

## BROWN UNIVERSITY CURRICULUM VITAE

1. Edward G. Walsh, Ph.D.  
Assistant Professor (Research), Carney Institute for Brain Science

2. EDUCATION

Ph.D. 1992 Biomedical Engineering  
Worcester Polytechnic Institute

Dissertation on quantitative nuclear magnetic resonance measurement of cerebral blood flow.

B.S. 1981 Electrical Engineering  
Worcester Polytechnic Institute

Emphasis on semiconductor device design and fabrication.

3. PROFESSIONAL APPOINTMENTS

July 2022 – Present

Assistant Professor (Research)  
Brown University  
Robert J. & Nancy D. Carney Institute for Brain  
Science

February 2019 – Present

Assistant Director, Brown University Graduate  
Program in Medical Physics

February 2018 – Present

Co-Founder, Advisor, Theromics, Inc.  
West Bridgewater, MA

September 2015 – Present

Adjunct Assistant Professor  
University of Rhode Island Department of Physics

June 2012 – Present

Research Service, Veterans Administration Medical  
Center Providence, RI

September 2008 – June 2022

Assistant Professor (Research)  
Brown University Department of Neuroscience

January 2007 – Present

Associate Director for MRI Physics  
Brown University Magnetic Resonance Facility  
Brain Science Program

August 2005 – September 2008

Investigator  
Brown University Department of Neuroscience

May 2003 – July 2005	Associate Scientist Center for the Development of Functional Imaging Department of Vision Sciences UAB School of Optometry
June 2001 – July 2005	Adjunct Research Assistant Professor University of Alabama at Birmingham School of Nursing
May 2000 – July 2005	Research Assistant Professor University of Alabama at Birmingham School of Engineering Department of Biomedical Engineering
November 1998 – April 2000	Adjunct Assistant Professor University of Alabama at Birmingham Department of Biomedical Engineering
October 1994 – April 2000	Assistant Professor University of Alabama at Birmingham Division of Cardiovascular Disease
October 1992 - September 1994	Postdoctoral Fellow University of Alabama at Birmingham Division of Cardiovascular Disease
June 1981 - June 1985	Research Engineer Air Force Systems Command Rome Laboratories Reliability Physics Division

#### 4. COMPLETED PUBLICATIONS

##### Book Chapters:

Walsh, E.G., “Basic MR Physics: Considerations for Behavioral Medicine and Neurophysiology”, for “Brain Imaging in Behavioral Medicine and Clinical Neuroscience”. R.A. Cohen, L.H. Sweet (Editors), Springer, 2011, p.11-36.

Walsh, E.G., “Cardiovascular MR Instrumentation”, for “Textbook of Cardiovascular MRI”, G.M. Pohost , K. Nayak (Editors), Informa Healthcare, 2007, p31-49.

Refereed Journal Articles (Graduate students/postdoctoral fellows in italics):

*Flannery, S. W., Barnes, D.A., Costa, M.Q., Menghini, D., Kiapour, A.M., Walsh, E.G., BEAR Trial Team, Kramer, D.E., Murray, M.M., Fleming, B.C., Automated Segmentation of the Healed Anterior Cruciate Ligament From T<sub>2</sub>\* Relaxometry MRI Scans. Journal of Orthopaedic Research 41:649-656 doi:10.1002/jor25390 (2023).*

*Chen, X., Zhang, J., Wu, Y., Tucker, R., Baird, B.L., Domonoske, R., Barrios-Anderson, A., Lim, Y.P., Bath, K., Walsh, E.G., Stonestreet, B.S., Inter-Alpha Inhibitor Proteins Ameliorate Brain Injury and Improve Behavioral Outcomes in a Sex-Dependent Manner After Exposure to Neonatal Hypoxia Ischemia in Newborn and Young Adult Rats. Neurotherapeutics 19:528-549 (2022).*

*Flannery, S.W., Walsh, E.G., Sanborn, R., Chrostek, C., Costa, M.Q., Shankar K., Murray, M.M., Fleming, B.C., Kiapour, A.M., Reproducibility and Post-Acquisition Correction Methods for Quantitative Magnetic Resonance Imaging of the Anterior Cruciate Ligament (ACL). Journal of Orthopaedic Research 40:2908-2913 doi:10.1002/jor25319 (2022).*

*White, T.A., Gonsalves, M. A., Cohen, R.A., Harris, A.D., Monning, M.A., Walsh, E.G., Nitenson, A.Z., Porges, E.C., Lamb, D.G., Woods, A.J., Borja, C.B., The Neurobiology of Wellness: 1H-MRS Correlates of Agency, Flexibility and Neuroaffective Reserves in Healthy Adults. NeuroImage 225 117509 (2021).*

*Tamaki, M., Wang, Z., Barnes-Diana, T., Guo, D., Berard, A.V., Walsh, E., Watanabe, T., Sasaki, Y., Complementary Contributions of NREM and REM Sleep to Visual Learning. Nature Neuroscience 23:1150-1156 (2020). doi:10.1038/s41593-020-0666-y.*

*Maxwell, A.W.P, Walsh, E.G., Park, W.K.C., Baird, G., Dupuy, D.D., Adjuvant Thermal Accelerant Gel Increases Microwave Ablation Zone Temperature in Porcine Liver as Measured by Magnetic Resonance Thermometry. Journal of Vascular and Interventional Radiology, 31(8):1357-1364 (2020). Doi:10.1016/j.jvir.2020.01.010, PMID: 32457010.*

*Monnig, M.A., Woods, A.J., Walsh, E.G., Martone, C.M., Blumenthal, J., Monti, P.M., Cohen, R.A., Cerebral Metabolites on the Descending Limb of Acute Alcohol: A Preliminary <sup>1</sup>H Study. Alcohol and Alcoholism, Alcohol Alcohol. 9:54(5):487-496 (2019). doi:10.1093/alcalc/agz062.*

*Bang, J.W., Shibata, K., Frank, S., Walsh, E.G., Greenlee, M., Watanabe, T., Sasaki, Y., Consolidation and Reconsolidation Share Behavioral and Neurochemical Mechanisms, Nature Human Behavior, 2:501-513 (2018). doi 10.1038/s41562-018-0366-8.*

*White, T.L., Monnig, M.A., Walsh, E.G., Nitenson, A.Z., Harris, A.D., Cohen, R.A., Porges, E.C., Woods, A.J., Lamb, D.G., Boyd, C.A., Fekir, S., Psychostimulant Drug Effects on Glutamate, Glx, and Creatine in the Anterior Cingulate Cortex and Subjective Response in Healthy Humans, Nature Neuropsychopharmacology, 43:1498-1509 (2018), doi:10.1038/s41386-018-0027-7.*

*Beveridge, J.E., Machan, J.T., Walsh, E.G., Kiapour, A.M., Karamchedu, N.P., Chin, K.E., Proffen, B.L., Sieker, J.T., Murray, M.M., Fleming, B.C.,* Magnetic Resonance Measurements of Tissue Quantity and Quality Using  $T_2^*$  Relaxometry Predict Temporal Changes in the Biomechanical Properties of the Healing ACL. *Journal of Orthopedic Research*, 36(6):1701-1709, 2017. doi 10.1002/jor.23830.

*Preiss, M., Cournoyer, E., Paquin, K., Vuono, E., Belanger, K., Walsh, E., Howlett, N., Bothun, G.,* Tuning the Multifunctionality of Iron Oxide Nanoparticles Using Self-Assembled Mixed Lipid Layers. *Bioconjugate Chemistry*, 28(11):2729-2736, 2017.

*Shibata, K., Sasaki, Y., Bang, J.W., Walsh, E.G., Machizawa, M., Tamaki, M., Chang, L.H., Watanabe, T.,* Overlearning Hyperstabilizes a Skill by Rapidly Making Neurochemical Processing Inhibitory-Dominant. *Nature Neuroscience*, doi:10.1038/nn.4490, 2017.

*Park, W.K.C., Mills, D.R., Lim, S., Sana, B., Frank, V.E., Kenyon, B.M., Primmer, M.P., Paul, J.B., Baird, G.L., Walsh, E.G., Dupuy, D.E.,* A Ferritin-Containing Nanoconjugate as MRI Image-Guidance to Target Necl-5, A Tumor-Surface Antigen: A Potential Thermal Accelerant for Microwave Ablation. *Proc. SPIE Energy-based Treatment of Tissue and Assessment IX* 10066:H1:9, 2017. Doi:10.1117/12.2250041

*Beveridge, J.E., Walsh, E.G., Murray, M.M., Fleming, B.C.,* Sensitivity of ACL Volume and  $T_2^*$  Relaxation Time to Magnetic Resonance Imaging Scan Conditions. *Journal of Biomechanics* 56:117-121, 2017. Doi: 10.1016/j.jbiomech.2017.03.010.

*Biercevicz, A.M., Akelman, M.R., Rubin, L.E., Walsh, E.G., Merck, D., Fleming, B.C.,* The Uncertainty of Predicting Intact Anterior Cruciate Ligament Degeneration in Terms of Structural Properties using  $T_2^*$  Relaxometry in a Human Cadaveric Model. *Journal of Biomechanics* 48: 1188-1192, 2015.

*Biercevicz, A.M., Proffen, B.L. Murray, M.M., Walsh, E.G., Fleming, B.C.,*  $T_2^*$  Relaxometry and Volume Predict Semi-quantitative Histological Scoring of an ACL Bridge-enhanced Primary Repair in a porcine model. *Journal of Orthopaedic Research* 33:1180-1187, 2015.

*Rand, D., Walsh, E.G., Derdak, Z., Wands, J.R., Rose-Petruck, C.,* A Highly Sensitive X-Ray Imaging Modality for Hepatocellular Carcinoma Detection In-Vitro, *Physics in Medicine & Biology*, 60:769-784, 2015.

*Alosco, M.L., Gunstad, J., Beard, C., Xu, X., Clark, U.S., Labbe, D., Jerskey, B.A., Ladino, M., Cote, D., Walsh, E.G., Poppas, A., Cohen, R.A., Sweet, L.H.,* The Synergistic Effects of Anxiety and Cerebral Hypoperfusion on Cognitive Dysfunction in Older Adults with Cardiovascular Disease, *J Geriatr Psychiatry Neurol* 28(1):57-66, 2015.

*Alosco, M.L., Gunstad, J., Xu, X., Clark, U.S., Labbe, D., Riskin-Jones, H., Terrero, G., Schwarz, N.F., Walsh, E.G., Poppas, A., Cohen, R.A., Sweet, L.H.,* The Impact of Hypertension on Cerebral Perfusion and Cortical Thickness in Older Adults. *Journal of the American Society for Hypertension*, 8(8):561-570, 2014.

*Biercevicz, A.M., Walsh, E.G., Murray, M.M., Akelman, M., Fleming, B.C., Improving the Clinical Efficiency of T<sub>2</sub>\* Mapping of Ligament Integrity, Journal of Biomechanics, 47(10):2522-2525, 2014.*

Menon, R., Walsh, E.G., Twieg, D.B., Cantrell, C., Vakil, P., Jonathan, S., Batjer, H., Carroll, T., Snapshot MT Technique to Measure OEF using Rapid Frequency Mapping. *Journal of Cerebral Blood Flow and Metabolism, 34(7):1111-1116, 2014.*

Xu, X., Jerskey, B.A., Cote, D.M., Walsh, E.G., Hassenstab, J.J., Ladino, M.E., Clark, U.S., Labbe, D.R., Gunstad, J.J., Poppas, A., Cohen, R.A., Hoge, R.D., Sweet, L.H., Whole Brain Cerebral Perfusion Among Older Adults is Moderated by Strength Training and Gender. *Neuroscience Letters 560:26-30, 2014.*

*Biercevicz, A.M., Murray M.M., Walsh, E.G., Miranda, D.L., Machan, J.T., Fleming, B.C., T<sub>2</sub>\* MR Relaxometry and Ligament Volume are Associated with the Structural Properties of the Healing ACL. Journal of Orthopaedic Research 32(4):492-499, 2014.*

*Chen, Y., Guo, F., Qiu, Y., Hu, H., Kulaots, I., Walsh, E.G., Hurt, R.H., Encapsulation of Particle Ensembles in Graphene Nanosacks as a New Route to Multifunctional Materials, ACS Nano 7(5):3744-3753, 2013.*

*Alosco, M.L., Gunstad, J., Jerskey, B.A., Xu, X., Clark, U.S., Hassenstab, J., Cote, D.M., Walsh, E.G., Labbe, D.R., Hoge, R., Cohen, R.A., Sweet, L.H., The Adverse Effects of Reduced Cerebral Perfusion on Cognition and Brain Structure in Older Adults with Cardiovascular Disease, Brain Behav 3(6):626-636, 2013.*

Doyle, M., Weinberg, N., Pohost, G.M., Merz, C.N, Shaw, L.J., Sopko, G., Fuisz, A., Rogers, W.J., Walsh, E.G., Johnson, B.D., Sharaf, B.L., Pepine, C.J., Mankad, S., Reis, S.E., Rayarao, G., Vido, D.A., Bittner, V., Tauxe, L., Olson, M.B., Kelsey S.F., Biederman, R.W., Left Ventricular Energy Model Predicts Adverse Events in Women with Suspected Myocardial Ischemia: Results From the NHLBI-Sponsored Women's Ischemia Syndrome Evaluation (WISE) Study. *Cardiovasc Diagn Ther 3(2):64-72, 2013.*

Walsh, E.G., Mills, D.R., Lim, S., Sana, B., Brilliant, K.E., Park, W.K.C., MRI Contrast Demonstration of Antigen-Specific Targeting With an Iron-Based Ferritin Construct, *Journal of Nanoparticle Research 15:1409, 2013.*

Doyle, M., Weinberg, N., Pohost, G.M., Bairey-Merz, C.N., Shaw, L.J., Sopko, G., Fuisz, A., Rogers, W.M., Walsh, E.G., Johnson, B.D., Sharaf, B.L., Pepine, C.J., Mankad, S., Reis, S.E., Vido, D.A., Rayarao, G., Bittner, V., Tauxe, L., Olson, M.B., Kelsey, S.F., Biederman, R.W.W., Prognostic Value of Global Magnetic Resonance Myocardial Perfusion Imaging in Women with Suspected Myocardial Ischemia and No Obstructive Coronary Artery Disease: Results from the NHLBI-Sponsored Women's Ischemia Syndrome Evaluation (WISE). *JACC, 3(10):1030-1036, 2010. PMID: 20947048*

Myers, E., Blumstein, S., Walsh, E.G., Eliassen J., Inferior Frontal Regions Underlie the Perception of Phonetic Category Invariance, *Psychological Science*, 20(7):895-903, 2009. PMID: 19162052

Walsh, E.G., Anayiotos, A., Brott, B., Johnson, V.Y., Venugopalan, R., Assessment of Cardiovascular Implant Devices for MRI Compatibility, *Technology in Health Care* 16(4):233-245, 2008. PMID: 18776600

Xu, C., Xie, J., Kohler, N., Walsh, E.G., Chin, Y.E., Sun, S., Monodisperse Magnetite (Fe<sub>3</sub>O<sub>4</sub>) Nanoparticles Coupled with Nuclear Localization Signal (NLS) Peptide for Cell Nuclear Targeting, *Chemistry Asian J* 3:548-552, 2008. PMID: 18080259

Xu, C., Xie, J., Ho, D., Wang, C., Kohler, N., Walsh, E.G., Morgan, J.R., Chin, Y.E., Sun, S., Au-Fe<sub>3</sub>O<sub>4</sub> Dumbbell Nanoparticles as Dual Functional Probes, *Angewandte Chemie. Int Ed* 47:173-176, 2007. PMID: 17992677

Walsh E, Brott B, Venugopalan R, Anayiotos AS, In-Stent Restenosis Measurements by MRI, *Journal of Biomechanics* 39(1):S298, 2006.

Zuo, J., Walsh, E.G., Deutsch, G., Twieg, D.B., Rapid Mapping of Flow Velocity Using a New PARSE Method, *Magn Reson Med* 55:147-152, 2006. PMID: 16315204

Johnson, V.Y., Walsh, E.G., Nurses Making a Difference: The Process of Technology Transfer. *Journal of Neuroscience Nursing* 37(5):279-282, 2005. PMID: 16379136

Holton, A.D., Walsh, E.G., Brott, B.C., Venugopalan, R., Hershey, B., Ito, Y., Shih, A., Koomullil, R., Anayiotos, A., Evaluation of In-Stent Stenosis by Magnetic Resonance Phase-Velocity Mapping in Nickel-Titanium Stents, *J Magn Reson Imag* 22:248-257, 2005. PMID: 16028265

Walsh, E.G., Holton, A.D., Brott, B.C., Venugopalan, R., Anayiotos, A.S., Magnetic Resonance Phase Velocity Mapping Through NiTi Stents in a Flow Phantom Model, *J Magn Reson Imag* 21:59-65, 2005. PMID: 15611949

Zuo, J., Walsh, E.G., Twieg, D.B., Flow SS-PARSE: A New Method for Rapid Imaging and Mapping of Blood Flow Velocity, *Proc IEEE EMBS International Conference* 1:530-533, 2004. PMID: 17271730

Doyle, M., Fuisz, A., Kortright, E., Biederman, R.W., Walsh, E.G., Martin, E.T., Tauxe, L., Rogers, W.J., Merz, C.N., Pepine, C., Sharaf, B., Pohost, G.M., The Impact of Myocardial Flow Reserve on the Detection of Coronary Artery Disease by Perfusion Imaging Methods: an NHLBI WISE Study, *J Cardiovasc Magn Reson* 5(3):475-485, 2003. PMID: 12882078

Holton, A.D., Walsh, E.G., Venugopalan R., Pohost, G.M., Comparative MRI Compatibility of 316L Stainless Steel Alloy and Nickel-Titanium Alloy Stents, *Journal of Cardiovascular Magnetic Resonance* 4(4):423-430, 2002. PMID: 12549230

Walsh, E.G., Anayiotos, A., Pohost, G.M., Effect of Contrast Agent Viscosity on Peripheral Venous Bolus Injections in First-Pass Myocardial Perfusion Studies, *Technology in Health Care* 10(1):57-63, 2002. PMID: 11847448

*Butterworth, E.J.*, Walsh, E.G., Hugg, J.W., A TiO<sub>2</sub> Dielectric Filled Toroidal RF Cavity Resonator for High Field NMR, *NMR in Biomedicine* 14:184-191, 2001. PMID: 11357183

Kortright, E., Doyle, M., Anayiotos, A.S., Walsh, E.G., Fuisz, A.R., Pohost, G.M., Validation of Rapid Velocity Encoded Cine Imaging of a Dynamically Complex Flow Field Using Turbo Block Regional Interpolation for k-Space, *Annals of Biomedical Engineering*, 29:128-134, 2001. PMID: 11284667

Anayiotos, A.S., Kortright, E., Doyle, M., Walsh, E.G., Fuisz, A., Pohost, G.M., Hemodynamic Evaluation with TURBO-BRISK, a Rapid Phase Contrast Angiography Technique, *Technology and Health Care* 8, 327-342, 2000. PMID: 11258579

Walsh, E.G., Pohost, G.M., Recent Progress in RF Tagged Ventricular Function Imaging, *Journal of Cardiovascular Magnetic Resonance*. 1,2:185-193, 1999. PMID: 11550352

Doyle, M., Kortright, E., Anayiotos, A.S., Elmahdi, A.M., Walsh, E.G., Fuisz, A.R., Pohost, G.M., Rapid Velocity Encoded Cine Imaging with Turbo-BRISK, *J Cardio Magn Reson*, 1(3):223-232, 1999. PMID: 11550356

Reis, S.E., Holubkov, R., Lee, J.S., Sharaf, B., Rogers, W.J., Walsh, E.G., Fuisz, A.R., Deter, K.M., Sopko, G., Pepine, C.J., Coronary Flow Velocity Response to Adenosine Accurately Characterizes Coronary Microvascular Function in Women With Chest Pain and Normal Coronaries: Results from the Pilot Phase of the WISE Study, *J Am Col Cardiol*, 33(6):1469-1475, 1999. PMID: 10334410

Doyle, M., Walsh, E.G., Foster, R.E., Pohost, G.M., Common k-Space Acquisition: A Method to Improve Myocardial Grid Tag Contrast, *Magn Reson Med* 37:754-763, 1997. PMID: 9126950

Doyle, M., Walsh, E.G., Foster, R.E., Pohost, G.M., Rapid Cardiac Imaging with Turbo BRISK, *Magn Reson Med*, 37:410-417, 1997. PMID: 9055232

Walsh, E.G., Pohost, G.M., Myocardial Viability Assessment Using Magnetic Resonance, *Science and Medicine* 3(6):42-51, 1996.

Doyle, M., Walsh, E.G., Blackwell, G.G., Pohost, G.M., Block Regional Interpolation Scheme for k-Space (BRISK): A Rapid Cardiac Imaging Technique, *Magn Reson Med*, 33:163-170, 1995. PMID: 7707905

Walsh, E.G., Doyle, M., Lawson, M.A., Blackwell, G.G., Pohost, G.M., Multislice First-Pass Myocardial Perfusion Imaging on a Conventional Clinical Scanner, *Magn Reson Med*, 34:39-47, 1995. PMID: 7674896

Doyle, M., Chapman, B.L.W., Blackwell G.G., Walsh, E.G., Pohost, G.M. Adaptive Fourier Threshold Filtering, a Method to Reduce Noise and Incoherent Artifacts in High Resolution Cardiac Images. *Magn Reson Med* 31:546-550, 1994. PMID: 8015409

Walsh, E.G., Minematsu, K., Leppo, J., Moore, S.C., Radioactive Microsphere Validation of a Volume Localized Continuous Saturation Perfusion Measurement, *Magn Reson Med* 31:147-153, 1994. PMID: 8133750

*Donoghue, C., Brideau, M., Newcomer, P., Pangrle, B., DiBiasio, D., Walsh, E.G., Moore, S.C., Use of MRI to Analyze the Performance of Hollow Fiber Bioreactors. Annals New York Academy of Sciences, Biochemical Engineering VII 665-685, 1992.*

*Pangrle, B., Walsh, E.G., Moore, S.C., DiBiasio, D., Magnetic Resonance Imaging of Laminar Fluid Flow in Porous Tube and Shell Systems. Chem Engineering Science 47:517-526, 1992.*

*Pangrle, B., Walsh, E.G., Moore, S.C., DiBiasio, D., Investigation of Fluid Flow Patterns in a Hollow Fiber Module Using Magnetic Resonance Velocity Imaging. Biotechnology Techniques 3:67, 1989.*



Abstracts:

White, T.L., *Gonsalves, M.A.*, Cohen R.A., Harris, A.D., Monnig, M.A., Walsh E.G., Nitenson, A.Z., Porges, E.C., Lamb, D. G., Woods, A., Borja, C.B., Brain Metabolites Predict Major Dimensions of Emotional Wellness in Healthy Humans, Association for Psychological Science Annual Meeting (Virtual), 2021.

Tamaki, M., *Wang, Z.*, Barnes-Diana, T., Guo, D., Walsh, E.G., Watanabe, T., Sasaki, Y., Different but Complementary Roles of NREM and REM Sleep in Facilitation of Visual Perceptual Learning Associated with Neurotransmitter Changes Revealed by Magnetic Resonance Spectroscopy, 25<sup>th</sup> Congress of the European Sleep Research Society (Virtual), September 2020.

Tamaki, M., Barnes-Diana, T., Guo, D., Walsh, E.G., Watanabe, T., Sasaki, Y., Different but Complementary Roles of NREM and REM Sleep in Facilitation of Visual Perceptual Learning Associated with Neurotransmitter Changes Revealed by Magnetic Resonance Spectroscopy, VSS Tampa, FL, 2019.

*Beveridge, J.E.*, Machan, J.T., Walsh, E.G., Kiapour, A.M., Karamchedu, P., Chin, K.E., Proffen, B.L., Sieker, J.T., Costa, M., Murray, M.M., Flening, B.C., Structural Properties of Healing ACL Predicted from MR T<sub>2</sub>\*, Signal Intensity, and Ligament Volume, Orthopedic Research Society Annual Meeting, New Orleans, LA, March 2018, Program Number 2233.

Park, W.K.C., Maxwell, A.W.P., Walsh, E.G., Frank, V.E., Primmer M.P., Collins, S.A., Lu, S., Lombardo, K.A., Dupuy, D.E., A Novel Thermal Accelerant for Augmentation of Microwave Energy During Image-Guided Tumor Ablation, World Conference on Interventional Oncology, Boston, MA, June 2016.

*Biercevicz A.M.*, Walsh, E.G., Murray, M.M., Akelman, M., Fleming, B.C., T2\* Mapping of Ligaments: Can We Improve Computational Time With Relaxometry Post-processing? Orthopedic Research Society Annual Meeting, New Orleans, LA, March 2014, Program Number 1364.

*Zhou, W.*, Walsh, E.G., Laidlaw, D., DoubleAx: In vivo Axon Measurement in the Human Corpus Callosum Using Angular Double-PFG MRI, Organization for Human Brain Mapping Annual Meeting, Seattle, WA, June 2013, Program Number 2222.

Mills, D.R., Walsh, E.G., Brilliant, K.E., Hixson, D.C., Park, W.K.C., A Targeted Iron-Based MRI Contrast Agent for Tumor Detection. Experimental Biology 2013, Boston, MA. Abstract Number 4160, Program Number 1088.6.

Menon, R.G., Walsh, E.G., Twieg, D.B., Carroll, T.J., A Parse-MRI Based Technique to Measure Cerebral Oxygen Extraction Fraction (OEF). Proc. ISMRM Annual Meeting, Salt Lake City UT, April 2013, Program Number 2996.

Menon R.G., Cantrell, C.G., Walsh, E.G., Twieg, D.B., Carroll, T.J., Mild Hypercapnia Causes a Measurable Change in Cerebral Oxygen Extraction Fraction (OEF). Proc ISMRM Annual Meeting, Salt Lake City, UT, April 2013, Program Number 2997.

*Biercevicz, A.M.*, Walsh, E.G., Murray, M.M., et al., Noninvasive Prediction of Healing Ligament Structural Properties with T2\* and Volume. Trans Orthop Res Soc 38:28, 2013.

Walsh, E.G., Twieg, D.B., Worden M.S., Reeves S., First Detection of the BOLD Effect in Humans Using SS-PARSE, International Society for Magnetic Resonance in Medicine 2009 Conference, Honolulu HI, Program Number 3669.

White, T.L., Walsh, E.G., Worden, M.S., Orbitofrontal Cortex Responses During Performance of the Balloon Analogue Risk Task (BART): Efficacy of 3-Dimensional Volume Localized Linear Shim, Society for Neuroscience Annual Meeting, Chicago, IL, 2009.

Walsh, E.G., Boxerman, J., Xie, J., Nu. C., *Kohler, N.*, Sun, S., MRI Observations of Static Dephasing with Cellular Uptake of PEG-Coated Iron Oxide Nanoparticles. Joint Molecular Imaging 2007 Conference, Providence, RI, September 2007, Program Number 345.

Xu, C., *Kohler, N.*, Wang, C., Walsh, E.G., *Chin, E.Y.*, Sun, S., Dumbbell Nanoparticles as a Dual Imaging Agent. Joint Molecular Imaging 2007 Conference, Providence, RI, September 2007, Program Number 317.

*Kohler N.*, Xu, C., Xie, J., Ho, D., Walsh, E.G., Kalluri, R., Sun, S., Tumstatin Conjugated Iron-Oxide Nanoparticles for MRI Contrast Enhancement and Anti-Angiogenic Drug Therapy, Joint Molecular Imaging 2007 Conference, Providence, RI, Sept. 2007, Program Number 853.

*Xie, J.*, Xu, C., *Kohler, N.*, Hou Y., Walsh, E.G., Sun, S., Controlled PEGylation of Monodisperse Fe<sub>3</sub>O<sub>4</sub> Nanoparticles for Reduced Non-Specific Uptake by Macrophage Cells, Joint Molecular Imaging 2007 Conference, Providence, RI, Sept. 2007, Program Number 323.

Menon R.G., Ward M.K., Bolding M.A., Deshpande H., Gamlin P.D., Walsh E.G., Twieg D.B., Cerebral Blood Flow Calculations in Awake, Behaving Non-Human Primates using CASL MRI. Presented to Annual Scientific Meeting of the Biomedical Engineering Society, Los Angeles, CA Sept. 2007.

Walsh, E.G., Brott, B., Venugopalan, R., Anayiotos, A.S., In-Stent Restenosis Measurements by MRI, 5<sup>th</sup> World Congress on Biomechanics, Munich, Germany, August 2006, Program Number 6012.

Walsh, E.G., Ress, D.B., Adaptive Kernel Reconstruction of Variable-Density Trajectories, International Society for Magnetic Resonance in Medicine, Seattle, WA, May 2006, Program Number 2962.

Ward, M.K., Bolding, M., Twieg, D., Busettini, C., Gawne, T.J., Walsh, E.G., Dobbins, A.C., Weller, R.E., Gamlin, P.D., fMRI Studies in Alert, Behaving Primates at 4.7T, International Society for Magnetic Resonance in Medicine, Miami, FL, May 2005, 1395.

Walsh, E.G., *Holton, A.D.*, Venugopalan, R., Quantitative Spatial Determination of Flip Angles for Assessment of Radiofrequency Distribution and Attenuation Associated with NiTi Stents in Magnetic Resonance Imaging, Proc. American Society for Metals 2004 Medical Devices and Processes Conference.

*Bolding, M.*, Ward, M.K., Twieg, D., Mays, L.E., Weller, R.E., Walsh, E.G., Gawne, T.J., Dobbins, A.C., Busettini, C., Gamlin, P.D., Functional Magnetic Resonance Imaging Studies in Alert, Behaving Primates at 4.7T. Proc. Society for Neurosciences Annual Conference Program No. 693.8, 2004.

Walsh, E.G., Newcomer, B.R., *Landers, K.*, Davis, N., Pohost, G.M., Functional Skeletal Muscle Imaging Using RF Tagging and Isometric Exercise, 2000 ISMRM Book of Abstracts p.2100.

*Butterworth, E.J.*, Walsh, E.G., Hugg, J.W., A TiO<sub>2</sub> Dielectric-Filled Toroidal Resonator, Proc. Intl. Soc. Mag. Reson. Med. 7:169, 1999.

*Butterworth, E.J.*, Walsh, E.G., Hugg, J.W., A Conformal Map for Computing Toroidal Coil Fields, 1998 ISMRM Workshop on Computational Electromagnetics Book of Abstracts.

Walsh, E.G., Doyle, M., Foster, R., *Kortright, M.E.*, Pohost, G.M., Correlation of NMR Derived Arterial Pulse Wave Velocity with Doppler Echo and Arterial Compliance Imaging, Annual Meeting Inter. Soc. Magn. Reson. Med., 1997 Book of Abstracts p.118.

Walsh, E.G., Doyle, M., Foster, R., *Kortright, M.E.*, Pohost, G.M., Optimized Flip Angles for Segmented k-Space First Pass Myocardial Perfusion Imaging with Saturation Recovery, Annual Meeting Inter. Soc. Magn. Reson. Med., 1997 Book of Abstracts p.1781.

Doyle, M., Walsh, E.G., Foster, R.E., Pohost, G.M., Rapid High Resolution Multiple Slice Imaging with BRISK, 4<sup>th</sup> Ann. Mtg. Inter. Soc. Magn. Reson. Med., New York, p.1499, 1996.

Walsh, E.G., Doyle, M., Lawson, M.A., Pohost, G.M., Multislice Myocardial Perfusion Imaging Using BRISK, 4<sup>th</sup> Ann. Meeting Inter. Soc. Magn. Reson. Med., New York, p.683, 1996.

Lawson, M.A., Walsh, E.G., Doyle, M., Blackwell, G.G., Singleton, H.R., Pohost, G.M., Contrast Wash-in of Normal Myocardium Under Resting Conditions, 4<sup>th</sup> Ann. Meeting Inter. Soc. Magn. Reson. Med., New York, p.679, 1996.

Lawson, M., Walsh, E.G., Doyle, M., Singleton H.R., Roney, M., Blackwell, G.G., Pohost, G.M., Contrast Wash-in During MRI Myocardial Perfusion Imaging in Patients with Internal Mammary Grafts, 3<sup>rd</sup> Ann. Meeting Society for Magnetic Resonance, Nice, France, 1995.

Doyle, M., Walsh, E.G., Blackwell, G.G., Pohost, G.M., Rapid High Resolution Cardiac Imaging with BRISK, 3<sup>rd</sup> Ann. Meeting Society for Magnetic Resonance, Nice, France, 1995.

Walsh, E.G., Lawson, M., Doyle, M., Pohost, G.M., Multislice Magnetic Resonance Imaging of Myocardial Perfusion Using Gd-HP-DO3A on a Conventional Clinical Scanner: A Comparison Study with Radionuclide Perfusion Imaging in a General Patient Population, Am. Col. Cardiol., 44<sup>th</sup> Sci. Sessions, No. 929-61, New Orleans, LA 1995.

Lawson, M., Singleton H.R., Walsh, E.G., Doyle, M., Roney, M., Blackwell, G.G., Pohost, G.M., Contrast Wash-in During MRI Myocardial Perfusion Imaging in Patients with Q-Wave Myocardial Infarction, Am. Col. Cardiol., 44<sup>th</sup> Sci. Sessions, No. 929-61, New Orleans, LA 1995.

Lawson, M., Walsh, E.G., Doyle, M., Blackwell, G.G., Johnson, L., Pohost, G.M., Multislice MRI in the Assessment of Myocardial Perfusion: A Comparison with Radionuclide Methods, 67<sup>th</sup> Scientific Sessions of the American Heart Association, Dallas TX, No. 3392, 1994.

Doyle, M., Walsh, E.G., Blackwell, G.G., Pohost, G.M., Multiple Contiguous Slice Coronary Artery Imaging Without Breath Holding, Amer. Soc. For Artificial Organs Cardiovascular Science and Technology Conf. Washington D.C., 1994.

Lawson, M., Walsh, E.G., Doyle, M., Roney, M., Blackwell, G.G., Pohost, G.M., Myocardial Perfusion Imaging Using Contrast Enhanced MRI Versus Radionuclides. SMR 2nd Meeting Book of Abstracts, 1994.

Doyle, M., Walsh, E.G., Blackwell, G.G., Pohost, G.M., EPI Method to Obtain 16 Cardiac Images of 128<sup>2</sup> Resolution in a Single Heartbeat. SMR 2nd Meeting Book of Abstracts, 1994.

Doyle, M., Walsh, E.G., Hetherington, H.P., Pohost, G.M., Reduced k-Space Acquisition of Spectroscopic Images. SMR 1st Meeting Book of Abstracts, No.133, 1994.

Walsh, E.G., Doyle, M., Blackwell, G.G., Pohost, G.M., Rapid Multi-Phase Imaging by Progressive Fourier Interpolation. SMR 1st Annual Meeting Book of Abstracts, No.144, 1994.

Doyle, M., Walsh, E.G., Blackwell, G.G., Pohost, G.M., Automatic Cardiac Wall Motion Analysis from MRI Images. SMRM 12th Annual Meeting Book of Abstracts, p.723, 1993.

Walsh, E.G., Doyle, M., Hetherington, H.P., Pohost, G.M., Rapid Imaging Methods for First Pass Tracer Studies. SMRM 12th Annual Meeting Book of Abstracts, p.390, 1993.

Doyle, M., Walsh, E.G., Blackwell, G.G., Pohost, G.M., Magnetic Resonance Cardiac Imaging: Acquisition Time Reduction. American Federation for Clinical Research Annual Meeting Book of Abstracts p.288A, 1993.

Walsh, E.G., Moore, S.C., *Meadows, M.*, Minematsu, K., Davis, M.A., Blood Flow Measurements Using Large (10-20 $\mu$ ) Paramagnetic Particles. SMRI 10th Annual Meeting Book of Abstracts P-350, 1992.

Walsh, E.G., Moore, S.C., Minematsu, K., Li, L., Localized Continuous Saturation Perfusion Measurements in Rats at 2.0T. SMRI 10th Annual Meeting Book of Abstracts P-328, 1992.

DiBiasio, D., Pangrle, B., Walsh, E.G., Moore, S.C., Donoghue, C., Brideau, M., Newcomer, P., Use of MRI to Analyze the Performance of Hollow Fiber Bioreactors. 7th Biochemical Engineering Conf, Santa Barbara, CA 1991.

Sotak, C.H., Moore S.C., Walsh, E.G., Rapid 19-F Imaging Without the Use of Driven Equilibrium Techniques. Book of Abstracts 1990 ENC Annual Conference.

Sotak, C.H., Hees, P., Walsh, E.G., Huang, H., Hung, C., Krespan, C., Reynolds, S., A New Perfluorocarbon for Use in a Standard Clinical Imaging Instrument. SMRI 8th Annual Conference, Washington DC, Book of Abstracts, Works in Progress, p.6, 1990.

Sotak, C.H., Walsh, E.G., Hees, P., Monitoring the Effect of Nicotinamide on Tumor Perfusion using the D<sub>2</sub>O Washout Technique. SMRI 8th Annual Conference, Washington DC, Book of Abstracts, Works in Progress, p.14, 1990.

Pangrle, B., Walsh, E.G., Moore, S.C., DiBiasio, D., Magnetic Resonance Imaging of Fluid Flow in Hollow Fiber Membranes. Proc. Engr. Foundation Separations Meeting, Davos, Switzerland, 1989.

Pangrle, B., DiBiasio, D., Walsh, E.G., Moore, S.C., Magnetic Resonance Imaging of Membrane Modules. Proc. Membrane Technology and Planning Conference, Boston, MA, 1989.

Pangrle, B., Walsh, E.G., Moore, S.C., DiBiasio, D., Using Magnetic Resonance Imaging to Characterize Fluid Flow. Book of Abstracts Amer. Phys. Soc. Meeting, Palo Alto, CA, 1989.

Pangrle, B., DiBiasio, D., Walsh, E.G., Moore, S.C., Magnetic Resonance Imaging of Laminar Fluid Flow in Inorganic Membrane Modules. Book of Abstracts AIChE Meeting, San Francisco, CA, 1989.

DiBiasio, D., Pangrle, B., Walsh, E.G., Moore, S.C., Magnetic Resonance Imaging: A Novel Technique for Fluid Flow Determinations in Ceramic Bioreactors. Proc. 1st Intl. Conf. Inorganic Membranes, Montpellier, France, 1989.

Walsh, E.G., Peura, R.A., Time Differentiation of Endocardial Signals by Five-Point Parabolic Interpolation. Proc. 13th IEEE N.E. Bioengineering Conference 2:438, 1987.

### Invited Lectures:

Incorporation of Prior Fourier Domain Edge Information in the  $L_1$  Minimization Problem as Applied to Compressed Sensing. Mathematical Biosciences Institute Annual Meeting, Ohio State University, February 2013.

Rapid Quantitative MR Imaging Using a PARSE Technique, Physics Graduate Seminar Series, University of Rhode Island, Kingston RI, February 2010.

Quantitative MR Imaging Using Parameter Assessment by Retrieval from Signal Encoding (PARSE), Southwest Conference on Integrated Mathematical Methods in Medical Imaging, Arizona State University, Tempe AZ, February 2010.

Rapid Parametric Magnetic Resonance Imaging, Mathematics Department Graduate Seminar Series, Arizona State University, Tempe AZ, February 2009.

Radiofrequency Artifacts Associated with Cardiovascular Implant Devices in MR Imaging, American Society for Metals, Medical Devices Conference, St. Paul Minnesota, August 2004.

High Field Cardiac NMR, presented at the 1<sup>st</sup> Annual Meeting of the Society for Cardiovascular Magnetic Resonance, 1998.

Cerebral Perfusion Measurement by Continuous Saturation. American Association of Physicists in Medicine, New England Chapter Annual Young Investigators Symposium, Boston, Massachusetts, April 1992.

### Work in Progress:

Rmus, M., He, M., Baribault, B., Walsh, E.G., Festa, E.K., Collins, A.G.E., Nassar, M.R., Age-Related Decline in Prefrontal Glutamate Predicts Failure to Efficiently Deploy Working Memory in the Service of Learning. Provisional acceptance, in revision, eLife.

U.S. Patents, Patents Pending:

Maxwell, A.W.P., Walsh, E.G., Endovascular Coil Device for Embolization of Blood Vessels, Provisional Patent Application No. 63/161,750 filed 16 March 2021.

Dupuy, D.E., Park, W.K.C, Walsh, E.G., Heat Substrate and/or Image Enhanced Compositions and Enhanced Tissue Ablation Methods. U.S. Patent 10,722,289 issued 28 July 2020.

Hesthaven, J.S., Walsh, E.G., Image Reconstruction From Incomplete Fourier Measurements and Prior Edge Information. U.S. Patent 8,942,456 issued 27 January 2015.

Walsh, E.G., Venugopalan, R., Resonant Inductively Coupled NiTi Stent with Ablation Capability and MRI Imaging Compatibility. U.S. Patent 6,802,857 issued 12 October 2004.

Vaughn, M., Walsh, E.G, den Hollander, J.A., Large Volume Resonator for High Field MRI, U.S. Patent 6,590,393 issued 8 July 2003.

Walsh, E.G., Functional Skeletal Muscle Imaging, U.S. Patent 6,546,278 issued 8 April 2003.

Johnson, V.Y., Walsh, E.G., Newcomer, B.R., Umlauf, M.G., Vaginal MRI Imaging Probe with Force Transduction Capability. U.S. Patent 6,526,306 issued 25 February 2003.

## 5. RESEARCH GRANT ACTIVITY

### Current:

Ocean State Research Institute: Phenotyping Heart Failure with Preserved Ejection Fraction Using Non-Invasive Biomarkers, PI Brown subcontract, 5% effort.

Ocean State Research Institute: Low Intensity Focused Ultrasound: A New Paradigm for Depression and Anxiety, PI Brown subcontract, 10% effort.

NIH, Center for Nervous System Function, Core B Investigator, 10% effort.

Veterans Administration, Rhode Island VA Medical Center, Center for Neurotechnology and Neurorestoration, 10% effort

NIH, Low Intensity Focused Ultrasound: A New Paradigm for Depression, Anxiety, and PTSD, 8% effort.

### Completed:

NSF/SBIR, HeatSYNC Gel, A Novel Thermal Accelerant for Enhancing Microwave Ablation Performance: Investigation of Dielectric Properties and Diffusion Rate, PI Brown Subcontract, 5% effort.

NIH, Non-invasive Assessment of Ligament Healing in Vivo, Principal Investigator on Brown subcontract, total award \$44000.

Brown University DEANS Award: Neuroprotective Effects of Novel Anti-HMBG-1 Antibody on Neonatal Brain Ischemia, Principal Investigator, total award \$80000.

Industry, Cordis/Johnson&Johnson: Magnetic Resonance Compatibility of Hydrocephaly Shunt Devices: Principal Investigator, total award \$50,000.

Brown University DEANS Award: Neuroprotective Effects of Novel Anti-HMBG-1 Antibody on Neonatal Brain Ischemia, Principal Investigator, total award \$80000.

DoD ONR N66604-08-1-1616: Magnetic Resonance Imaging of Water Infiltration into Nanoparticle-Filled Polymers. Start 3/08, end 9/08, Principal Investigator, total award \$15,614.

Industry: Johnson & Johnson: Center for MRI Implant Device Characterization, 6/03-5/05, total award \$50,000, Co-PI for quantitative assessment of image artifacts produced by NiTi stent prototypes.



NIH NINR R15-NR08210-01, Assessment of Pelvic Muscle Function in Women (PI V Johnson, Ph.D.) 3/03-2/05 total award \$100,000, co-investigator for implementation of MR hardware, functional muscle imaging techniques and image processing.

NIH NCRR P41-RR11811, Core Project III PI, Clinical NMR Studies at 4.1T (PI H. Hetherington) – Imaging of Physiologic Function 3/97-2/02 total award on core \$310,000.

UAB Center for Nuclear Imaging Research Pilot Award – Functional Skeletal Muscle Imaging in Orthopedic Applications 11/00-10/01 \$5,000.

NIH 1R01-DA020725-01: Amphetamine Effects on Brain fMRI and Behavior: Genetic and Personality Differences (T. White, PI) start 8/07 end 5/11, Co-investigator for physics support relating to imaging in high susceptibility gradient regions such as orbitofrontal cortex, 8.5% effort, total award \$1,440,303.

## 6. SERVICE

### University Service:

Assistant Director and Co-Founder, Brown University Graduate Program in Medical Physics, also member of the Steering Committee, Curriculum Committee, and Admissions Committee.

Brown University Magnetic Resonance Facility Scientific Advisory Committee.

Seed grant reviewer for the 2022 award round.

ABET Accreditation and Curriculum Committee (UAB Biomedical Engineering Undergraduate Program).

### Professional Service:

#### Editorial Boards:

June 2004 – September 2012

Editorial Board  
Current Cardiology Reviews

August 2003 – October 2007

Editorial Board  
Journal of Cardiovascular Magnetic Resonance

January 1998 – August 2003

Assistant Editor  
Journal of Cardiovascular Magnetic Resonance

### Professional Societies:

IEEE Engineering in Medicine and Biology Society, IEEE/Engineering in Medicine and Biology Society, Providence, RI Chapter, Executive Board 2006 - 2008

International Society of Magnetic Resonance in Medicine

### Journal Reviewer:

Molecular Imaging and Biology  
IEEE Transactions on Medical Imaging  
Journal of Biomaterials Science (Polymer Edition)  
Carbon  
PLOS  
Journal of Nanoscience and Nanotechnology  
Nanoscale

Grant Review Activity:

NIH, Biomedical Imaging Technology Study Section, September 2007, October 2008, July 2009.

Brown University OVPR Seed Grant program: Fall 2022.

Rhode Island INBRE Early Career Development Grants, January 2023.

7. ACADEMIC HONOR SOCIETY

Alpha Eta Mu Beta- National Biomedical Engineering Honor Society, 1990.

8. TEACHING

Brown University:

MED2260 Physics of Medical Imaging, taught with Dr. Michael Oumano, Spring 2022 and 2023.

PHYS/ENGN1931S Medical Physics, taught with Dr. Eric Klein, Spring 2020, 2021, will offer for Fall 2023.

Undergraduate Research/Senior Honors Thesis advisor: Katherine Barry, Neuroscience concentration. Methods in image segmentation and brain tissue classification. Completed May 2019.

Thesis committee: Elise Chonka-Croteau, M.S. in Biomedical Engineering, completed September 2016.

Brown University Summer Research Program, Senior Honors Thesis – Undergraduate Teaching and Research Award, co-advisor with Tara White for Chelsea Boyd. Project Title: A Pilot Study of Metabolic Chemistry in the Anterior Cingulate: Magnetic Resonance Spectroscopy in Healthy Volunteers. Summer 2013.

University of Rhode Island

Advanced Clinical Medical Imaging (PHY 585) – Spring Semester 2016, 2019, 2021.

University of Alabama/Birmingham:

Principles of Medical Imaging (BME 542) – Spring semester 2003, 2004, 2005.

Bioimaging (BME340) – Spring semester 2005.

Introduction to Medical Imaging (BME 443) - Fall Semester 2003, 2004.

Medical Image Processing (BME 543) – Fall semester 2003, 2004.

Graduate Student Thesis Committees:

Brown University:

Donovan Davino (Ph.D), Department of Physics: Title to be determined, project involves investigation of possible quantum information processing in the brain.

Li Yuan (M.S.), Medical Physics Graduate Program: Characterizing the Automatic Tube Potential Selection Feature for a CT Simulator with the Mercury 4.0 Phantom, completed February 2023.

Sean Flannery (Ph.D.), Department of Biomedical Engineering: An End-to-End Pipeline for Quantitative MRI Analysis of Ligament/Graft Healing.

Thesis committee: Elise Chonka-Croteau, M.S. in Biomedical Engineering, completed September 2016.

Kenny Chowdhary (Ph.D.), Division of Applied Mathematics: Aleatoric and Epistemic Uncertainty Quantification, Sparse Gradient Image Recovery from Fourier and Edge Data. May 2012.

University of Alabama/Birmingham:

Jin Zuo (Ph.D.), Research Project: Direct Parametric Imaging of Blood and Tissue Velocity, Ph.D. completed December 2005.

Andrea Holton (M.S./Ph.D.), Research Project: MRI Compatibility of NiTi Stents. Expected Graduated June 2002. Paper accepted: Holton A., Walsh, E.G., Venugopalan, R., MRI Compatibility of 316-L and NiTi Stents, Journal of Cardiovascular Magnetic Resonance 4(4):423-430, 2002. Ph.D. completed June 2004.

Adam Greenburg (M.S.), Research Project: Projection Onto Convex Sets – A Method to Improve Tag Line Contrast in Rapid Functional Skeletal Muscle Imaging. Graduated May 2001.

James Burrow (M.S.), Research Project: Partial Fourier Imaging: A Combined Technique Using Partial K-Space Reconstruction and UNFOLD. Graduated August 2000.

Arizona State University School of Mathematical and Statistical Sciences:

Aaron Jesse (Ph.D.), Research Project: Magnetic Resonance Parameter Assessment from a Second Order Time-Dependent Linear Model. Graduated August 2019.