

Richard F. ff. Weir, PhD.

Director
Biomechanics Development laboratory
Research Institute,
Children's Hospital,
13123 E 16th Ave,
Aurora, CO 80045

Research Career Scientist
Rocky Mountain Regional VAMC

Research Associate Professor,
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College of Engineering, Design and Computer Sciences
University of Colorado Denver | Anschutz Medical Campus
Bioscience 2 – Building Y18
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Aurora, CO 80045

RESEARCH INTERESTS

My research is focused on the development an artificial hand replacement capable of true dexterous manipulation for use by persons with upper-limb loss. Our research covers all aspects of the problem ranging from neural control and sensing, mechatronic design and development, novel actuator technologies, and clinical deployment of these systems. While we are able to build highly complex mechatronic recreations of the human hand, as evidenced by our development of an 18 degree-of-freedom hand for the DARPA Revolutionizing Prosthetics (RP2007 & RP2009) initiatives, intuitive control of these hands still eludes us. The interface between the user and the device is lacking. To enable advanced control of the next generation of prosthetic devices we are developing, as part of the NIH SPARC initiative, a highly novel compact optogenetic based optical probe capable of optically neuromodulating individual afferent and/or efferent axons. My goal is to achieve non-invasive read-in or read-out from these nerves with the goal of modulating the organs, brain circuits, or muscles innervated by them. We are also developing robust mechatronic artificial finger replacements using our expertise in 3D metal printing to fabricate high strength small parts and we are exploring the use of implantable fuel cells which can extract electricity from blood sugar as well as 3D printed osseointegration abutments for prosthetic finger replacement.

I have been in the field of Prosthesis design and Rehabilitation Research for over 25 years and have maintained extramural funding both at the University and VA over that time. Over that time, I completed the training required to become clinical prosthetist and was Director of Research for Advanced Arm Dynamics (AAD) for 2 years, AAD is a national provider of upper-limb prosthetics care. We are working with commercial partners to translate novel control algorithms for todays 6 DoF hands I am a founding partner of Point Designs a company we started to sell a novel mechanical finger for persons with partial hand amputations. Most recently I am participating in the ACUE certificate course to become a better teacher more learned in how to apply the techniques of active learning.

In the past, I led the development of the Implantable Myoelectric Sensor (IMES) devices that can be chronically implanted into the residual muscles of an amputee's arm using minimally invasive surgical techniques. We are working with Alfred Mann Foundation (AMF) (Valencia, CA), Illinois Institute of Technology (IIT), (Chicago, IL), and Sigenics Inc. (Chicago, IL) to move our IMES through FDA and to get them into people. In other work, we developed the drive train for a 3 DOF Hand for the University of New Brunswick, Canada. I was the lead architect of the hand for the final limb system of the DARPA Revolutionizing Prosthetics 2009 initiative. As part of the RP2009 initiative we developed, in collaboration with Otto Bock, Vienna, and Applied Physics Laboratory, an 18 DOF multifunction hand system called the "Intrinsic Hand" for "Prototype 2", as well as a 7 DOF arm/hand system called "Prototype 1". As part of the DARPA RP2007 initiative I consulted for DEKA on the development of their Luke arm. I have also explored work in the area of series elastic, or compliant, motors/drives/actuators for use in prosthetic components in particular a compliant elbow and wrist. We are about designing and building and translating physical prosthesis systems.

2. EDUCATION

a. Baccalaureate

- 1979 - 1983 BAI(Hons.) Microelectronics & Electrical Eng., Trinity College, Dublin, Ireland (Major).
1979 - 1983 BA Mathematics, Trinity College, Dublin, Ireland (Minor).

b. Graduate

- 1986 - 1989 M.Sc. Biomedical Engineering, Northwestern University, Evanston, IL.
Thesis: An Externally-Powered, Myo-electrically Controlled Synergetic Prosthetic Hand for the Partial Hand Amputee. Committee: Dudley Childress, Zev Rymer, Ed. Colgate
1989 – 1995 Ph.D. Biomedical Engineering, Northwestern University, Evanston, IL.
Dissertation: Direct Muscle Attachment as a Control Input for a Position Servo Prosthesis Controller.
Committee: Dudley Childress, Zev Rymer, Ed. Colgate, Scott Delp.

c. Postgraduate

- 1995-1996 Post-Doctoral Research Fellow, Department of Orthopaedic Surgery, Northwestern University Medical School, Chicago, IL, May 1995
1996-1997 Research Associate, Department of Orthopaedic Surgery, Northwestern University Medical School, Chicago, IL, May, 1996.
1997-1999 Research Associate, Department of Physical Medicine & Rehabilitation, Northwestern University Medical School, Chicago, IL, September, 1997.

3. POSTDOCTORAL TRAINING

- 1995 Recipient Annual Postdoctoral Research Fellowship awarded by the National Institute on Disability and Rehabilitation Research (NIDRR), US Department of Education.
1999 Recipient of a 3-year Career Development Award.
VARR&D B0928CD(Weir): Rehabilitation Research and Development of Gait Instrumentation and Upper-Extremity Prostheses.

4. APPOINTMENTS

a. VA Appointments

- 1999-2010 Research Healthcare Scientist, Veterans Administration, Jesse Brown VA Medical Center – Lakeside CBOC, Chicago, IL, August, 1999 (GS13-1 – GS13-8)
2011-2018 Research Healthcare Scientist, VA Eastern Colorado Healthcare System - Denver VAMC, Denver, Colorado (GS13-8 - GS13-10)
2018-Present Research Career Scientist, VA Eastern Colorado Healthcare System - Denver VAMC, Denver, Colorado (GS13-10 - GS13-10)

b. University appointments

- 1999-2006 Research Assistant Professor, Department of Physical Medicine & Rehabilitation, Northwestern University Feinberg School of Medicine, Chicago, IL, June, 1999.
2003-2006 Research Assistant Professor, Biomedical Engineering Department, Northwestern University McCormick School of Engineering and Applied Science, Evanston, IL, October, 2003.
1996-2011 Adjunct Faculty, Northwestern University Prosthetics & Orthotics Center (NUPOC), Chicago, IL, September 1996
2006-2011 Research Associate Professor, Department of Physical Medicine & Rehabilitation, Northwestern University Feinberg School of Medicine, Chicago, IL, September, 2006.
2006-2013 Associate Clinical Professor, Biomedical Engineering Department, Northwestern University McCormick School of Engineering and Applied Science, Evanston, IL, September, 2006.
2006-2013 Adjunct Professor, Department of Physical Medicine & Rehabilitation, Northwestern University Feinberg School of Medicine, Chicago, IL, September, 2006.
2011-Present Adjunct Professor, Department of Integrative Physiology, University of Colorado – Boulder, Boulder, CO
2011-Present Associate Research Professor, Department of Rehabilitation Medicine, Anschutz Medical Center, Colorado University at Denver, Denver, CO

2011-Present Associate Research Professor, Department of Bioengineering, College of Engineering and Applied Science, University of Colorado Denver · Anschutz Medical Campus, Aurora, CO

c. Other professional employment

1983 Summer 1981 Internship, Chem Systems Ltd., London, England
1983-1986 Control Engineer, APV Automation, Crawley, England.
Designed and commissioned computer control panels for hygienic applications, principally in the biotech, food, and beverage industries.
1995-2006 Biomedical Engineer, Northwestern University Rehabilitation Engineering Research Center and Prosthetics Research Laboratory, Chicago, IL, May, 1995.
2006-2011 Senior Research Scientist, Rehabilitation Institute of Chicago, Chicago, Illinois, September 2006.
2006-2011 Director, Biomechatronics Development Laboratory, Rehabilitation Institute of Chicago, Illinois, September 2006.
2011-2013 National Director for Research and Development, Advanced Arm Dynamics, Redondo Beach, CA
2011-Present Director, VA/CU Biomechatronics Development Laboratory, Jewell Center, Aurora, Colorado.
2017-Present President and Co-Founder, Point Designs LLC, Louisville, Colorado.

5. PROFESSIONAL AFFILIATIONS AND MEMBERSHIP IN SCIENTIFIC SOCIETIES

1991-Present Member, Institute of Electrical & Electronic Engineers (IEEE)
1994-Present Member, Sigma XI, the Scientific Research Society.
1998-Present Member, of the American Society of Mechanical Engineers (ASME) - Bioengineering Society.
1998-Present Member, of the International Society for Prosthetics and Orthotics (ISPO).
2007-Present Member, Institute of Engineers of Ireland.

6. SERVICE TO LOCAL VAMC

1999-2003 Member, Research Committee, VA Chicago Health Care System - Lakeside Division.
2000-2004 VA Representative, Panel C, Institutional Review Board, Northwestern University, Chicago, IL.,
2008-2009 Mentor, VA Pre-Doctoral Fellowship Awardee: Sulzer, James (Jesse Brown VAMC/ Northwestern University).
2010-2015 Member, VA Eastern Colorado Health Care System Research Committee
2012-2018 Mentor to Alena Grabowski, CDA-2 A7972-W (Grabowski): *Characterizing Ankle Function during Sloped Locomotion for Prosthesis Development*
2017-2019 Mentor to Jacob Segil, CDA 1: VA CDA-1 IK1RX002011 (Segil): *Integration of a Sensory Feedback Implant with Myoelectric Prosthetic Hands*
2018 Gave tour to VA CCTSI NCATS site visit – 09/18/2018
2018 Gave talk at VA ECHCS Research Days – 10/05/2018
2019 Gave talk at Research Seminar – 02/27/2019

7. SERVICE TO NATIONAL VA

2003 Member Upper-Limb Advisory Panel, Walter Reed Army Medical Center (WRAMC)/VA Prosthetics Workshop, Washington DC, Nov 17th –18th, 2003.
2004-Present Reviewer, Department of Veterans Affairs Rehabilitation Research and Development Service Scientific Merit Review.
2005 Member Advisory Panel, DARPA/VA Advanced Prosthesis Workshop, Maryland, Jan 10th –11th, 2005.
2006 *Speaker at Senate Subcommittee Hearing on VA Research Funding*
2007 Chairperson, Rehabilitation Engineering Review Panel, VA Merit Review
2008-Present Reviewer, Career Development Award Panel, VA Merit Review.
2010 Chairman, Powered/Controlled Devices Session, VA/DoD State of the Art Conference on Prosthetics/Orthotics, Washington DC, March 15th -17th.
2011 Reviewer Career Development Panel
2014 Reviewer VA RR&D Research Career Scientist Review Panel - 08/01/2014
2016 Reviewer VA RR&D Research Career Scientist Award Review - 02/26/2016
2017 Reviewer VA RR&D Spinal Cord Injury (RRDA) – 03/08/2017

2017 Reviewer VA RR&D Career Development Award Panel.
2018 Reviewer VA RR&D Research Career Scientist Review – 08/10/2018
2019 Reviewer VA RR&D Research Career Scientist Review – 08/09/2019

8. SERVICE TO AFFILIATED UNIVERSITY

2000-2004 Member, Panel C, Institutional Review Board, Northwestern University.
2011-2013 Bioengineering, Faculty Search Committee, BIOE UCD|AMC
2011-Present Bioengineering, Graduate Admissions Committee
2012-2015 CU: Department: Technology Core Course Syllabus Committee
2012-2015 CU: Department: Staff Hiring/Interviewing
2012-2015 CU: Department: Participated in High School outreach to promote New Undergraduate Bioengineering Degree
2013-2014 CU: Department/Primary Unit Curriculum Committee
2013 CU: University System: Tour of lab. for Lynne Lyons, Assistant Vice President of Research & Federal Relations and Jack Waldorf, Associate Director of Federal Relations 04/10/2013-04/10/2013
2014 CU: Denver/Anschutz Medical Campus: Hosted booth at 7th Annual Donor Dinner for CU Denver|Anschutz 02/13/2014-02/13/2014
2014 CU: University System: Toured Children's Hospital Leadership around Lab. 02/12/2014
2014 CU: University System: Toured Children's Hospital CEO Jim Shmerling around lab. 04/15/2014
2015 CU: Department: Regents Tour of New Bioscience Building 06/22/2015
2015 CU: University System: Lab. Tour Members of Congressman Coffman Office - 08/06/2015
2016 CU: University System: Gave tour of our laboratory to Senator Corey Gardner - 07/21/2016
2016 CU: University System: Gave tour of our lab. to Children's Hospital Amputee Clinic Staff, 08/09/2016
2016 CU: Anschutz Medical Campus: Tour for Leonard A. Dinegar, Senior Vice President & Chief of Staff University of Colorado, Office of the President - 04/20/2016
2016 CU: Anschutz Medical Campus: Wyoming High Schools Talk - 11/15/2016
2017 Judge for the 2017 Master's Program in Modern Human Anatomy Capstone poster project, UCD|AMC, 04/17/2017
2017 Attended Commencement in Academic Regalia Summer 2017
2017 Attended Commencement in Academic Regalia Fall 2017
2017 BIOE Departmental Advisor to undergrad. BIOE Students: Joshua Carlin, Michaela Pott, Tu Nguyen, Paige Moseley
2018 Judge Master's Program in Modern Human Anatomy Capstone poster project, UCD|AMC,
2018 CCTSI TOTTS TL1 Review Panel – T32 funded internal grant applications – 05/23/2018
2018 Research Studio Review Panel - Expert panelist – 06/15/2018
2019 Judge Master's Program in Modern Human Anatomy Capstone poster project, UCD|AMC,
2019 CCTSI TOTTS TL1 Review Panel – T32 funded internal grant applications – 05/31/2019

9. SERVICE TO PROFESSIONAL ORGANIZATIONS

2000-2006 Member, RESNA Student Design Competition Review Panel.
2002-2012 Member Advisory Committee, NIDRR Rehabilitation Engineering Research Center (RERC) on "Machines Assisting Recovery from Stroke" (MARS).
2004-Present Ad Hoc Reviewer, National Institutes of Health, Musculoskeletal Rehabilitation Sciences (MRS) Study Section.
2012 Peer Reviewer, NIH ZHD1 DSR-K 61 1, Neural Interfaces: Improving Functional Outcomes 3/22/2012
2012 Peer Reviewer, NIH NST-2 Study Section, Washington DC 11/5/2012
2013 Member, Review Panel for NSERC Canada 01/01/2013-12/31/2013
2014 Peer Reviewer, NIH Telecon Review Panel - 2014/10 ZRG1 MOSS-F(02) M,
2014 Peer Reviewer, NIH MRS review Panel - 02/27/2014
2014 Reviewer Nebraska EPSCoR Grant Proposal Review - 1/2014
2015 Scientist Reviewer, CDMRP: 2015 Peer Reviewed Medical Research Program, Prereview Preapplication – Advanced Prosthetics, PRE-AP - 06/11/2015

2015 Scientist Reviewer CDMRP: Fiscal Year 2014 Orthotics and Prosthetics Outcomes Research Program (OPORP) 03/04/2015-03/06/2015

2015 Scientist Reviewer, CDMRP: Fiscal year 2015 Peer Reviewed Medical Research Program (PRMRP) - 12/07/2015

2015 Reviewer, NSF Application Review: Chris Paredis, Program Director, ENG/CMMI ESD & SYS - 05/18/2015

2016 NIH Video Review - 05/25/2016

2016 NIH SBIR Grant Proposal Review Panel - 10/19/2016

2016 DoD CDMRP Grant Review - 05/25/2016

2016 Member, American Academy of Orthotist and Prosthetists (AAOP) State of the Science Meeting on Myoelectric Control.

2017 Reviewer, NIH ETTN-C (10) panel (Small Business: Clinical Neurophysiology, Devices, Neuroprosthetics and Biosensors), San Francisco, CA., 03/20/2017

2017 Reviewer, Online review NIH: ZRG1 BDCN-W (55), 07/25/2017.

2017 Track Chair, Biomedical Engineering Society Meeting, Phoenix AZ, Oct.

2017 Track Chair, Myoelectric Control Symposium, Fredericton, New Brunswick, Canada, Aug.14-16

2017 Panel Member, 3D Printing in Prosthetics, Myoelectric Control Symposium, Fredericton, New Brunswick, Canada, Aug.16.

2017 Chairman of Review Panel, CDMRP, 2017 Peer Reviewed Orthopaedic Research Program (PRORP) 2017 PRORP CTR-REHAB peer review panel, Baltimore, MD, 11/15/2017

2018 Reviewer, NIH CMIP Review Panel - 02/07/2018

2018 Reviewer, NIH: ZRG1 BDCN-W (55): 03/08/2018

2018 Reviewer, NIH: ETTN(10) SBIR Review Panel – 11/29/2018

2019 Reviewer, DoD P2RMIS Grant Review - Online Medical Research Award (MRA), Clinical and Rehabilitative Medicine (CRM) online panel of Medical Research and Materiel Command (MRMC), Department of Defense – 01/2019

2019 Reviewer, NIH: ETTN(10) SBIR Review Panel – 03/14/2018

2019 Reviewer, NIH Anonymization Study – 03/22/2019

2005-Present Steering Committee of the International Conference on Rehabilitation Robotics (ICORR)

2008-Present Member, IEEE Engineering in Medicine & Biology Society Technical Committee on BioRobotics.

Journal Review

Reviewer IEEE/ASME Transactions on Mechatronics

Reviewer IEEE Transactions on Neural Systems and Rehabilitation Engineering

Reviewer Journal of the International Society for Prosthetics and Orthotics (ISPO)

Reviewer IEEE Transactions on Biomedical Engineering

Reviewer Journal of Rehabilitation Research and Development

Reviewer Prosthetics and Orthotics International

Reviewer IEEE Trans. Neural Systems and Rehabilitation Eng.

Reviewer BioMedical Engineering Online

Reviewer Science Paper Review

Reviewer Journal Prosthetics and Orthotics

Reviewer Science

2012-2015 Community: Volunteer as Colorado Member on National Rules Committee for the MESA Prosthetic Arm Challenge 4/12/2012 - 5/1/2015

2012-2015 Community: Volunteer as Lead Judge MESA Prosthetic Arm Challenge for Middle School and High School Competitions 4/12/2012 - 5/1/2015

2014 Community: Toured Senator's Bennett's Staff around Lab. 03/06/2014

2014 Community: Toured Health Care Journalist Conference Organizers and Participants around lab. 03/07/2014

2014 Community: Public Lectures/Speeches Terumo, BCT, Inc. -05/27/2014 Notes: Invited Speaker

2014 Community: Outreach lecture at The Academy for Lifelong Learning -04/09/2014

2014 Community: Longmont Highschool Tour 04/11/2014

2014 Community: Jacqueline Thomas Health and Education L.A. – Office of Senator Udall - tour of lab. 08/11/2014

2014 Community: Capital Development Committee tour of lab. 08/14/2014-08/14/2014

2014 Community: lab. tour for Noelle Delage of CU Development 09/16/2014-09/16/2014

2014 Community: ARCS org tour 12/05/2014-12/05/2014

2015 Community: Prof. Allison Caster Class, School of Colorado School of Mines Visit 03/17/2015-03/17/2015
Notes: Tour of lab.

2015 Community: CU Regent Linda Shoemaker Tour 04/07/2015-04/07/2015 Notes: Tour of lab.

2016 Community: Logan Highschool Tour of our Laboratory at Children’s - 01/09/2016

2018 Community: host tours of lab. for local high schools and Hospital Management

2018 Community: Readily accept Interested High school students as interns

2018 Community: Café Scientifique Invited talk – 02/27/2018

2019 Community: host tours of lab. for local high schools and Hospital Management

2019 Community: Readily accept Interested High school students as interns

Consulting

2004-2005 Consulting: Barrett Technologies

2005-2006 Consulting: DEKA – Consulted on the hand design for the DEKA Arm for DARPA RP2007 BAA

2012-2013 Consulting: National Director for Research, Advanced Arm Dynamics, Redondo Beach CA

2015 Consulting GJORDING FOUSSER PLLC, Boise, Idaho 09/2015 12/2015 Notes: Consulted on prosthetic options for a client.

2015 Consulting Ripple Inc., Salt Lake City, Utah 02/2015 07/2015 Notes: Consulted with Ripple on Direct EMG Measurement and Fine Wire Measurement of EMG for their DARPA HAPTIX project.

2018 Consulting Wilson Elsner, Las Vegas, Nevada - Notes: Consulted on prosthetic options for a client.

2019 Consulting Wilson Elsner, Michigan - Notes: Consulted on prosthetic options for a client.

10. PROFESSIONAL AWARDS AND HONORS

1989 **Winner Easter Seal US National Student Design Competition** for “The Design and Development of a Synergetic Partial Hand Prosthesis with Powered Fingers”.

1992, 1993, 1994 Recipient Annual **Predoctoral Fellowship** awarded by the National Institute on Disability and Rehabilitation Research (NIDRR), US Department of Education.

2005 Lowery, M. M., **Weir, R. F. ff.**, & Kuiken, T. A., (2005): Simulation of Intramuscular EMG Signal Detection using Implantable MyoElectric Sensors (IMES). **Winner** Excellence in Neural Engineering Award, IEEE EMBS Conference on Neural Engineering, Washington D.C., March, 2005.

2007 Awarded **POPULAR MECHANICS** 2007 Breakthrough Innovator Award for the design of the Proto 2 myoelectric arm as part of the Revolutionizing Prosthetics 2009 (RP2009) team led by John Hopkins University Applied Physics Laboratory (JHUAPL).

2008 DARPA Prototype 2 Hand Cover IEEE Spectrum – Hand built by my lab.

2009 Paper made Cover of IEEE TBME 56(1) Journal: **Weir, R. F. ff.**, Troyk P. R., DeMichele G. A., Kerns D. A., Schorsch J. F., Maas H., (2009): *Implantable MyoElectric Sensors (IMES) for Prosthesis Control: Development and Testing*. IEEE Trans. Biomed. Eng. 56(1)159-171, Jan.

2009 Awarded **IEEE Spectrum in the Service of Society ACE Award** for involvement in the design of the DARPA Revolutionizing Prosthetics projects.

2010 MPL Hand on Cover of National Geographic, Jan 2010. – Lead Architect for this Arm.

2014 Winner Best Student Poster: Segil, J. L., Huddle, S., **Weir, R. F. ff.**, (2014): *Functional Assessment of Transradial Amputees with a Myoelectric Postural Controller and Multi-Functional Prosthetic Hand*. Myoelectric Controls Symposium (MEC), Fredericton, NB, Canada, 2014.

2015 Paper made JRRD Facebook feed 09/30/2015: Segil, J. L., and **Weir, R. F. ff.**, (2015): *A Novel Architecture for a Postural Controller of Multi-Functional Myoelectric Prosthetic Hands*, Journal of Rehabilitation Research and Development, 52(4)449–466

2019 Undergraduate Team Advisor: Winning Design Team for University of Colorado Denver College of Design and Computer Sciences.

PATENTS & DISCLOSURES

- 1998 **Awarded US Patent #5,831,937: Weir, R. F. ff.**, Childress, D. S., and Licameli, J. N., (1998): Portable Ranging System for Analyzing Gait. United States Patent, Number: 5,831,937, Date of Patent: November 3rd, 1998.
- 2002 **Awarded US Patent #60/432,676: Weir, R. F. ff.**, and Grahn, E. G., (2002): A New Externally-Powered Hand Prosthesis Suitable for the Restoration of Prehension of Persons with Amputations at or more Proximal to the level of the Meta-carpophalangeal Joint. United States Provisional Patent, Number: 60/432,676, Filed December 12th, 2002.
- 2007 Kuiken, T. A., **Weir, R. F. ff.** & Sensinger, J. A., (2007): System and method for improving the functionality of prostheses. United States Provisional Patent 20070038311 02/15/
- 2013 Segil, J. L., **Weir, R. F. ff.**, (2013):: Systems and Methods for Postural Control Of A Multi-Function Prosthesis. International Application No. PCT/US2014/040569 [United States Provisional Patent 61830504 06-03-2013](currently licensed to Infinite Biomedical Technologies LLC) .
- 2014 Gopinath, J. T., Gibson, E. A., Bright, V. M., **Weir, R. F. ff.**, D. Restrepo, D., (2014): Optical Imaging Devices and Electrowetting Lens Elements, and Methods for Using Them. Application No. 61/930,349. US Provisional Patent. Filed on 22 Jan. 2014. International Application # PCT/US2015/012539 filed on 22 Jan. 2015.
- 2017 Anderson, H, Caldwell, J., **Weir, R.F. ff.** (2017): An Automated Method for the Quantification of Transgene Expression in Motor Axons of the Peripheral Nerve. **Disclosure** CU4611H Submitted 12/22/2017.
- 2018 Murali, B., Huddle, S. A., Celik, O., **Weir, R. F. ff.**, (2018): Provisional Patent Application: High Torque Density Miniature Laminar Gear Transmission. United States Provisional Patent Application, CU4504D, 1306.2004PR.
- 2018 Segil, J. L., Huddle, S. A., Sliker, L., **Weir, R. F. ff.** (2018): Point Partial: A prosthetic partial finger for heavy-duty use. Provisional Patent Submission CU4889D-PPA1; United States Provisional Patent Application Appl. #: 62/769,360; Filed 11/19/2018 (currently licensed to Point Designs LLC).
- 2018 Patel, R., Segil, J. L., Klinger, J., **Weir, R. F. ff.** , Correll, N., (2018): Multi-Modal Fingertip Sensor with Proximity, Contact, and Force Localization Capabilities. United States Provisional Patent Application CU4737B-PPA1 (currently licensed to Robotic Materials LLC).
- 2019 **Weir, R. F. ff.** , Littich, S., Hogan, L., Fontaine, A., Futia, G., Arevalo, N., Caldwell, J., Gibson, E., Restrepo, D., (2019): Nerve Cuffs for Optical Relay Imaging in Peripheral Nerves and Ganglia, CU Innovations File No. CU5067H

11. FUNDED RESEARCH PROJECTS

List funded research projects (pending, current and past, VA and non-VA):

CURRENT FEDERALLY FUNDED RESEARCH PROJECTS

VA Grants

1 IK6 RX002996-01(Weir): 10/01/2018 - 09/30/2022 Role: PI
U.S. Dept. of Veterans Affairs \$785,575
VA RR&D (Weir): RR&D Research Career Scientist Award.

1 I01 RX002830-01(Weir) 10/01/2018 - 09/30/2020 Role: PI
U.S. Dept. of Veterans Affairs \$496,416
VA RR&D: Artificial Digit Replacements for Women Veterans with Individual Digit Loss
Project to develop a ratcheting prosthetic finger using advanced rapid manufacturing technology suitable for women veterans with loss of one or more fingers.

VARR&D Contract (Segil): 10/01/2018 - 9/30/2019 Role: Co-I
U.S. Dept. of Veterans Affairs \$199,747
VARR&D: Proximity, Contact, and Force Sensing Finger Tip Material for Cleveland VA Medical Center Clinical Trial

Non-VA Grants

R42 HD097827-01A1 (Weir) 05/01/2019 – 04/30/2022 Role: PI
NIH NICHD
The Point Digit: A ratcheting prosthetic finger using advanced rapid manufacturing technology.

Fasttrack STTR: Commercial Entity: Point Designs

R41 HD096942-01 (Sliker) 10/1/2018 – 09/30/2019 Role: PI UCD SubK
NIH NICHD \$209,900(\$39,000 UCD SubK)
The Point Partial: A ratcheting prosthetic partial finger using advanced rapid manufacturing technology
Phase 1 Small Business Innovative Research (SBIR),
Lead Institution: Point Designs LLC.

HHSF223201810127C(Benam) 01/09/2018 - 30/09/2021 Role: Co-I
Food and Drug Administration
Toxicity and Carcinogenicity Profiling of Tobacco Products via Organ Microengineering and Systems Biology

1OT2OD023852-01 (Weir): 09/24/2016 - 08/31/2019 Role: PI
NIH Office of the Director \$1,890,039
Development of a Bidirectional Optogenetic Minimally Invasive Peripheral Nerve Interface with single axon read-in & read-out specificity.
Our goal for this project is to develop a novel compact Optogenetic based Optical Probe capable of optically neuromodulating individual afferent and/or efferent axons within nerves of the parasympathetic, or peripheral, nervous system. We seek to read-in or read-out from these nerves with the goal of modulating the organs or brain circuits innervated by them.

1 R44 HD090811 (Kaliki) 09/01/2016 – 08/31/2019 Role: PI UCD SubK
NIH NICHD \$1,460,000 (\$256,212 UCD SubK) [No cost extension]
Joint Angle Transform Based Methodology for Controlling Upper Limb Prostheses.
Project to transfer our Hand Posture Control Algorithm developed in our lab. to Infinite Biomedical Technologies, LLC, in order to develop it into a product and commercialize it.
Lead Institution: Infinite Biomedical Technologies, LLC

COMPLETED FEDERALLY FUNDED RESEARCH PROJECTS

VA Grants

1-I01-RX-001341-01 (Weir) 01/01/2014 – 06/30/2018 Role: PI
U.S. Dept. of Veterans Affairs \$794,416 (No Cost Extension)
VARR&D A1341-R: A Principle Component Paradigm for EMG Control of Advanced Prosthetic Hands
Project to Develop, optimize and fit a novel postural control algorithm for upper-limb users. This algorithm provides a novel method of controlling multi-degree-of freedom (6 DOF) prosthetic hands with only 2-3 surface myo-electrodes without requiring the user to use switch commands to move from state to state.

1-I21-RX000858-01-A1 (Weir) 11/01/2013 - 12/31/2017 Role: PI
U.S. Dept. of Veterans Affairs \$199,933 (No Cost Extension)
VARR&D A0858-P(Weir): *Exploration of Socket Cooling Using Novel Passive Heat Spreader Technology.*
The goal of this project is to explore whether the Celsia nanospreader heat spreader technology can be used to confer improved heat dissipation to prosthetic sockets. We are proposing to fabricate and fit intact individuals with bypass sockets that mimic shoulder disarticulation interface. Subjects walk on a treadmill while wearing these sockets while monitoring the temperature inside the socket and measuring O₂ consumption.

VARR&D A3962R (Weir & Herr) 08/01/2009 - 12/31/2013 Role: Co-PI
U.S. Dept. of Veterans Affairs \$914,000 (No cost extension)
VARR&D A6586R (Weir & Herr): *Implantable Myoelectric Sensors for Control of a Powered Foot Prosthesis*
Project to use Implantable Myoelectric sensors developed by Dr. Weir to control a new powered foot ankle prosthesis developed by Dr. Herr.

VA RR&D A4207I (Weir & Murray) 04/01/2006 - 03/31/2009 Role: Co-PI
U.S. Dept. of Veterans Affairs \$250,000 (No cost extension)

A Model-Based Approach to Multifunction Artificial Hand Control.

2 Year special collaborative grant solicitation with primary objective to establish a strong collaboration between Dr. Wendy Murray, a principal investigator at the VA Palo Alto Health Care System Center of Excellence on Bone and Joint Rehabilitation and Dr. Richard Weir, a principal investigator at the Jesse Brown VAMC (Chicago, IL) and a secondary objective to implement 3D, computer graphics based model of the upper extremity to develop a control system for a multifunction artificial hand. This collaboration served as a means to integrate their complementary skills in the areas of biomechanical modeling (Dr. Murray) and the design and control of prosthetic devices for the upper limb (Dr. Weir).

VA RR&D A3962R (Weir) 10/01/2005 - 09/30/2009 Role: PI
Dept. of Veterans Affairs \$383,958 (No cost extension)

Compliant Wrist for Upper-Extremity Prosthetics Applications.

The goal of this project is to build a new compliant externally-powered two degree-of-freedom (DOF) prosthetic wrist for use in upper-extremity prostheses. We believe that a small two DOF wrist mechanism capable of high speed and torque and that appears compliant when interacting with the environment could substantially improve the function and reliability of upper-limb prostheses for persons with arm amputations, in particular for persons with trans-humeral arm amputations.

VA RR&D A3028R (Weir & Childress) 07/01/2003 - 06/31/2006 Role: Co-PI
U.S. Dept. of Veterans Affairs \$690,896

Technology Transfer of an Externally-Powered Trans-Metacarpal Hand Prosthesis.

The purpose of this project is to develop into a commercially realizable form, a prototype externally-powered trans-metacarpal hand prosthesis developed by our laboratory. Variety Ability Systems Inc. (VASI), Toronto, Canada expressed interest in developing this prototype into a commercial product. The expected outcome is the successful transfer of our current laboratory prototype into a viable commercial product. The current laboratory prototype mechanism needs to be refined as a prelude to a clinical evaluation.

VA RR&D A3028R (Weir & Childress) 04/01/2001 - 03/31/2004 Role: Co-PI
U.S. Dept. of Veterans Affairs \$456,596

Development of a Four Degree-of-Freedom Hand.

The goal of this project is to develop and evaluate a four degree-of-freedom prosthetic hand and controller for use by persons with amputations at or proximal to the wrist. At issue is the need for a multi-functional hand prosthesis to achieve our goal of coordinated control of individual digits on an artificial hand. Given the inherent complexity of the natural hand we believe that limiting the design of this hand to four degrees-of-freedom (DOF) is an acceptable compromise that will allow most commonly used hand prehension patterns to be attained.

VARR&D B0928CD (Weir) 09/01/1999 - 31/07/2002 Role: PI
US Dept. of Veterans Affairs \$268,464

Rehabilitation Research and Development of Gait Instrumentation and Upper-Extremity Prostheses.

Career Development Award to develop an easily controlled multi-functional prostheses for upper-limb amputees and to further develop low-cost tools for the evaluation of pathological gaits - specifically amputee gait.

VARR&D A2263-R (Weir & Childress) 01/01/1999 - 01/31/2001 Role: Co-PI
US Dept. of Veterans Affairs \$290,000

Development of an Externally Powered Prosthetic Hand for Partial-Hand Amputees

The goal of the project was to develop an externally powered prosthetic hand for persons with trans-metacarpal amputations. This prosthesis will be applicable to prosthetic restoration of prehension (with cosmesis) in partial hand, and wrist disarticulation amputees as well as the more conventional below elbow fitting. Being light in weight it will also have application in the fitting of persons with high level transhumeral amputations.

Projects Funded by the Department of Veterans Affairs

VARR&D A2087-RA (Childress) Submitted 4/1996 – 3 years Role: Biomedical Engineer
US Dept. of Veterans Affairs

Generalized EPP Position Controller for Electric-Powered Upper-Limb Prosthesis

VARR&D A306-4DC (Childress) Submitted 4/1993 – 3 years Role: Biomedical Engineer
US Dept. of Veterans Affairs
Direct Muscle Attachment: Multifunctional Control of Hands & Arms

VARR&D A306-2DA/A521-2DA (Childress) Submitted 4/1990 – 3 years Role: Biomedical Engineer
US Dept. of Veterans Affairs
New Control Applications for Upper-Limb Prostheses

VARR&D A306-2A (Childress) Submitted 4/1987 – 3 years Role: Research Assistant
US Dept. of Veterans Affairs
Improved Upper-Limb Prosthetics Development Program-Development of Powered Prosthetic Fingers.

Non-VA Grants

OEDIT AIA Grant 103,068 (Weir) 04/01/2017 – 04/30/2019 Role: PI
OEDIT, State of Colorado \$137,424 (\$103,068 State + \$34,356 CU)
The Point Digit: A ratcheting mechanical prosthetic finger built using advanced rapid manufacturing
Project to transfer a 3D metal printed finger developed in our lab. to Point Designs, LLC, in order to develop it into a product and commercialize it.

2R01 EB001672 (Weir) 09/01/2011 - 07/31/2017 Role: PI
NIH NIBIB/NICHD \$6,630,328
Clinical Development of Implantable Myoelectric Sensors for Prosthesis Control
The primary goal of this Bioengineering Research Partnership (BRP) proposal is to demonstrate upper limb prosthesis control using our implantable myoelectric sensor (IMES) system in human amputees. By the end of this second and final five-year project period we plan to achieve our long-term vision of individual finger control of a prosthetic hand.

1R01EB011615-01 (Murray) 04/05/2011 - 03/31/2015 Role: PI UCD SubK
NIH NIBIB \$2,189,896
Prosthesis Control by Simulation of the Intact Biomechanical System
Project to build a biomechanical model of the human hand and wrist with full musculo-tendon action and to use this model as the basis of a real-time controller to predict finger joint motion in an artificial hand.

Atlantic Innovation Fund, Canada 10/01/2007 - 12/31/2010 Role: PI UCD SubK
University of New Brunswick CRADA \$242,588.00.
UNB Prosthetic Hand System
Project to develop a 3 DOF hand with sensorized glove. Our role is to lead the development of the drives.

DARPA DSO DARPA Revolutionizing Prosthetics 2009 BAA, Phase 1&2
SubK to Applied Physics Laboratory of John Hopkins University (JHU/APL) - Subcontract 908090

- 2008 Phase 2: Role: Co-PI RIC SubK 01/01/2008-12/31/2010
- 2005 Phase 1: Role PI of NUPRL SubK 07/31/2005-08/01/2007

DARPA Revolutionizing Prosthetics 2009 BAA, \$1,994,672

Implantable Sensors to Revolutionize Control of Prostheses

On this subcontract we were tasked with working with APL and Otto Bock, Vienna, to build a first-generation prototype arm, Prototype 1, using “off-the-shelf” technology and to deliver it in the first year. In addition, working with Otto Bock, Vienna, New world Associates and APL we are tasked to complete an intrinsically actuated electromechanical hand solution capable of meeting the full DARPA specifications as part of the Prototype 2 arm. The Intrinsic hand is an 18 DOF hand wrist system. Our other major role in this DARPA initiative is to accelerate the development, testing and integration of a 16-channel implantable myoelectric sensor system.

N01-HD-5-3402 (Kuiken) 06/01/2005 – 05/30/2006 Role: Co I (PI of SubK)
NIH NICHD \$52,806

Hyper-Reinnervation to Improve Myoelectric Prosthesis Control in Shoulder Disarticulation.

Subcontract to RIC to develop a system capable of providing force feedback directly to the skin of a woman who has undergone targeted sensory reinnervation. A small compliant 'plunger' actuator was developed that lay on the side of the socket so that there was an acceptable profile or contour to the socket. The initial controller uses a simple algorithm for control that was incorporated into the LTI Boston Elbow controller.

1 F31 HD049319-01 (Ajiboye) 01/01/2005 – 12/31/2008 Role: Sponsor
NIH NICHD/GMB \$85,500
Ruth L. Kirchstein National Research Service Award, Fellow: Abidemi B. Ajiboye.

1 R13 EB004819-01 (Patton) 10/31/2004 – 06/30/2005 Role: Co-I
NIH NIBIB/NICHD \$21,000.
9th International Conference on Rehabilitation Robotics (ICORR 2005),
Funding for IEEE ICORR, Chicago, IL.

PI: Patton 10/07/2004 – 06/30/2005 Role: Co-I
Whitaker Foundation \$8,000
9th International Conference on Rehabilitation Robotics (ICORR 2005).
Funding for IEEE ICORR, Chicago, IL

1R01 EB001672 (Weir) 09/30/2003 - 07/31/2009 Role: PI
NIH NIBIB/NICHD \$3,562,430 (No cost extension)
Multifunction Prosthesis Control using Implanted Sensors.

5 Year Bioengineering Research Partnership (BRP) in which we developed a multichannel/multifunction prosthetic hand/arm controller system capable of receiving and processing signals from up to sixteen "BION[®]-like" implanted bipolar differential electromyographic (EMG) electrodes. An external prosthesis controller deciphered user intent from telemetry sent over a transcutaneous magnetic link by the implanted electrodes. The same link will provide power for the implanted electrodes.

Grant #H133E980023 (Childress) 10/01/1998 - 09/30/2003 Role: Project Director
US Dept. of Education, National Institute for Disability Research and Rehabilitation (NIDRR)
Rehabilitation Engineering Center in Prosthetics and Orthotics (NIDRR RERC in P&O)
Project: Development of a Portable, Real-Time, 3-D Single Marker Gait Evaluation System

12. TRAINING AND MENTORING RELATIONSHIPS

a. List specific teaching assignments, past and current with inclusive dates, at the affiliate or other institutions. Include participation in teaching rounds for fellows, residents, and interns; providing updates on relevant topics to scientists and training investigators in special techniques.

1994 Guest Lecturer - 765(BME)-C65 Control of Human Limbs and Their Artificial Replacements, Department of Biomedical Engineering, Northwestern University.

1996 Guest Lecturer - Externally Powered Prostheses, Upper and Lower-Limb Prosthetics and Orthotics for Physicians and Surgeons - 723, Section B, Northwestern University Prosthetics and Orthotics School (NUPOC).

1996 Project Director: Research Assistant, Summer 1996: *Israel, Adina: "Construction and Calibration of the Flip-Side Direct Ultrasonic Ranging System Transponder".*

1996 Project Director: Research Assistant, Summer 1996: *McCormick, Jeremy: "DURS Research Report - Measurement and Calibration of the DURS Zone of Operation"*

1997 - 2008 Adjunct Faculty - Fundamentals of Biomaterials for Prosthetists and Orthotists, Fall & Winter semester, (12 lecture course each semester), Northwestern University Prosthetics and Orthotics School (NUPOC).

1997 Preceptor: Student Design Project, 765 (BME)-C90 Biomedical Engineering Design, Winter Quarter, 1997: Ayson, Jason; Dumbauld, Pat; Messing, Katie; and Monje, Aaron; *"MMAD: A Motor Driven Humeral Rotator Equipped with a Continuous Externally-Activated Locking Mechanism".*

- 1997 Guest Lecturer - Problem Based Learning, in the Structure/Function Course for First Year Medical Students, Northwestern University Medical School.
- 1998 Guest Lecturer - 765(BME)-C95 Human Limbs and Their Artificial Replacements. Department of Biomedical Engineering, Northwestern University.
- 1998 Project Director: Master of Science Student doing software development for the Direct Ultrasound Ranging System. June-December, 1998.
- 1999 Guest Lecturer – 765(BME)-C66: Biomechanics of Movement, May 13th, 1999, Spring Quarter. Department of Biomedical Engineering, Northwestern University.
- 1999 Guest Lecturer – PBL 104 Problem Based Learning, in the Structure/Function Course for First Year Medical Students, Northwestern University Medical School, May 3rd, 1999.
- 1999 Preceptor Student Design Project, 765 (BME)-C90 Biomedical Engineering Design, Winter Quarter, 1999: Findlay, Michael; Radtke, Michael; Tabayoyong, William; Tran, Dinh; Yuen, Jonathon: *“Improved Prosthetic Wrist.”*
- 2000 Client for the Northwestern University Engineering Design and Communication Course - Design Team B: Shaw, Shinie; Valasek, Bill; Martinez, Joaquin; Provost, Louie; Yao, Di: *Website Design for Inside Ireland.* March 14th, 2000
- 2000 Client for the Northwestern University Engineering Design and Communication Course - Section 13: Ray, Jehana; Hood, Andrew; Carter, Matt; Roman, Brenda: *Website Design for the Meteorite Mining Company.* March 16th, 2000.
- 2000 Guest Lecturer – 765(BME)-C66: Biomechanics of Movement, May 18th, 2000, Spring Quarter, Department of Biomedical Engineering, Northwestern University.
- 2000 Preceptor Student Design Project, 765 (BME)-C90 Biomedical Engineering Design, Winter Quarter, 2000: Chi, Linda; Korona, Margaret; Leung, Nicky; Odden, Michelle; Whang, Naree: *“The Capstan Trans-Humeral Rotation Device”.*
- 2001 Guest Lecturer - 765(BME)-C95 Human Limbs and Their Artificial Replacements, February 28th & March 2nd 2001, Winter Quarter, Department of Biomedical Engineering, Northwestern University.
- 2002 Co-Instructor – BMD ENG 365 Human Limbs and Their Artificial Replacements, Winter Quarter Department of Biomedical Engineering, Northwestern University.
- 2002 Guest Lecturer – BMD ENG 495 Biomedical Robotics, May 22nd, 2002. Spring Quarter Department of Biomedical Engineering, Northwestern University.
- 2003 Guest Lecturer - BMD ENG 365 Human Limbs and Their Artificial Replacements, March 2003, Winter Quarter, Department of Biomedical Engineering, Northwestern University
- 2003 PBL Tutor – Problem Based Learning Block 103, Group 21, Northwestern University Feinberg School of Medicine, Winter Quarter, 2003.
- 2004 - 2008 Co-Instructor – BMD ENG 365 Human Limbs and Their Artificial Replacements, Winter Quarter Department of Biomedical Engineering, Northwestern University.
- 2004 Guest Lecturer – BMD ENG 495 Biomedical Robotics, May 5th & 7th, 2004. Spring Quarter Department of Biomedical Engineering, Northwestern University.
- 2004 Preceptor Student Design Project, BMD ENG 390 Biomedical Engineering Design, Winter Quarter, 2004:
- 2009 - 2010 Co-Instructor – BMD ENG 306: Biomedical systems analysis. This is the second of a Mandatory three course sequence for all juniors. The course covers basic aspects of the quantitative analysis of biological systems, focusing on linear systems analysis. Topics covered are impulse responses and convolution, Laplace transforms, z-transforms, and Bode plots. Both discrete and continuous time analyses are covered. Department of Biomedical Engineering, Northwestern University.
- 2012 Anatomy & Physiology for Engineers II – Guest Lecture; Mechanical Engineering, University of Colorado-Boulder. 04/17/2012.
- 2012 - 2014 BIOE TECH 1 CORE CEAS BIOE: Technology for Bioengineers; Lecture/Recitation; Fall Semester - Lectured on Frequency Domain and use of Fourier Transform Fall 2012; Instructors: Dae Won Park, Kendall Hunter, Richard Weir, Richard Benninger. Bioengineering, University of Colorado-Denver|Anschutz Medical Campus.
- 2012-Present BIOE-5073-001: Neural Interface/Bionic Limbs; Lecture/Recitation/Lab; Spring Semester. Intro to disability & disability etiquette, evolution of limbs and hands, anatomy of the arm and hand, physiology of the muscle and nerves, Electromyogram (EMG) and its measurements. Muscle modeling using OpenSimm,

circuit design and EMG acquisition using nScope, Machine learning and then developing Linear Discriminant Analysis Machine learning system to map EMG to hand posture. Actuators and DC motors and their control. Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Spring 2017 Semester - 3 credit hours - 4 students

2015-Present BIOE-3010-001: Bioinstrumentation – Lecture/Recitation/lab.; Fall Semester. Intro. to linear systems, Characteristic equations, first, second order systems, and system dynamics and responses, circuits, circuit design, passive components, Intro to op-amps, Data acquisition and Nyquist. In class lab is taught using a USB driven breadboard that has a Software oscilloscope, multimeter, and function generator as well as using Online circuit simulator tools. Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Fall 2017 Semester - 3 credit hours, 37 students.

Teaching Development

2011 Department Curriculum Development: Helped develop new BIOE Curriculum for Technology Core
2012 Department Curriculum Development: BIOE TECH 1 CORE CEAS BIOE: Designed the Technology Core class required of incoming Graduate Students, Craig Lanning, Dae Won Park, Bryan Yunker, Richard Weir
2015 Department Curriculum Development Curriculum Committee for BIOE Dept. CEAS BIOE Vet, standardize, oversee development of courses in BIOE Dept. Spring 2015 Richard Weir
2016-2017 University of Colorado Denver|Anschutz Medical Campus **2016/2017 Faculty Development Grant:** Portable Electronics Laboratory for BIOE 3010, Bioscience 2, Anschutz. Received Grant to introduce nScope a novel USB based electronics development system into our class.

b. List past and current undergraduate and graduate students, postdoctoral fellows, and faculty mentored in tabulated form. Include the following:

Over the past 15 years, I have mentored four Post Docs, eight PhD students, numerous masters students, undergraduate students and high school student interns as well as hosted Fulbright, Whitaker, and other foreign scholars from Japan, Italy, India and the Netherlands.

Mentorship

Post-Doctoral Trainees

2008-2009 **Post-Doctoral Fellow:** Todd R Farrell.: Biomechatronics Development Lab., Rehabilitation Institute of Chicago. Got publications from PhD out and then joined LTI in Boston to start and grow their Research program.
2012-2019 **Post-Doctoral Fellow:** Alena Grabowski, PhD, (VA ECHCS) **VA CDA2 Recipient**, VA Researcher and Assistant Professor University of Colorado Boulder, Dept. of Integrative Physiology. VA CDA-2 A7972-W (Grabowski): *Characterizing Ankle Function during Sloped Locomotion for Prosthesis Development*. Did Post Doc with Hugh Herr of MIT returned to CO where we worked together to apply for her CDA2. She has recently obtained an assistant Professor position and is obtaining independent funding (Douglas Bader Foundation). VA Mentor: Richard Weir.
2016-Present **Post-Doctoral Fellow:** Arjun Fontaine, Biomechatronics Development Lab., Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. – Now a Post-Doc for me working on our NIH SPARC grant to optically neuromodulate the vagus nerve.
2017-Present **Post-Doctoral Fellow:** Jacob Segil, Biomechatronics Development Lab., Now a VA Researcher & CDA 1 Awardee (CDA2 submitted) working collaboratively with our lab. and Dustin Tyler's Lab. at Louis Stokes VAMC in Cleveland, OH. VA CDA-1 IK1RX002011 (Segil): *Integration of a Sensory Feedback Implant with Myoelectric Prosthetic Hands*. Mentor: Dustin Tylor, Linda Resnick, Richard Weir

PhD Students

2003-2007 **Principal Dissertation Advisor:** Todd R Farrell.: *Issues in Multifunctional Myoelectric Control of Powered Prostheses: The Use of Surface vs. Intramuscular Electromyograms and the Determination of the Optimal Controller Delay*. Biomedical Engineering, Northwestern University, Evanston, IL, June 2007.
2003-2007 **Principal Dissertation Advisor:** Abidemi Bolu Ajiboye, *Neuromotor Muscle Synergies for EMG Pattern Recognition of Prehension Grasps for Control of Multifunctional Myoelectric Prostheses*. Biomedical Engineering, Northwestern University, Evanston, IL, December 2007

- 2005-2007 **Principal Dissertation Advisor:** Jon Sensinger, Jon: *User-modulated Impedance control of a prosthetic elbow*. Biomedical Engineering, Northwestern University, Evanston, IL, June 2007.
- 2007-2012 **Principal Dissertation Advisor:** Alex Birdwell, *“Investigation of Extrinsic Finger and Thumb Muscles to Command Individual Digits on a Multi-Functional Artificial Hand”*, Mechanical Engineering, Northwestern University, Evanston, IL, January 2012. Committee: Edward Colgate, Levi Hargrove, Todd Kuiken M.D. Ph.D. (chair), Wendy M. Murray, Michael A. Peshkin, Richard F. ff. Weir. Alex is now a lecturer in Mechanical Engineering at Northwestern University. Where he conducts education-based and applied research, teaching avid learners, and creating innovative methods to improve educational outcomes.
- 2011-2014 **Principal Dissertation Advisor:** Jacob Segil, *“Development and Validation of a Myoelectric Postural Control System for Advanced Prosthetic Hands”*, Mechanical Engineering, University of Colorado-Boulder. Committee: Richard Weir (BIOE), Derek Reamon (CU ME), Mark Rentschler (CU ME). Now a VA Researcher & CDA 1 Awardee and a Lecturer in Mechanical Engineering University of Colorado-Boulder.
- 2011-2016 **Principal Dissertation Advisor:** Arjun Fontaine, *“Toward an Optogenetic Peripheral Nerve Interface for Control of Advanced Prosthesis”*, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Committee: Richard Weir (BIOE), John Caldwell (Physiology), Emily Gibson (BIOE), Richard Benninger (BIOE). – Now a Post-Doc for me working on our NIH SPARC grant to optically neuromodulate the vagus nerve.
- 2011-2017 **Principal Dissertation Advisor:** Hans Anderson, *“Building an Optical Neural Interface: Targeting Neurons and Making Them Glow”*, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Committee: Richard Weir (BIOE), John Caldwell (Physiology), Richard Benninger (BIOE), Angie Ribera (Biology). – Returning to Medical School to complete his MD-PhD.
- 2011-2017 **Principal Dissertation Advisor:** Matthew Davidson, *“Development of a novel prosthetic wrist device incorporating the Dart Thrower’s Motion”*, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Committee: Richard Weir (BIOE), Cathy Bodine (BIOE), Kendall Hunter (BIOE), Jim Carollo (Pediatrics). Now working with Cathy Bodine (BIOE) as a Post Doc in assistive technology and has applied to become a Congressional Science Fellow.
- 2015-2018 **Principal Dissertation Advisor:** Laura Elson, *“An optically controlled closed-loop system for use in peripheral nerves toward control of an advanced prosthesis”*, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Committee: Richard Weir, John Caldwell, Diego Restrepo – Admitted to Candidacy 12/05/2017 (left Dept. with MS now with Kansas VA)
- 2018-Present **Principal Dissertation Advisor:** Sam Littich, *“Optical Nerve cuff for vagus nerve Stabilization”*, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Committee: Richard Weir, John Caldwell, Emily Gibson, Diego Restrepo.

PhD Committees/Mentees

- 2008-2009 **VA Pre-Doctoral Fellowship Awardee:** Sulzer, James (Jesse Brown VAMC/ Northwestern University) Now an Assistant Professor, Biomedical engineering, UT Austin after a Post Doc in Switzerland. VA Mentor: Richard Weir.
- 2012 **Member of PhD Dissertation Committee:** Sutha Aphanupong, *“Dynamics, Control, and Fabrication of Embedded Heaters and Sensors for Micro SMA Active Catheters”*, Aerospace Engineering, University of Colorado-Boulder. Committee: Dale Lawrence (Aerospace Eng.), Richard Weir (BIOE). – Whereabouts unknown
- 2014 **Member of PhD Dissertation Committee:** Stephen Humphries, *“Quantitative Analysis of the Lungs on Computed Tomography”*, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Committee: David Lynch (Advisor), Kendall Hunter (Chair BIOE), Richard Weir (BIOE), Emily DeBoer, Joyce Schroeder. Employed by National Jewish Hospital as a PhD researcher.
- 2015 **Member of PhD Dissertation Committee:** Colleen Monahan, *“Looking at localizing cognitive ERPs associated with a task switching Paradigm”*, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Committee: Dr. Benzi Kluger, Dr. Shandas (BIOE), Richard Weir (BIOE).
- 2016 **Member of PhD Dissertation Committee:** Cecilia Clark, *“TBD”*, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Committee: Cathy Bodine, Levin Sliker, Emily Gibson, Richard Weir, Diego Restrepo.

- 2018 **Member of PhD Dissertation Committee:** Jesse Gilmer, “. Jesse Gilmer, "Gating of cerebellar input to red nucleus", Neuroscience University of Colorado - Anschutz Medical Campus, Summer 2018, Committee: Abby Pearson, Gideon Felson, Anthony Peng, John Thompson, Richard Weir, Christin Welle.
- 2018 **Member of PhD Dissertation Committee:** Radhen Patel, “Machine Learning to perform Sensor fusion of two sensor types in a finger-tip touch sensor”, **Mechanical** Engineering, University of Colorado - Boulder. Committee: Jacob Segil, Nikolaus Correll, Richard Weir.
- Master’s**
- 1997-1999 **Master’s Thesis Advisor:** Yiorgos Bertos, “*The Design and Development of an Embedded Microcontroller System for an E.P.P. Based Position Controller for Upper-Limb Prostheses*”. Electrical and Computer Engineering, Northwestern University, Evanston, IL, June 1999.
- 1999-2000 **Master’s Thesis Advisor:** Ernst Doering, “*Modeling the Interaction Between the User and Machine in an EPP Unbeatable Position Servomechanism*”. Mechanical Engineering, Northwestern University, Evanston, IL, June 2000.
- 1999-2001 **Master’s Thesis Advisor:** Haitham Mohammed Al-Angari, “*A Design of two Degrees-of-freedom Microprocessor-Based E.P.P. Position Controller for Upper-Limb Prostheses*”. Biomedical Engineering, Northwestern University, Evanston, IL, June 2001.
- 2001-2003 **Master’s Thesis Advisor:** Abidemi Bolu Ajiboye, “*Investigation of Fuzzy Logic as a Classification Algorithm of EMG for the Control of Multifunctional Myoelectric Prostheses*”. Biomedical Engineering, Northwestern University, Evanston, IL, June 2003.
- 2001-2003 **Master’s Thesis Advisor:** Todd Farrell, “*The Effect of Non-Linearities on Extended Physiological Proprioception (EPP) Control of a Powered Prosthesis*”. Biomedical Engineering, Northwestern University, Evanston, IL, June 2003.
- 2002-2005 **Master’s Thesis Advisor:** Jon Sensinger, “*Design & Analysis of a Non-Backdrivable Series Elastic Actuator for Prosthetic Use*”. Biomedical Engineering, Northwestern University, Evanston, IL, June 2005.
- 2007-2010 **Master’s Thesis Advisor:** Jeff Schroeder, *A New Mechanism with a Mechanically Variable Near-Infinite Range of Stiffness*. Master of Science Thesis, Department of Biomedical Engineering, Northwestern University, Evanston, IL,
- 2007-2010 **Master’s Thesis Advisor:** Jeff Christenson: *Design and Analysis of a Series Elastic Actuator for Use as a Prosthetic Wrist with Accompanying Control Strategies*. Master of Science Thesis, Biomedical Engineering, Northwestern University, Evanston, IL,
- 2008-2010 **Master’s Thesis Advisor:** Agatha Lee: *Magnetic Field of the External Power Coil for the Implantable Myoelectric Sensor System*. Biomedical Engineering, Northwestern University, Evanston, IL,
- 2011-2013 **Master’s Thesis Advisor:** Daniel Cano, “*Anthropomorphic Adaptation and Control of a Mechanically-Variable, Near-Infinite Range-of-Stiffness Mechanism*”, Mechanical Engineering, Colorado School of Mines. Committee: Anthony Petrella (CSM ME), Richard Weir (BIOE) – Now at CSM doing PhD in Mining.
- 2012-2013 **Master’s Thesis Advisor:** Nili Krausz, “*Design and Fabrication of a Six Degree-of-Freedom Open Source Hand*”, Mechanical Engineering, University of Colorado-Denver. Committee: Ron Rorrer (UCD ME), Richard Weir (BIOE), Dana Carpenter (UCD ME) - Graduated Summer 2013 - Doing PhD in BME at Northwestern University, Chicago, IL
- 2013- 2015 **Master’s Thesis Advisor:** Philip Bien, “*Controlled Needle Advancement of Optical Biopsy Instrument*”, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Richard Weir (BIOE).
- 2014-2015 **Master’s Thesis Advisor:** Anton Filatov, “*Torque Transfer Across a Flexible Joint*”, Mechanical Engineering, Colorado School of Mines, Spring 2014, Committee: Ozkan Celik (CSM), Richard Weir (BIOE). – Went on to do PHD with Dr. Celik at CSM in un-related project.
- 2015-2017 **Master’s Thesis Advisor:** Kelsey Fitzgerald, “*Exploratory Pilot Study of Electrical Stimulus as a Treatment Option for Chronic Phantom Limb Pain*”, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Committee: Richard Weir (BIOE), Cathy Bodine (BIOE), Frank Petrella, MD, (PM&R)
- 2015-2017 **Master’s Thesis Advisor:** Brendan Lyle, “*Development of a Standard of Testing and Evaluation for 3D-Printed Pediatric Upper Limb Prosthetics*”, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Richard Weir (BIOE), Committee: Richard Weir (BIOE), Cathy Bodine (BIOE), Steven Lammers (BIOE).

- 2015-2017 **Master's Thesis Advisor:** Laura Elson, "*An optically controlled closed-loop system for use in peripheral nerves toward control of an advanced prosthesis*", Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Richard Weir (BIOE), Committee: Richard Weir, John Caldwell, Diego Restrepo. Was admitted to Candidacy for a PHD 12/05/2017 before deciding to leave the program for personal reasons with a MS and is now with the Kansas City VA working as a Biomedical Engineer in Assistive Technology.
- 2016-2018 **Master's Thesis Advisor:** Sam Littich, "*Optical Nerve cuff for vagus nerve Stabilization*", Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Richard Weir (BIOE), Committee: Richard Weir, John Caldwell, Emily Gibson.
- 2016-2018 **Master's Thesis Advisor:** Rusty Burch, "*Kalman Filter for EMG Pre-processing*", Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Richard Weir (BIOE), Committee: Richard Weir (BIOE), Steven Lammers,
- 2017-2019 **Master's Thesis Advisor:** Ben Pulver, "*Study of Optically Excited Twisted String Actuator*", Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Richard Weir (BIOE), Committee: Richard Weir (BIOE)
- 2017-2019 **Master's Thesis Advisor:** Stephanie Lorelli, "*Fuzzy C-Means Clustering for Pattern Recognition Control of a Prosthetic Fingers*", Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Richard Weir (BIOE), Committee: Richard Weir (BIOE), Cathy Bodine, Vitalli
- 2018-Present **Master's Thesis Advisor:** Laura Feamster, "*Development of a Prosthetic Toe*", Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Richard Weir (BIOE), Committee: Richard Weir (BIOE)
- 2018-Present **Master's Thesis Advisor:** Joshua Choice, "*Postural Controller with wrist motion*" Bioengineering, University of Colorado-Denver|Anschutz Medical Campus, Richard Weir (BIOE), Committee: Richard Weir (BIOE)
- 1998 **Project Director:** Master of Science Student doing software development for the Direct Ultrasound Ranging System. June-December, 1998.
- 2012-2013 **Independent Study:** Steven Huddle, CU Boulder "*Design of a Powered Shoulder Ab-Ad DOF*", MS Mechanical Engineering, University of Colorado – Boulder. Richard Weir. Now works for me as our Lab. Manager and runs our 3D Metal Rapid Prototype machine.
- 2015 **Advisor Capstone Project:** Jon Dolata, "*Ultrasound Reconstruction and Identification of Muscle in Forearm*" Master of Science in Modern Human Anatomy, Committee: Richard Weir, Brian Yunker, Danielle Royer
- 2009 **Member of Thesis Committee:** James Buffi, Biomedical Engineering, Northwestern University, Evanston, IL. Committee: Wendy Murray, Richard Weir.
- 2009 **Member of Thesis Committee:** Elliot Rouse, Biomedical Engineering, Northwestern University, Evanston, IL. Committee: Todd Kuiken, Levi Hargrove, Richard Weir.
- 2009 **Member of Thesis Committee:** Dave Nahlik Biomedical Engineering, Northwestern University, Evanston, IL. Committee: Todd Kuiken, Levi Hargrove, Richard Weir.
- 2011 **Member of Thesis Committee:** Thomas Harha, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Committee: Jim Carollo, Richard Weir (BIOE)
- 2012 **Member of Thesis Committee:** Derek Eilers, "*Alternative Method for Attaching Artificial Heart Valves Using Nitinol Clips*", Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Committee: Robin Shandas, Kendall Hunter, Richard Weir (BIOE)
- 2013-2015 **Member of Thesis Committee:** Kate Worster, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Committee: Jim Carollo, Richard Weir (BIOE)
- 2013-2015 **Member of Thesis Committee:** Kayla Burnim, "*Motion Capture as an Assessment Tool for the Relationship Between Knee Stability and Pediatric Anterior Cruciate Ligament Tears*", Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Committee: Jim Carollo, Richard Weir (BIOE), Jay Albright.
- 2016 **Member of Thesis Committee:** Ryan Arce, "*A Biomechanical Evaluation of Mercilene Suture to Decrease Proximal Junctional Kyphosis Risk in Thoracolumbar Spinal Fusion Instrumentation*", Bioengineering,

University of Colorado-Denver|Anschutz Medical Campus. Committee: Reed Ayers, Richard Weir, Vikas Patel.

2016 **Member of Thesis Committee:** Henry Madsen, *"Spectral Decomposition of electrocardiograms for the Diagnosis of Pulmonary Hypertension and the Estimation of Invasively Measure Parameters"*, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Committee: Vitaly Kheyfets, Richard Weir.

2019 **Member of Thesis Committee:** David Pak, *"TBD"*, Bioengineering, University of Colorado-Denver|Anschutz Medical Campus. Committee: Cathy Bodine, Richard Weir.

Undergraduates

1997 **Undergraduate Advisor:** Preceptor: Student Design Project, 765 (BME)-C90 Biomedical Engineering Design, Winter Quarter, 1997: Ayson, Jason; Dumbauld, Pat; Messing, Katie; and Monje, Aaron; *"MMAD: A Motor Driven Humeral Rotator Equipped with a Continuous Externally-Activated Locking Mechanism"*. NU BME,

1999 **Undergraduate Advisor:** Preceptor Student Design Project, 765 (BME)-C90 Biomedical Engineering Design, Winter Quarter, 1999: Findlay, Michael; Radtke, Michael; Tabayoyong, William; Tran, Dinh; Yuen, Jonathon: *"Improved Prosthetic Wrist."* NU BME,

2000 **Undergraduate Advisor:** Preceptor Student Design Project, 765 (BME)-C90 Biomedical Engineering Design, Winter Quarter, 2000: Chi, Linda; Korona, Margaret; Leung, Nicky; Odden, Michelle; Whang, Naree: *"The Capstan Trans-Humeral Rotation Device"*. NU BME,

2000 **Undergraduate Advisor:** Client for the Northwestern University Engineering Design and Communication Course - Design Team B: Shaw, Shinnie; Valasek, Bill; Martinez, Joaquin; Provost, Louie; Yao, Di: *Website Design for Inside Ireland*. March 14th, 2000. NU BME,

2000 **Undergraduate Advisor:** Client for the Northwestern University Engineering Design and Communication Course - Section 13: Ray, Jehana; Hood, Andrew; Carter, Matt; Roman, Brenda: *Website Design for the Meteorite Mining Company*. March 16th, 2000. NU BME,

2013-2015 **Undergraduate Advisor:** Jacob Altholz *"Low Torque High Speed transmission across a Joint"*, Undergraduate BIOE Intern, Richard Weir, Winner UROP Grant - Accepted by military to go to Army Medical School.

2013-2014 **Independent Study:** Celia Jean King, *"Complaint Finger Joints"*, Undergraduate Senior, Mechanical Engineering, University of Colorado-Boulder, Richard Weir.

2013 **Coop/Internship Students:** Matthew Kristensen, *"Scanning and importing Hand Shapes into 3D CAD"*, Undergraduate, Engineering Science, Wartburg College, Waverly, IA, Spring 2013, Richard Weir

2015 **Undergraduate Advisor:** Dominic Isaacs, *"Optogenetics Study"*, BIOE Undergraduate, Summer 2015, Richard Weir, Stephen Huddle, UROP Applicant.

2017 **Coop/Internship Students:** Morgan Neuendorf, *"3D Metal printed hand frame"*, Undergraduate, Engineering Science, Wartburg College, Waverly, IA, Summer 2017, Richard Weir

2017 **Departmental Advisor,** Joshua Carlin, Michaela Pott, Tu Nguyen, Paige Moseley

2018 **Independent Study:** Anna Gilbertson, *"CAD Design for Otto Bock Michelangelo Motor cover"* Spring 2018, Richard Weir, Stephen Huddle, Colorado College Undergraduate

2018 **Internship Students:** Emma Cooper "Locking Track for artificial Thumb Ab/Adduction", Summer 2018, Richard Weir, Stephen Huddle. Aerospace Eng. Undergrad CU Boulder.

2018-2019 **Principal Thesis Advisor of Undergraduate Students:** Barathwaj Murali, *"Novel Powered Prosthetic Finger"* 12 credits, Spring 2018, Committee: Richard Weir, Ozkan Celik, Stephen Huddle, Undergrad Mechanical Engineering Intern from Colorado School of Mines

2018-2019 **Principal Thesis Advisor of Undergraduate Student Team:** Two Thumbs Up, *"3D Metal Printed Thumb for persons with Thumb Amputations"* Bioengineering Dept. UC Denver|AMC Capstone Design Project, 12 credits, Spring 2018, Committee: Richard Weir, Undergrad ME Intern from Colorado School of Mines

2019 **Internship Students:** Rachel Lockwood, Summer 2019 Richard Weir. Undergrad. Student in BS. BS in Mechanical Engineering, Washington University, St Louis.

2019 **Internship Students:** Kile Kelly, Summer 2019 Richard Weir, Intern. Undergrad. Student in BS in Mechanical Engineering, Colorado School of Mines.

Interns

- 1996 **Internship Students:** Jeremy McCormick: *"DURS Research Report - Measurement and Calibration of the DURS Zone of Operation"*. Research Assistant, NUPRL, Summer 1996: My Role: Project Director.
- 1996 **Internship Students:** Project Director: Israel, Adina: *"Construction and Calibration of the Flip-Side Direct Ultrasonic Ranging System Transponder"*. Research Assistant, NUPRL, Summer 1996: My Role: Project Director.
- 2001 **Internship Students:** Ahoni, Beverly: *Redesign of the Synergetic Hand Controller*. Biomedical Engineering Senior NU BME, Summer 2001. My Role: My Role: Project Director.
- 2007 **Internship Students:** HaeOck Lee, SINE program intern, Biomechatronics Development Lab. Rehabilitation Institute of Chicago. Summer PhD Candidate from University of Texas, San Antonio, Texas. My Role: Mentor.
- 2007 **Internship Students:** Nathan Stackhouse, Junior in Biomedical Engineering at Northwestern University spent summer in the BioMechatronics Development lab. to get research experience in Prosthetics, Biomechatronics Development Lab. Rehabilitation Institute of Chicago. Summer, My Role: Mentor.
- 2008 **Internship Students:** William Kethman, NIH T32 SINE Summer intern, Biomechatronics Development Lab. Rehabilitation Institute of Chicago. Summer My Role: Mentor.
- 2008 **Internship Students:** Chris Rodell, NIH T32 SINE Summer intern, Biomechatronics Development Lab. Rehabilitation Institute of Chicago. Summer My Role: Mentor.
- 2009 **Internship Students:** David McCoul, Summer Intern, Biomechatronics Development Lab. Rehabilitation Institute of Chicago, Summer. My Role: Mentor.
- 2008 **Internship Students:** Renaldo Evans, Laboratory Volunteer, Biomechatronics Development Lab. Rehabilitation Institute of Chicago, Fall. My Role: Mentor.
- 2009 **Internship Students:** Correy Pew, Volunteer Engineering intern, Biomechatronics Development Lab. Rehabilitation Institute of Chicago. My Role: Mentor.
- 2012 **Internship Students:** Eric Earley, *"Redesign of a Multifunctional Hand"*, Undergraduate Engineering Intern, UCD|AMC, Summer 2012, Richard Weir (BIOE) –Now doing PhD in BME at Northwestern University, Chicago, IL
- 2013 **Internship Students:** Eric Honert, *"Development of a Thumb Ad-Abduction Drive"*, Undergraduate Engineering Student, Valparaiso University, Summer 2013, UCD|AMC Richard Weir
- 2015 **Internship Students:** Christine Renee Carda, *"Volume Study for the TI Edison in the BeBionic Hand"*, CU Boulder Mech E. Intern, Summer 2015, UCD|AMC Richard Weir, Stephen Huddle, Jacob Segil.
- 2015 **Internship Students** Melchior de la Rochefoucauld, *"3D Socket for partial Hand Amputee"*, Undergraduate Engineering Student, Trinity College Ireland Summer 2015, UCD|AMC, Richard Weir; Stephen Huddle.
- 2016 **Internship Students:** Catherine Kutsuris, *"Imaging Human median and ulnar human peripheral nerves"*, Medical Student Intern, UCD|AMC Summer 2016
- 2016 **Internship Students:** Emma Mulligan, *"Pattern Recognition using MyoBand EMG sensing system"* Undergraduate Engineering Student, Boston University, UCD|AMC, Summer 2016, Richard Weir
- 2016-2017 **Internship Students:** Stephanie Gunn, *"3D Median Nerve Reconstruction from Nerve Slices"* Volunteer MS ASU, UCD|AMC, Richard Weir
- 2018 **Internship Students** Karen Purba, *"Cuffs for Optogenetic Stim of mouse Sciatic nerve"* 1 Summer 2018 Richard Weir, Laura Elson, Arjun Fontaine. Unpaid Volunteer Intern w/ undergraduate degree.

Highschool Student Interns

- 2007 **Internship Students:** Prem Ramkumar, High School Student spent summer in the BioMechatronics Development lab. to get research experience in Prosthetics, Biomechatronics Development Lab. Rehabilitation Institute of Chicago. Summer
- 2013 **Internship Students:** Thomas Nortman, *"3D CAD of a Mechanical Hand"*, Highschool Student Intern, Fall 2013, UCD|AMC Richard Weir, Steven Huddle
- 2014 **Internship Students:** Wynn Feddema, *"Assembly of Otto Bock Arm"*, Highschool Student Intern, Summer 2014, UCD|AMC, Richard Weir – Now ME undergraduate at UC Berkeley

- 2015 **Internship Students** Teaghan Weir, *Webpage redesign*, Summer, Highschool Student Intern, UCD|AMC, Richard Weir; Stephen Huddle. At Denver University
- 2015-2016 **Internship Students:** Michael Gimbal, *“Redesign of the Prototype 1 shoulder”*. Summer 2015 UCD|AMC, Richard Weir; Stephen Huddle. Went to Mechanical Engineering, Johns Hopkins University, Baltimore MD.
- 2015-2017 **Internship Students:** Andrew Chan, *“Backlocking Clutch Design”*, Highschool Student Intern, Fall 2015 UCD|AMC, Richard Weir, Stephen Huddle, Matthew Davidson. Started at Caltech Fall 2017.
- 2017 **Internship Students:** Sebastian Melendez, *“Simple 4DoF Hand”*, Highschool Student Intern, Summer 2017, UCD|AMC, Stephen Huddle, Richard Weir– Senior in HS.
- 2017 **Internship Students:** Claire Feddema, *“Thumb Armature for 3D Printed Hand Frame”*, Highschool Student Intern, UCD|AMC, Summer 2017, Stephen Huddle, Richard Weir – HS Senior
- 2017 **Internship Students:** Nico Ollala, *“Bevel Gear Assembly for a Shoulder”*, Highschool Student Intern, Summer 2017, UCD|AMC, Stephen Huddle, Richard Weir– Senior in HS.
- 2018 **Internship Students:** Caden Randolph "CAD and print of 3D Gears", Summer 2018 Richard Weir, Stephen Huddle. Highschool Intern.
- 2018 **Internship Students** Rachel Soans, *“Hand Frame Reiteration”*, Summer 2018 Richard Weir, Stephen Huddle. Highschool Intern.
- 2019 **Internship Students:** Sanjana Potlapelly, Summer 2019, Richard Weir, Stephen Huddle. Stephanie Lorelli, Highschool Intern.

Visiting Fellows

- 2005-2006 **Hosted Visiting Scholar:** Dr. Kengo Onishi, from Oita University in Japan, Dr. Onishi worked with Dr. Richard Weir in the area of Upper-Limb Prosthetics, 03/2005 - 02/2006.
- 2006 **Hosted Visiting Scholar:** Narendra Vaidya PhD Candidate from Lowell University, Mass. Internship Report *“A Mathematical Model for Calculating Muscle Force”* 06/01/2006 - 08/31/2006
- 2008 **Hosted Visiting Scholar:** Claude Lagoda, Technical University of Delft (TUDelft), Netherlands, 09/01/2008-12/01/2008.
- 2008-2009 Preceptor to **VA Predoctoral Fellow** James Sulzer.
- 2011 **Hosted Visiting Scholar:** Joseph Belter, PhD Candidate, Yale University (Aaron Dollar, Mentor). Visited our group for two weeks in March 2011.
- 2012 **Hosted Fulbright Scholar:** Dr. Christian Cipriani from Sclua Superiore Santa Anna, Pisa, Italy, 3/1/2012
- 2014-2015 **Hosted Fulbright Post-Doc. Scholar:** Dr Geethanjali Purushothaman from India, 08/2014 - 05/2015
- 2017 **Hosted Visiting Scholar:** Tom Noe, PhD Candidate, Technical University of Delft (TUDelft), Netherlands, 09/01/2017-12/01/2017 – Visiting Scholar from Dick Plettenburg’s Lab.

c. Provide evidence of successful mentoring of fellows or junior scientists, VA and non-VA, in terms of their transitions to independence, e.g. obtaining independent research awards/grants, publications as senior author or advancement in their academic position.

Dr. Bolu Ajiboye, MS & PhD, Biomedical Engineering, Northwestern University, Evanston IL, Graduated 2003-2007. Dissertation title: Neuromotor Muscle Synergies for EMG Pattern Recognition of Prehension Grasps for Control of Multifunctional Myoelectric Prostheses. Dr. Ajiboye is now an Assistant Professor, and VA Researcher in the Biomedical Engineering Department of Case Western Reserve. His main research interest is in the development and control of brain-computer-interface (BCI) technologies for restoring function to individuals who have experienced severely debilitating injuries to the nervous system, such as spinal cord injury and stroke. Currently, he is interested in developing a comprehensive understanding of the neuroscience underlying how cortical and muscular circuits give rise to natural movements. With the end goal of developing BCI systems that allow for more natural interactions with one’s surrounding environment. His work focuses on understanding the underlying synergies involved in motor coordination, and how these synergies can be used in rehabilitation engineering neuroprosthetic systems to restore lost or compromised function to movement impaired populations through FES. Bolu was an NIH F31 Recipient during his PhD and then when he moved to Louis Stokes VAMC, Cleveland a VA CDA1 & 2 Recipient. He also works with Robert Kirsch of Case Western Reserve Cleveland and Phil Donoghue and Leigh Hochberg and his group at Princeton. He is also PI own Merit Review Proposal VA RR&D *“Restoring High Dimensional Hand Function to Persons with Chronic High Tetraplegia”*.

- Dr. Todd Farrell, MS, PhD, Post-Doc, Biomedical Engineering, Northwestern University, Evanston IL, Graduated 2003-2007. Dissertation title: Issues in Multifunctional Myoelectric Control of Powered Prostheses: The Use of Surface vs. Intramuscular Electromyograms and the Determination of the Optimal Controller Delay. After completing his PhD Dr. Farrell remained in the lab. to publish his work after which he went to work for Liberating Technologies, Inc. (A leading Upper-limb prosthetics manufacturer) where he is now Director of Research and has led a research program funded through SBIR and DoD grants for the last 9 years. Over the past nine years he grew the program from its infancy to include over 25 successfully funded projects as both a prime- and sub-contractor. In addition, to create the most efficient and productive research teams for different projects, he has developed multiple collaborations with other engineering research groups as well as both prosthetic and medical clinicians. Todd independently built up the research arm of LTI which was non-existent when he arrived to now running multiple projects On which he PI of 6.
- Dr. Jon Sensinger, MS & PhD, Biomedical Engineering, Northwestern University, Evanston IL, Graduated 2005-2007. Dissertation title: User-modulated Impedance control of a prosthetic elbow. After completing his PhD Jon was recruited by Dr Todd Kuiken of the Rehabilitation Institute to do a Post Doc and then to head up the RIC Biomechatronics Development Lab. that became vacant when I moved to Colorado. Jon subsequently moved to become Vice-Chair of the Biomedical Engineering Center, University of New Brunswick, Fredericton, NB, Canada one the premier research institutes for the control of prosthetic limbs. Where he teaches and leads his own research team and is involved with the DARPA HAPTIX project.
- Dr. Jacob Segil, MS & PhD, Post-Doc), Dept. of Mechanical Engineering, University of Colorado Boulder, 2010-2014. Dissertation title: Development and Validation of a Myoelectric Postural Control System for Advanced Prosthetic Hands. Jacob after completing his PhD was recruited to become a Lecturer in Mechanical Engineering at University of Colorado Boulder. He also became a VA Researcher and last year received a VA CDA1 award to allow him to develop his own research program [VARR&D IK1RX002011 (Segil): Integration of a Sensory Feedback Implant with Myoelectric Prosthetic Hands]. This CDA involves an exciting collaboration with Dustin Tyler of the Louis Stokes VAMC in Cleveland. We are collaborating to use some of our control algorithms on the prosthetic hand they are using with the subjects Dustin has implanted with the FINE nerve cuff-system. This will allow us to see how integrating a sense of touch will affect our ability to control multifunctional hands. This CDA will go a long way towards providing Jacob the independence he needs to flourish as an investigator and also to help build our nascent VA RR&D research group here in Colorado.
- Dr. Arjun Fontaine, PhD & Post Doc, Dept. of Bioengineering, University of Colorado Denver|Anschutz Medical Campus, 2011-2016, Dissertation title: Toward an Optogenetic Peripheral Nerve Interface for Control of Advanced Prosthesis. Arjun's PhD work led our efforts in the area of optogenetic control in the peripheral nervous system. Arjun is now a post doc on our NIH SPARC grant to develop and optical interface for the vagus nerve.
- Dr. Hans Anderson, PhD & Post Doc, Dept. of Bioengineering, University of Colorado Denver|Anschutz Medical Campus, 2011-2016, Dissertation title: *"Building an Optical Neural Interface: Targeting Neurons and Making Them Glow"*, 2011-2017, Committee: Richard Weir (BIOE), John Caldwell (Physiology), Richard Benninger (BIOE), Angie Ribera (Biology). He was part of the UC AMC MD-PhD program and has now returned to medical school to complete his MD-PhD.
- Dr. Matthew Davidson, PhD & Post Doc, Dept. of Bioengineering, University of Colorado Denver|Anschutz Medical Campus, 2012-2017, Dissertation title: *"Development of a novel prosthetic wrist device incorporating the Dart Thrower's Motion"*, Committee: Richard Weir (BIOE), Cathy Bodine (BIOE), Kendall Hunter (BIOE), Jim Carollo (Pediatrics). Completed a Post Doc with Assistive Technology Partners (ACT) led by Cathy Bodine (BIOE) before moving to DC to become a Congressional Science Fellow.
- Dr. Alena Grabowski, (VA ECHCS) VA CDA2 Recipient, VA Researcher and Assistant Professor University of Colorado Boulder, Dept. of Integrative Physiology. VA CDA-2 A7972-W (Grabowski): *Characterizing Ankle Function during Sloped Locomotion for Prosthesis Development*. Did Post Doc with Hugh Herr of MIT returned to CO where we worked together to apply for her CDA2. She has recently obtained an assistant Professor position and has obtained her first independent VA RR&D Merit Grants as well as a SPIRE grant. VA Mentor: Richard Weir.

13. EXTRAMURAL ACTIVITIES.

List extramural invited presentations and seminars (include dates and limit to the past 10 years).

1. **Weir, R. F. ff.**, (2019): Invited speaker, Plenary Session, IEEE Neural Engineering Research Conf. San Francisco, CA, 03/20/2019.
2. **Weir, R. F. ff.**, (2018): Café Scientifique Invited talk, Denver, CO, 02/27/2018.

3. **Weir, R. F. ff.,** (2018): invited speaker University of Utah's Neural Engineering Research Group (NERG), Salt Lake City, UT, 03/27/2018.
4. **Weir, R. F. ff.,** (2017): Virally Transfected Optogenetics as the basis of a nerve interface for the control of Prosthetic Hands, Masters in Human Anatomy Program, 2017 Seminar Series – Invited Speaker, 10/26/2017
5. **Weir, R. F. ff.,** (2017): Virally Transfected Optogenetics as the basis of a nerve interface for the control of Prosthetic Hands, University of Colorado Denver, College of Engineering and Applied Science, Fall 2017 - Seminar Series – Invited Speaker, 10/17/2017
6. **Weir, R. F. ff.,** (2017): Workshop Component Technologies for Robotic Materials, CU Boulder, March 10-12, Invited Participant and Speaker.
7. **Weir, R. F. ff.,** (2016): Wide ranging Presentation on Upper-limb prosthetics, Invited visit Reykjavik, Iceland Össur, 07/07/2016 - Invited Speaker.
8. **Weir, R. F. ff.,** (2016): State of the Science of Myoelectric vs Body-Powered Control State of the Science Meeting on Myoelectric vs Body-Powered Control Orlando Florida Academy of Orthotists and Prosthetists of America (AOPA), 09/16/2016 – Invited Speaker.
9. **Weir, R. F. ff.,** (2016): IMES and Optogenetics: Thoughts on Neural Interfaces for Advanced Prosthesis Control, Össur-Otto Bock Treaty on NeuroIntegrated Man Machine Interface, Reykjavik, Iceland, Össur and Otto Bock, 10/27/2016 – Invited Speaker.
10. **Weir, R. F. ff.,** (2016): Dexter Sinistre and the Left Hand of Darkness, Annual Meeting of the National Association of Disability Examiners Denver, CO, National Association of Disability Examiners, 08/15/2016 – Invited Speaker.
11. **Weir, R. F. ff.,** (2015): Neural Interfaces and Bionic Limbs: Recent Work in the development of Advanced Prosthetic Hand Replacements Invited Talk University of Oregon, Eugene University of Oregon, 10/23/2015 – Invited Speaker.
12. **Weir, R. F. ff.,** (2014): The Biomechatronics Development Laboratory: Dexterous Manipulation for Artificial Hands. DEMOVE Symposium University of Gottingen, Gottingen, Germany, 10/21/2014 - Invited Speaker by Dario Farina.
13. **Weir, R. F. ff.,** (2014): The Biomechatronics Development Laboratory: Dexterous Manipulation for Artificial Hands Scula Superiore Santa Anna Pisa, Italy, 10/28/2014 - Invited Speaker hosted by Dr. Christian Cipriani.
14. **Weir, R. F. ff.,** (2014): The Benefits of Additive Manufacturing in R&D of Upper-limb Prosthetics STEMtech Conference Denver, 11/12/2014 - Invited talk by Stratasys.
15. **Weir, R. F. ff.,** (2014): Muscle as Biological Amplifier of the Neural Command, Colorado School of Mines, Golden, CO., 03/25/2014 – Invited Speaker.
16. **Weir, R. F. ff.,** (2014): Muscle as Biological Amplifier of the Neural Command Terumo, BCT Arvada, CO, 05/26/2014, Invited Speaker.
17. **Weir, R. F. ff.,** (2014): Muscle as a Biological Amplifier of the Descending Neural Command, Conf. Sensorimotor Prosthetics Workshop, Scottsdale, AZ DARPA RENET Meeting, 03/13/2014 - DARPA Consensus Meeting for HAPTIX BAA – Invited Speaker.
18. **Weir, R. F. ff.,** (2014): Mechatronic Prosthetic Hands and Arms for Persons with Upper-Limb Loss, Innovation Grand Rounds Library, 02/05/2014 – Invited Speaker.
19. **Weir, R. F. ff.,** (2014): Implantable Myoelectric Sensors (IMES) for direct muscle control of Prostheses. DEMOVE Symposium University of Gottingen, Gottingen, Germany, 10/23/2014 -- Invited Speaker by Dario Farina.
20. **Weir, R. F. ff.,** (2014): Dexter Sinistre and the Left Hand of Darkness, Academy of Life Long Learning Denver, 04/09/2014 – Invited Speaker.
21. **Weir, R. F. ff.,** (2014): Anatomical Issues Related to the Development of Advanced Prosthetic Arms and Hands. Master of Science in Modern Human Anatomy AMC, 11/20/2014 - Invited Speaker.
22. **Weir, R. F. ff.,** (2014): Additive Manufacturing and it's use in the Development of Biomimetic Advanced Hand/Arm Replacements OLLI Denver, 07/09/2014. Invited Speaker
23. **Weir, R. F. ff.,** 2013): Biomedical Engineering: The Interface between Medicine & Engineering CO-WY Junior Academy of Science ED2 South, Anschutz Medical Campus 11/12/2013 – Invited Speaker.
24. **Weir, R. F. ff.,** (2013): Human-Machine Systems: A New Generation of Biomechatronic Arms Denver Tech Center Kiwanis Group Denver 06/18/2013 – Invited Speaker.
25. **Weir, R. F. ff.,** (2013): Dexter Sinistre and the Left Hand of Darkness: Neural Interfaces for the Control of Dexterous Artificial Hands. College of Engineering and Applied Sciences, UC Denver Auraria Campus, UC Denver, 03/07/2013 - Faculty Seminar Series.

26. **Weir, R. F. ff.**, (2013): Dexter Sinistre and the Left Hand of Darkness: - Tales from the development of advanced Prosthetic Hands. Master of Science in Modern Human Anatomy, 7th Floor, AO West Bldg., Anschutz Medical Campus, 11/20/2013 – Invited Speaker.
27. **Weir, R. F. ff.**, (2012): Upper-Extremity Prosthetics Overview: Advanced Technology Physical Medicine & Rehabilitation, UC Denver|Anschutz Medical Campus PM&R Dept., Anschutz Medical Campus 2/15/2012 – Invited Speaker.
28. **Weir, R. F. ff.**, (2012): New Directions in Peripheral Nerve Interfaces for Prosthesis Control VA ECHCS VA ECHCS - Denver VAMC 5/17/2012 – Invited Speaker.
29. **Weir, R. F. ff.**, (2012): MARK: MESA Advisor Retreat & Kickoff: Prosthetic Arm - MESA USA National Competition MESA UC Denver, Auraria Campus, 11/8/2012 – Invited Speaker.
30. **Weir, R. F. ff.**, (2012): Human-Machine Systems: A New Generation of Biomechatronic Arms Harvard IDEAS™ (Innovation, Design, and Emerging Alliances in Surgery): Opportunities and Challenges in Surgical Robotics Beth Israel Deaconess Medical Center, Harvard University Medical School Harvard Medical School 2012 – Invited Speaker.
31. **Weir, R. F. ff.**, (2011): Dexter Sinistre and the Left Hand of Darkness: Neural Interfaces for the Control of Dexterous Artificial Hands. Rocky Vista University School of Osteopathic Medicine Talk, 10/21/2011 – Invited Speaker.
32. **Weir, R. F. ff.**, (2011): Dexter Sinistre and the Left Hand of Darkness: The Search for an intuitive Neural Interface for the Control of Dexterous Artificial Hands. Department of Integrative Physiology, University of Colorado at Boulder. 11/07/2011 – Invited Speaker.
33. **Weir, R. F. ff.**, (2010): Design of Medical Devices Conference, Minneapolis, MN, April 14, 2011 – Invited Speaker by Andrew Hanson.
34. **Weir, R. F. ff.**, (2010): DOCTRID Charity Keynote - Carton, Ireland – Invited Speaker
35. **Weir R. F. ff.** (2009): Clinical Path to Implantable Myoelectric Sensors (IMES) for Multifunctional Prosthesis Control. Invited talk, Medical College of Milwaukee, May 21st, 2009.
36. **Weir R. F. ff.** (2009): Peripheral Neuroprostheses for Sensing/Stimulation. Invited Lecture, MIT, Boston, MA March 31st 2009.
37. **Weir R. F. ff.** and Schorch, J. S., (2008): Invited Session Contributor, “Revolutionary Neuroprosthetic Systems” Pre-Conference workshop, 30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (IEEE EMBS), Vancouver, Canada, August 20th – 24th, 2008.
38. **Weir R. F. ff.** (2008): Arms Race”: discovery of neural-muscular-control of the prosthetic arm, the bionic arm. Keynote Speech: Bionic Arms Race: Advances in limb prosthetics. The 32nd Annual Great Lakes Biomedical Conference, Golden Rondelle Theatre of SC Johnson, Racine, Wisconsin, April 18, 2008
39. **Weir R. F. ff.** (2008): Prosthetic Arm and Hand control with Myoelectric (Nerve-Muscle) Sensors. Invited Speech, Bionic Arms Race: Advances in limb prosthetics, The 32nd Annual Great Lakes Biomedical Conference, Golden Rondelle Theatre of SC Johnson, Racine, Wisconsin, April 18, 2008
40. **Weir R. F. ff.** (2008): Hot Topics in Biomedical Research: Neural Engineering Panel, Invited Panelist Midwest Bioengineering Consortium (MBEC), Illinois Institute of Technology, Chicago, Illinois, April 4th, 2008.
41. **Weir, R. F. ff.**, (2008): Our New Bionic Arm Replacements: How close to the Bionic Arms of Science Fiction are they? Invited Speech. The Biomedical Engineering Research Group in University College Dublin (UCD) and The Biomedical Engineering Division of the Institute of Engineers of Ireland (IEI), Rm. 326, Engineering Building, University College Dublin, Belfield, Dublin Ireland, March 28th, 2008.
42. **Weir R. F. ff.** (2007): The Next Generation of Prosthetic Arm Systems. Invited Speaker, No Barriers Festival 2007, Squaw Valley, California, June 28th – July 2nd, 2007.
43. **Weir R. F. ff.** (2007): The latest and Greatest in Hand Replacement Technology. Symposium: Quantification & mechanisms of impaired motor control, In honor of past, present & future contributions of Dr. W. Zev Rymer, Daniel Hale Williams Auditorium, Room 2-320, McGaw Medical Center, Northwestern University Feinberg School of Medicine, 240 E. Huron St., Chicago, IL., June 26-27 2007.
44. **Weir R. F. ff.** (2007): “Arms for Veterans - The Next Generation of Devices”, Invited Speech Student/Faculty Seminar Series, Illinois Institute of Technology, March 2nd, Chicago, IL.
45. **Weir R. F. ff.** (2007): The New New Things About Prosthetic Arms, Invited Speech Biomedical Engineering Department Seminar Series, Northwestern University, Thursday, January 25, 2006, 4:00 pm – 5:00 pm, Tech L361. Evanston, IL.
46. **Weir R. F. ff.** (2006): The New New Things About Prosthetic Arms and Hands, Invited Speech Emerging Trends in Rehabilitation Robotics session, MARS-RERC Annual Meeting, RIC 16th Floor, Magnuson Auditorium, 1:30 – 2:40 pm, Friday, November 17. RIC, Chicago, IL.

47. **Weir R. F. ff.** (2006): From EPP and Muscle Tunnel Cineplasties to Neuroelectric Control for Artificial Arms and Hands. Dudley S. Childress Scientific Symposium, Room 1702, Rehabilitation Institute of Chicago, Chicago, Illinois, Friday October 6th, 2006. (FessSchrift for Dr. Childress).

14. BIBLIOGRAPHY.

a. Papers published in peer-review journals

1. **Weir, R. F. ff.**, and Childress, D. S., (1997): A Portable, Low Cost, Real-Time, Clinical Gait Analysis System. *IEEE Transactions on Rehabilitation Engineering*, Vol. 5, No. 4, pp. 310 - 321, December.
2. **Weir, R. F. ff.**, and Childress, D. S., (2001): Die Kineplastik zur Steuerung von Fremdkraftprothesen. *Medizinisch-Orthopädische Technik*. No. 121, pp. 9 - 12, January.
3. **Weir, R. F. ff.**, Grahn, E. C., and Duff, S. J., (2001): A New Externally-Powered, Myoelectrically Controlled Prosthesis for Persons with Partial Hand Amputations at the Metacarpals. *Journal of Prosthetics and Orthotics*. Vol. 12, No. 2, pp. 26 - 31, June 2001.
4. **Weir, R. F. ff.**, Heckathorne, C. W., and Childress D. S., (2001): Cineplasty as a Control Input for Externally Powered Prosthetic Components. *Journal of Rehabilitation Research and Development*. Vol. 38, No. 4, pp. 357 - 363, July/August 2001.
5. Al-angari, H. M., **Weir, R. F. ff.**, Heckathorne, C. W., and Childress, D. S., (2003): A Two Degree-of-Freedom Microprocessor Based Extended Physiological Proprioception (EPP) Controller for Upper Limb Protheses. *Technology and Disability*, Vol. 15, No. 2, pp. 113 – 127.
6. Farrell, T. R., **Weir, R. F. ff.**, Heckathorne, C. W., Childress, D. S., (2005): The Effects of Static Friction and Backlash on Extended Physiological Proprioception (EPP) Control of a Powered Prosthesis. *Journal of Rehabilitation Research and Development*. Vol. 42, No. 3, pp. 327-342, May/June 2005.
7. Ajiboye, A. B., and **Weir, R. F. ff.**, (2005): A Heuristic Fuzzy Logic Approach to EMG Pattern Recognition for Multifunctional Prosthesis Control. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, Vol. 13, No. 3, pp. 280 – 291, September
8. Dario, P., Hogan, N., Krebs, H. I., Rahman, T., Patton, J., van der Loos, H.F. M., Harwin, W. S., Childress, D. S., **Weir, R. F. ff.**, (2005): The Past, Present and Future of Rehabilitation Robotics: An Ethical View from Pioneers of the Research. *Industry/Research News, IEEE Robotics and Automation Magazine* Vol. 12, No. 4, December, pp.92-95,
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c. Review articles

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d. Books and book chapters

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3. **Weir, R. F. ff.** (2003): Design of Artificial Arms and Hands for Prosthetic Applications. Invited Chapter (Chapter 32) in *Standard Handbook of Biomedical Engineering & Design*. Myer Kutz, Editor, McGraw-Hill, New York, pp. 32.1 – 32.61.
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e. Media and Outreach

- 1989 Program Digest, National Easter Seal Society, Vol. 3, No. 2, p. 12, Fall, 1989.
- 1990 Northwestern University Prospective Magazine, p. 4, Winter 1990.
- 1993 In: O&P Research and Engineering: Improving the Quality of Life in Today's World, O&P Almanac, P37-43, July 1993
- 1996 In Motion Magazine Vol. 6, No. 5, p. 29, Oct. 1996.
- 1997 "Science of the Impossible". Segment for Discovery Channel. Sept. 1998.
- 1997 FDA Consumer Vol. 31, No. 2, p. 9, 1997.
- 1998 "Prosthetics Laboratory Research". SCIENTIA-Idea Television. Segment for a Brazilian Television Station.
- 2000 Advertisement (Flyer) for the Graduate Program in Biomedical Engineering Northwestern University, ©2000.
- 2000 Segment for German Television ZDF by Christiane Blatter on the state of upper-limb prosthetics research. June 2000.
- 2001 "High-Tech Lab Helps Amputees 'Just do it'", Chicago Sun Times interview by Adrienne Drell. pp. 18A,19A, Sunday, May 6th, 2001.
- 2001 Contributor for BBC Radio 4 Programme "Flesh and Chips", Produced by Jeremy Grange broadcast February & March 2001 [02/28/2001] BBC Wales Programme No. 00CL0846CHO.
- 2002 MEC'02 Presentations Mentioned in O&P Business News 11/2002.
- 2002 Mentioned under Partners in Design in "Iris Miller: Teaching Students the Meaning of Human Centered Design" by John Anderson, Burn Support News, Winter Edition 2002, Issue 4, p13.
- 2003 "Chicago team crafts more lifelike artificial hand" by Rick Merritt, EE Times, September 22, 2003
- 2005 "Arm Amputees Rely on Old Devices" by Dave Muniz, USA Today. p3., October 6th, 2005;
- 2005 "Creating a Smart Arm" by Dan Ferber, Popular Science, December, 2005, p. 70.
- 2005 "Making a better helping hand" by Jordan Weissmann, Daily Northwestern, Friday, October 21, 2005, p.3,
- 2005 "Prosthetics of future will mesh body, mind and machine", October 26, 2005 Featured Article VA Research and Development Web site.
- 2005 "Rehabilitation Medicine Welcomes a Robotic Revolution." By Rebecca Voelker, JAMA. September 14th 2005; Vol. 294, No. 10, pp.1191-1195;
- 2005 "Re-wiring the body" by Chuck Murray, Design News, 10.24.05, p67
- 2005 "Robots help patients help themselves." By Jim Ritter, Health Reporter, Chicago Sun Times, June 29, 2005
- 2006 "Robotic Hand Showcases VA Research at Hearing" by Stephan Spotswood, U.S. Medicine, Vol. 42, No. 6, page 1, June 2006.
- 2006 Featured in Crain's Business News
- 2006 The American Veteran, Episode 208, August 23, 2006
- 2006 VA Senate Subcommittee Hearing on VA Research Funding with Under Secretary of the VA and head of VA Research and Development, and Senator Craig, Chairman of the Subcommittee – New York Times
- 2006 WGN News Saturday August 12th Disabled Veterans Convention, with the Secretary of the VA
- 2007 "The World's Most Advanced Bionic Arm" by Michael Belfiore, WIRED, August, 2007.
- 2007 Featured in Popular Mechanics
- 2007 Interviewed for Esquire Magazine
- 2008 DARPA 2009 Arm featured on cover of National Geographic, January 2010. Our lab. (mentioned in small print on p150) built the thumb drives, Ab-Ad drive, and the index and middle fingers
- 2008 Intrinsic Hand on cover of IEEE Spectrum Magazine
- 2009 Featured in October VA Research Currents
- 2009 Our Implantable Myoelectric Sensor paper on the cover of IEEE Trans. Biomed Eng. January.
- 2009 UNB Hand mentioned on Quebec TV

- 2012 Featured in Special edition on the Brain by Discover Magazine, 07/01/2012.
- 2014 Cyborg Nation Phone Interview about Advanced Limbs, 12/2014.
- 2014 **Exhibitions in galleries/museums:** "Implantable Sensors Improve Control for Prosthetic Limbs", Science Highlight: July 23, 2014, NIH NIBIB Website Interviewed 07/23/2014, by Thomas Johnson (NIBIB)
- 2014 Performances Co-Presenter(s) Six Million Dollar Man Becomes Reality, NewsMax, Interview about Advanced Limbs, John Edwards, Eve Kaiser 06/09/2014.
- 2014 Colorado State of Mind 7:30 p.m. MDT on Rocky Mountain PBS Talked about our Research in Prosthetic Limbs and the use of 3D Printing, Mary MacCarthy, 07/20/2014, Notes: video.RMPBS.org
- 2014 Good Living by Design Radio Show South Denver Interviewed about 3D printing in our work, Victoria Howell, 12/09/2014,
- 2015 CU Today Interview 09/2015.
- 2015 Interview about 3D printing Boulder Weekly Interview, Caitlin Rockett, 02/10/2015
- 2015 **Exhibitions in galleries/museums: Presented at Maker Faire** Boulder County Fair Grounds, Longmont, CO 01/31/2015 01/31/2015 Notes: Talked about MESA Prosthetics Challenge
- 2018 **Exhibitions in galleries/museums:** Richard Weir, "Implantable Myoelectric Sensor and DARPA hand display" Continuous Display in Lobby National Institute for Bioimaging and Bioengineering (NIBIB) Building, National Institutes of Health (NIH), Bethesda, MD - Contributed our technology and prototypes 01/2016 - 01/2018.