000	2006-2009
Oral & Maxillofacial Surgery Foundation, “Efficacy and Safety of Bone Graft Harvesting from the Proximal Tibia”, PI, \$ 55,000.	2004-2005
NIH, 1 R01 NS 42946. NIAMS, “An organotypic model of traumatic brain injury” PI, \$ 1,054,500,	2002-2004
U.S. Office of Naval Research, “Emergent, Non-Invasive Reduction and Stabilization of Pelvic Ring Disruptions”, PI, (N00014-01-1-0132) \$ 288,000	2000-2002
Legacy Foundation, “Operative Chest Wall Fixation”, PI, \$68,300	2002-2003
Legacy Foundation, “Strain assessment of Articular Cartilage”, PI, \$78,300	2001-2002
Legacy Foundation, “Cartilage Degeneration in Arthritic Joints”, PI, \$46,300	2001-2002

## Peer-Reviewed Publications

### Full Articles

1. Bottlang M, Tsai S, Bliven EK, von Rechenberg B, Kindt P, Augat P, et al. Dynamic Stabilization of Simple Fractures With Active Plates Delivers Stronger Healing Than Conventional Compression Plating. *J Orthop Trauma*. 2017 Feb;31(2):71-7.
2. Madey SM, Tsai S, Fitzpatrick DC, Earley K, Lutsch M, Bottlang M. Dynamic Fixation of Humeral Shaft Fractures Using Active Locking Plates: A Prospective Observational Study. *Iowa Orthop J*. 2017;37:1-10.

3. Henschel J, Tsai S, Fitzpatrick DC, Marsh JL, Madey SM, Bottlang M. Comparison of Four Methods for Dynamization of Locking Plates: Differences in the Amount and Type of Fracture Motion. *J Orthop Trauma*. 2017 Jun 22.
4. Bottlang M, Schemitsch CE, Nauth A, Routt M, Jr., Egol KA, Cook GE, et al. Biomechanical Concepts for Fracture Fixation. *J Orthop Trauma*. 2015 Dec;29 Suppl 12:S28-33.
5. Bottlang M, Tsai S, Bliven EK, von Rechenberg B, Klein K, Augat P, et al. Dynamic Stabilization with Active Locking Plates Delivers Faster, Stronger, and More Symmetric Fracture-Healing. *J Bone Joint Surg Am*. 2016 Mar 16;98(6):466-74.
6. Rice C, Christensen T, Bottlang M, Fitzpatrick D, Kubiak E. Treating Tibia Fractures With Far Cortical Locking Implants. *Am J Orthop (Belle Mead NJ)*. 2016 Mar-Apr;45(3):E143-7.
7. Tsai S, Fitzpatrick DC, Madey SM, Bottlang M. Dynamic locking plates provide symmetric axial dynamization to stimulate fracture healing. *Journal of orthopaedic research : official publication of the Orthopaedic Research Society* 2015.
8. Capanni F, Hansen K, Fitzpatrick DC, Madey SM, Bottlang M. Elastically suspending the screw holes of a locked osteosynthesis plate can dampen impact loads. *Journal of applied biomechanics* 2015;31:164-9.
9. Kessler O, Sommers M, Augustin T, et al. Higher strains in the inner region of the meniscus indicate a potential source for degeneration. *Journal of biomechanics* 2015;48:1377-82.
10. Bottlang M, Schemitsch CE, Nauth A, Routt M, Jr., Egol KA, Cook GE, et al. Biomechanical Concepts for Fracture Fixation. *J Orthop Trauma*. 2015 Dec;29 Suppl 12:S28-33.
11. Bottlang M, Augat P. The bottleneck of evidence-based fracture care. *Injury* 2014;45 Suppl 2:S1-2.
12. Bottlang M, Fitzpatrick DC, Sheerin D, et al. Dynamic fixation of distal femur fractures using far cortical locking screws: a prospective observational study. *Journal of orthopaedic trauma* 2014;28:181-8.
13. Ries Z, Hansen K, Bottlang M, Madey S, Fitzpatrick D, Marsh JL. Healing results of periprosthetic distal femur fractures treated with far cortical locking technology: a preliminary retrospective study. *The Iowa orthopaedic journal* 2013;33:7-11.
14. Hansen K, Dau N, Feist F, et al. Angular Impact Mitigation system for bicycle helmets to reduce head acceleration and risk of traumatic brain injury. *Accident; analysis and prevention* 2013;59:109-17.
15. Bottlang M, Long WB, Phelan D, Fielder D, Madey SM. Surgical stabilization of flail chest injuries with MatrixRIB implants: a prospective observational study. *Injury* 2013;44:232-8.
16. Wackym PA, Ratigan JA, Birck JD, Johnson SH, Doornink J, Bottlang M, Gardiner SK, Black FO. Rapid cVEMP and oVEMP responses elicited by a novel head striker and recording device. *Otol Neurotol* 2012;33-8:1392-400.
17. Bottlang M, Fitzpatrick DC, Lujan TJ, Doornink J, Madey SM: Biomechanics and use of far cortical locking in orthopaedic trauma. *Orthopaedic Knowledge Online Journal* 2012; 10(8)
18. Henderson CE, Lujan T, Kuhn L, Bottlang M, Fitzpatrick DC, Marsh JL. 2010 Mid-America Orthopaedic Association Physician in Training Award: Healing complications are common after locked plating for distal femur fractures. *Clin Orthop Rel Res*, 469:1757-1765, 2011.
19. C. S. Bahney, Trevor J. Lujan, C. W. Hsu, M. Bottlang, J. L. West, and B. Johnstone. "Visible Light Photoinitiation of Mesenchymal Stem Cell-Laden Bioresponsive Hydrogels" *European Cells and Materials* 22 (2011): 43-55.

20. Denard JD, Doornink J, Phelan D, Madey SM, Fitzpatrick DC, Bottlang M. Biplanar fixation of a locking plate in the diaphysis improves construct strength. *Clin Biomechanics*, 26:5, 484-90, 2011.
21. Pape HC, Bottlang M. Flexible fixation with locking plates. Editorial. *J Orthop Trauma*, 25:2 Suppl., S1-3, 2011.
22. Doornink J, Fitzpatrick DC, Madey SM, Bottlang M. Far cortical locking enables flexible fixation with periarticular locking plates. *J Orthop Trauma*, 25:2 Suppl., S29-34, 2011.
23. Bottlang M, Feist F. Biomechanics of Far Cortical Locking, *J Orthop Trauma*, 25:2 Suppl., S21-28, 2011.
24. Henderson CE, Lujan T, Bottlang M, Fitzpatrick DC, Madey SM, Marsh JL. Stabilization of distal femur fractures with intramedullary nails and locking plates: differences in callus formation. *Iowa Orthop J*, 30:61-68, 2010.
25. Bottlang M, Walleser S, Noll M, Honold S, Madey SM, Fitzpatrick DC, Long WB. Biomechanical rationale and evaluation of an implant system for rib fracture fixation. *Eur J Trauma Emerg Surg*, 2010, 36:417-426.
26. Bottlang M, Doornink J, Lujan TJ, Fitzpatrick DC, Marsh JL, Augat P, von Rechenberg B, Lesser M, Madey SM. Effects of construct stiffness on healing of fractures stabilized with locking plates. *J Bone Joint Surg Am*. 2010;92 Suppl 2:12-22.
27. Lujan TJ, Wirtz KM, Bahney CS, Madey SM, Johnstone B, Bottlang M. A Novel Bioreactor for the Dynamic Stimulation and Mechanical Evaluation of Multiple Tissue-Engineered Constructs. *Tissue Eng Part C Methods*, 17:3:367-74, 2011
28. Doornink J, Fitzpatrick DC, Boldhaus S, Madey SM, Bottlang M. Effects of hybrid plating with locked and nonlocked screws on the strength of locked plating constructs in the osteoporotic diaphysis. *J Trauma* 69(2):411-7, 2010.
29. Bottlang M, Lesser M, Koerber J, Doornink J, von Rechenberg B, Augat P, Fitzpatrick DC, Madey SM, Marsh JL. Far cortical locking can improve healing of fractures stabilized with locking plates. *The Journal of bone and joint surgery*.92:1652-1660, 2010.
30. Fitzpatrick DC, Denard PJ, Phelan D, Long WL, Madey SM, Bottlang M. Operative stabilization of flail chest injuries: review of literature and fixation options. *Eur J Trauma Emerg Surg*, 36(5), 417-433, 2010.
31. Lujan TJ, Henderson CE, Madey SM, Fitzpatrick, DC, Marsh JL, Bottlang M. Locked plating of distal femur fractures leads to inconsistent and asymmetric callus formation. *J Orthop Trauma*, 24:156-162, 2010.
32. Gardner MJ, Krieg CK, Simpson SS, Bottlang M, Displacement after simulated pelvic ring injuries: A cadaveric model of recoil. *J Trauma* 2010, 68:1, 159-165.
33. Lujan TJ, Madey SM, Fitzpatrick DC, Byrd GD, Sanderson JM, Bottlang, M. A computational technique to measure fracture callus in radiographs. *J Biomech*, 43:792-795, 2010.
34. Bottlang M, Helzel I, Long W, Fitzpatrick DC, Madey S. Less-Invasive stabilization of rib fractures by intramedullary fixation: A biomechanical study. 2010; ISSN 1529-8809 e-publication ahead of print.
35. Bottlang, M, Helzel, I, Long, WB, Madey, SM. Anatomically contoured plates for fixation of rib fractures. *Journal of Trauma*. 2010;68 (3):611-615.
36. Girard MJ, Suh JK, Bottlang M, Burgoyne CF, Downs JC. Scleral biomechanics in the aging monkey eye. *Invest Ophthalmol Vis Sci* 2009;50-11:5226-37.

37. Helzel I, Long W, Fitzpatrick D, Madey S, Bottlang M. Evaluation of intramedullary rib splints for less-invasive stabilisation of rib fractures. *Injury* 2009;40-10:1104-10.
38. Kouvidis GK, Sommers MB, Giannoudis PV, Katonis PG, Bottlang M. Comparison of migration behavior between single and dual lag screw implants for intertrochanteric fracture fixation. *J Orthop Surg Res* 2009;4:16.
39. Girard MJA, Downs JC, Burgoyne CF, Bottlang M, Suh J-KF: Peripapillary and Posterior Scleral Mechanics, Part II – Experimental and Inverse Finite Element Characterization. *Journal of Biomechanical Engineering*, 131(5):051012, 2009.
40. Bottlang, M, Doornink, J, Fitzpatrick, DC, Madey, SM. Far cortical locking can reduce stiffness of locked plating constructs while retaining construct strength. *J Bone and Joint Surg* 91(8):1985-1994, 2009.
41. Fitzpatrick, DC, Doornink, J, Madey, SM, Bottlang, M. Relative stability of locked plating fixation in a model of the osteoporotic femoral diaphysis. *Clinical biomechanics (Bristol, Avon)* 2009;24(2):203-209.
42. Bottlang, M., Doornink, J., Byrd, G., Fitzpatrick, DC, Madey, SM, A non-locking endscrew can decrease fracture risk caused by locked plating in the osteoporotic diaphysis. *The Journal of bone and joint surgery*, 91(3):620-627, 2009.
43. Henderson, C., Bottlang, M., Marsh, J.L., Fitzpatrick, D.C., Madey, S.M. Does locked plating of periprosthetic supracondylar femur fractures promote bone healing by callus formation? Two cases with opposite outcomes. *The Iowa Orthopaedic Journal*, 2008, Vol 28, 73-76.
44. Bottlang, M., Mohr, M., Simon, U., Claes, L. Acquisition of full-field strain distributions on ovine fracture callus cross-sections with electronic speckle pattern interferometry. *J Biomech*, 2008, Vol 41:3, 701-5.
45. Bottlang M, Sommers MB, Lusardi TA, Miesch JJ, Simon RP, Xiong ZG. Modeling neural injury in organotypic cultures by application of inertia-driven shear strain. *J Neurotrauma*. 2007 Jun;24(6):1068-77.
46. Sommers, MB, Fitzpatrick, DC, Madey, SM, Zanderschulp, CV, Bottlang, M. A Surrogate Long-Bone Model with Osteoporotic Material Properties for Biomechanical Testing of Fracture Implants. *J Biomech*. 2007, Vol 40/15 pp 3297-3304.
47. Mohr, M, Abrams, E, Engel, C, Long, WB, and Bottlang, M. Geometry of Human Ribs Pertinent to Orthopaedic Chest-Wall Reconstruction. *J Biomech*. 2007, 40(6):1310-7.
48. Ehmke, LW, Madey, SM, Britton, BP, Bottlang, M. Antegrade Femoral Nailing Through the Trochanter: The Reamer Pathway Indicates a Helical Shape for Trochanteric Intramedullary Nails. *J Orthop Trauma*. 2006 Nov-Dec;20(10):668-74.
49. Kessler, O., Lacatusu, E., Sommers, SM, Mayr, E, Bottlang, M. Femoral Malrotation Increases Cortical Strain in the Proximal Tibia after Total Knee Arthroplasty. *Clin Biomech (Bristol, Avon)*. 2006 Jul; 21(6):603-9.
50. Bottlang, M, Erne, O, Lacatusu, E, Sommers, MS, Kessler, O. The mobile bearing of a Scorpio+ PS Knee Arthroplasty can Reduce Strain at the Proximal Tibia. *Clin Orthop Relat Res*. 2006 Jun; 447:105-11.
51. Krieg, JC, Mohr, M, Ellis, TJ, Simpson, TS, Madey, SM, Bottlang, M, Emergent Stabilization of Pelvic Ring Injuries by Controlled Circumferential Compression: A Clinical Trial. *J Trauma*, 59(3):659-64.2005.

52. Ehmke LW, Fitzpatrick DC, Krieg JC, Madey SM, Bottlang M. Lag screws for hip fracture fixation: Evaluation of migration resistance under simulated walking. *J Orthop Res.*, 2005, 23:6 , 1329-1335.
53. Bottlang, M, Letters to the editor. *J Orthop Trauma*. 2005 Jul;19(6):435.
54. Krieg, JC, Mohr, M, Mirza, AJ, Bottlang, M. Pelvic Circumferential Compression in the presence of soft-tissue injuries: A case report. *J Trauma*, 59(2):470-9, 2005.
55. Fitzpatrick, D. C., Sommers, M.B., Kam, B.C.C., Marsh, J.L., Bottlang, M.: Knee Stability After Articulated External Fixation. *Am J Sports Med*. 33: 1735-1741, 2005.
56. Engel C, Krieg JC, Madey SM, Long WB, Bottlang M. Operative Chest Wall Fixation with Osteosynthesis Plates. *J Trauma*, 2005, 58:181-186.
57. Erne, OK, Reid, JB, Sommers, M, Madey, SM, Bottlang, M. Depth-dependent strain of patellofemoral articular cartilage in unconfined compression. *J Biomech.*, 2005, 38:4, 667-72.
58. Sommers MB, Fitzpatrick DC, Kahn KM, Marsh, JL, Bottlang M. Hinged External Fixation of the Knee: Intrinsic Factors Influencing Passive Joint Motion. *J Orthop Trauma*, 18:3, 163-169, 2004.
59. Sommers MB, Roth C, Hall H, Kam BCC, Ehmke LW, Krieg JC, Madey SM, Bottlang M. Cut-out resistance of implants for pertrochanteric fracture fixation. *J Orthop Trauma*.18(6):361-368, 2004.
60. Bottlang, M, Erstversorgung von lebensbedrohlichen Beckenfrakturen. *Rettungsdienst Journal*, 01-2004, 28-30, 2004.
61. Bottlang M, Krieg JC. The pelvic fracture stabilization in the field. *Emerg Med Serv*. 2003 Sep;32(9):126-9.
62. Bottlang M, Krieg JC. Introducing the pelvic sling. Pelvic fracture stabilization made simple. *JEMS*. 2003 Sep;28(9):84-93.
63. Bottlang M, Krieg JC. Simple solutions for life-threatening injuries: Stabilizing pelvic fractures at the scene with a pelvic sling. *Emergency, Fire/Rescue and Police* 2003;3:17-18.
64. Bottlang M, Scheinberg S, Krieg JC. Pelvic sling for application in special ops medicine. *Journal of Special Operations Medicine* 2003;3:62-64.
65. Bottlang M, Krieg JC, Mohr M, Simpson TS, Madey SM. Emergent management of pelvic ring fractures by circumferential compression. *Journal of Bone and Joint Surgery* 2002;84-A:43-47.
66. Simpson T, Krieg JC, Heuer F, Bottlang M. Stabilization of pelvic ring disruptions with a circumferential sheet. *J Trauma* 2002;52:158-161.
67. Bottlang M, Simpson TS, Sigg J, Krieg JC, Madey SM, Long WB. Non-invasive reduction of open-book pelvic fractures by circumferential compression. *J Orthop Trauma* 2001;16:367-373.
68. Von Koch F, Marsh JL, Steyers CM, McKinley TO, O' Rourke M, Bottlang M. A new articulated elbow external fixator technique for difficult elbow trauma. *Iowa Orthopaedic Journal* 2001;21:13-19.
69. Bottlang M, Madey SM, Steyers CM, Marsh JL, Brown TD. Assessment of elbow joint kinematics in passive motion via electromagnetic motion tracking. *J Orthop Res* 2000;18:195-202.
70. Bottlang M, O' Rourke M, Madey SM, Steyers CM, Marsh JL, Brown TD. Radiographic determinants of the elbow rotation axis: experimental identification and qualitative validation. *J Orthop Res* 2000;18:821-828.
71. Brown TD, Bottlang M, Pederson DR, Banes AJ. Development and experimental validation of a fluid/structure interaction finite element model of a vacuum cell culture mechanostimulus system. *Comput Methods Biomech Engin* 2000;3:65-78.

72. Brown TD, Pederson DR, Bottlang M, Banes AJ. Reactive fluid stress in a vacuum-driven cell culture mechanostimulus system. *J Orthop Res* 2000; provisionally accepted:
73. Madey SM, Bottlang M, Steyers CM, Marsh JL, Brown TD. Hinged external fixation of the elbow: optimal axis alignment to minimize motion resistance. *J Orthop Trauma* 2000;14:41-47.
74. O'Rourke M, Steyers CM, Marsh JL, Bottlang M, Madey SM, Brown TD. *Articulated elbow external fixation: determinants for optimal hinge alignment*. Atlas of Hand Clinics. New York, W.B. Saunders Company, 2000.
75. Banes AJ, Weinhold P, Yang X, Tsuzaki M, Bynum D, Bottlang M, Brown TD. Gap junction regulated response of tendon cells ex vivo to mechanical loading. *Clin Orthop Rel Re* 1999;367:S356-S357.
76. Bottlang M, Marsh JL, Brown TD. Articulated external fixation of the ankle: minimizing motion resistance by accurate axis alignment. *J Biomech* 1999;32:63-70.
77. Brown TD, Bottlang M, Pederson DR, Banes AJ. Loading paradigms -- intentional and unintentional -- for cell culture culture mechanostimulus. *Am J of Med Sci* 1999;316:162-168.
78. Bottlang M, Marsh JL, Brown TD. Factors influencing accuracy of screw displacement axis detection with a D.C. based electromagnetic tracking system. *J Biomech Eng* 1998;120:431-435.
79. Bottlang M, Sinnacher M, Schmitt H, Brand RA, Claes L. A cell strain system for small homogeneous strain applications. *Biomed Tech* 1997;42:305-309.

### Scientific Exhibits

1. Bottlang, M., O'Rourke, M., Marsh, J.L., Brown, T.D., "Quantitative Validation of Radiographic Landmarks for the Application of Articulated External Fixation to the Elbow and Ankle Joint" Am Acad Orthop Surg, Annual Meeting, SE 069, Anaheim, CA, 1999.
2. Marsh, J.L., von Koch, F., McKinley, T.O., Steyers, C.M., O'Rourke, M., Bottlang, M., "Articulated Elbow External Fixation Without an Axis Pin-Technique Results". Am Acad Orthop Surg, Annual Meeting, SE54, Dallas, TX, 2002.
3. Bottlang, M., Krieg, J.C., Mohr, M., Simpson, T.S., Madey, S.M., "Emergent Management of Pelvic Ring Fractures by Circumferential Compression". Am Acad Orthop Surg., Annual Meeting, SE 49, Dallas, TX, 2002.
4. Bottlang M., Doornink, J, Fitzpatrick, DC, Marsh, JL, Augat, P, von Rechenberg, B, Lesser, M, Madey, SM "Effects of Construct Stiffness on Healing of Fractures Stabilized With Locking Plates". American Academy of Orthopaedic Surgeons, AAOS 2010 Annual Meeting, New Orleans. Award of Excellence recipient.

### Book Chapters

1. O'Rourke M, Steyers CM, Marsh JL, Bottlang M, Madey SM, Brown TD. *Articulated elbow external fixation: determinants for optimal hinge alignment*. Atlas of Hand Clinics. New York, W.B. Saunders Company, 2000.
2. Bottlang M, Fitzpatrick DC, Augat P. *Musculoskeletal Biomechanics*. Orthopaedic Knowledge Update 10, Section 1. Editor: John Flynn, American Academy of Orthopaedic Surgeons, 2/2011.

3. Bottlang M, *Biomechanics of Chest Wall Stabilization*. Injuries to the Chest Wall: Diagnosis and Management. Editors: Michael McKee and Emil Schemitsch. Springer. ISBN-10: 331918623X.
4. Bottlang M, *Biomechanics of Fractures and Fracture Fixation*. Chapter 1 in Rockwood and Green's Fractures in Adults. Editor-elect for 9<sup>th</sup> edition.