LEIGH R. ABTS, Ph.D.
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BIOGRAPHICAL:

Date of Birth: July 23, 1951
City of Birth: Elgin, Illinois
Citizenship: USA

EDUCATION:

Sc.B.	Biology in Engineering, 1973, Brown University, Providence, RI.
Ph.D.	Engineering (Bio-medical), 1982, Brown University, Providence, RI.

Thesis Topic: "The Ultrasonic Detection of Microparticles, Microbubbles, and Microemboli in Flowing Liquids"

Thesis Advisors: Robert T. Beyer, Ph.D., Professor of Physics.

Pierre M. Galletti, M.D., Ph.D. Professor and Vice President of Medicine.

Karl E. Karlson, M.D., Ph.D., Professor of Surgery, Chief of CVT Surgery.

Peter D. Richardson, Professor of Engineering and Physiology.

ACADEMIC POSITIONS:

2007 – Present	**University of Maryland, College Park, MD**
2010 – Present	Research Associate Professor, A. James Clark School of Engineering, Department of Bioengineering Research Associate Professor, College of Education, Department of Counseling and Personnel Services, Higher Education and Special Education
2007 - 2010	Research Associate Professor College of Education Affiliate Research Professor, A. James Clark School of Engineering
2000 – 2007	**Johns Hopkins University (JHU), Baltimore, MD**
2003 – 2007	Principal Research Scientist, Appointment in Computer Science
2003 – 2007	Principal Research Scientist, Advance Technology Laboratory Principal Research Scientist and Deputy Director, Center for Educational Outreach
2003 – 2007	Principal Research Scientist and Thrust Leader for NSF Engineering Research Center (ERC) for Computer Integrated Surgery (CISST)
2003	Associate Director for Education & Outreach Programs for CISST
2000 – 2003	Executive Director for CISST ERC joint between JHU, MIT and CMU.
1988 – 1987	**Johns Hopkins University, Whiting School of Engineering** **Baltimore, MD**

1988	Special Assistant to the Dean for Industrial Relations
1987 – 1988	Director of Technology Transfer, Center for Nondestructive Evaluation

INDUSTRY POSITIONS:

2013	**CredentialED LLC, Phoenix, MD**
	President
1992 – 2003	**Future Health® Corporation, Inc., Timonium, MD**
	(Acquired by Nationwide Insurance, 2006)
1992 – 2003	Board of Directors
1995 – 2003	Vice President of Corporate Development
1992 – 1995	Chairman of the Board
1988 – 1991	**Triad Investors Corporation, Baltimore, MD**
	The Venture Capital Company joint between the Johns Hopkins University and Health System (Merged with Zero Stage Capital, 1991)
1991	Executive Vice President and COO
1988 – 1991	President and CEO
1984 – 1987	**Rexnord Corporation, Milwaukee, WS**
1984 – 1987	Director of Acoustical Research
1981 – 1985	**Micro Pure Systems, Inc., Warwick, RI**
	(Acquired by Rexnord Corporation, 1984)
1981 – 1985	Vice Chairman
1978 – 1981	President and CEO
1973 – 1978	**Rhode Island Hospital, Providence, RI**
	Biomedical Engineer

CONSULTING:

2000	CommerceOne, Boston, MA.
2000	Tekadence, Hollywood, CA.
1992 – 2000	Center For Nondestructive Evaluation (CNDE)
	The Johns Hopkins University (JHU), Baltimore, MD.
1998 – 2000	SnowMark Corporation (MedeWorks), Boca Raton, FL.
1987 – 1999	Drexelbrook Engineering, Horsham, PA.
1997 – 2000	Nalari, LLC, Providence, RI.
1997 – 1999	SOR Lenexa, KS.
1995	Patriot Sensors & Controls, Clawson, MI.
1994 – 1996	FMD Electronics, Roscoe, IL.
1992 – 1993	Displaytech, Inc., Boulder, CO.

OTHER PROFESSIONAL ACTIVITIES:

2013 – 2014	National Science Foundation Committee of Visitors, Engineering Education and Center Programs, and Engineering Career Development Sub-team Chair.
2012 – 2013	Montgomery County Task Force for Wheaton High School's transition to a problem-based learning environment.
2004 – Present	Advisory Steering Committee, Congressional Caucus for Science, Technology, Engineering and Mathematics (STEM) Education: Co- chaired by Congressman Lipinski (D- Ill) and Congressman Bartlett (R- MD)

2007 – 2104	Education, Outreach and Diversity Training Advisory Board, NSF Quality of Life Center (QoLT)
2006 – 2012	Women in Engineering Programs & Advocates Network (WEPAN) Communications Committee
2002 – Present	Strategies for Engineering Education in K-16 (SEEK-16) Co-chair to create a forum to change STEM Education working with the key Constituents such as the National Academes, American Association for the Advancement of Science, Engineering Schools, and Employers. Co-Chaired Workshops: National Academy of Engineering, February 21 – 22, 2004; National Academy of Engineering, March 19, 2006; University of Maryland, April 18, 2006.
2007 – 2009	Education, Outreach and Training Advisory Board, NSF Center for Compact and Efficient Fluid Power (CCEFP)
2009	Organizer of the Blind Youth Slam with the National Federation of the Blind at the University of Maryland, College Park
2006 – 2009	Board of Advisors Inventive Education, Inc. National Inventors Hall of Fame
2007	Organizer of the Blind Youth Slam with the National Federation of the Blind at Johns Hopkins University
2006 – 2007	The JHU Leadership Development Program
2006 – 2007	Visiting Scholar to Homeland Security's Education and University Programs
2005 – 2008	Network for Earthquake Engineering Simulation, Inc. (NEES) Education, Outreach and Training Committee
2004 – 2009	Board of Advisors National Federation of the Blind Jernigan Institute National Center for Blind Youth in Science Advisory Work Group

COURSES

BioE 110, *Designing Quantitative Solutions for Energy*, from January 27th to May 12, 2014.

BioE 289A, *Designing a Sustainable World*, University of Maryland I – series course, January 27 to May 12, 2014.

BioE 289A, *Designing a Sustainable World*, University of Maryland I – series course, January 24 to May 9, 2013.

BioE 100, *Introductory Mathematics for Engineering Applications,* 2010 – Present.

SEMINARS

MIT, *Design, Diversity and Digital Learning: Reframing 21st Century Education*, May 14th, 2015.

UMD Mechanical Engineering Seminar, *Education and Outreach – Building a Foundation*, January 1, 2013.

Doctor of Education Policy and Leadership, Seminar Series, *A Soft Systems Approach to Complex Educational Enterprise Problems – Educational Engineering, Case study for a Messy Problem: Transferability of Credit – AP® Engineering Design*, October 5, 2012.

WEB SITE (Based on my design research)

http://www.mydesigncompany.org

RESEARCH SUPPORT

Awarded:

Exploring Advanced Placement in Engineering: A Workshop Designing a Universal, Transferable Credit for Design (NSF Workshop $287,842 10/1/15 – 9/30/17 – PI: Leigh Abts). Note Co-PIs from Morgan State University (Dr. Craig Scott – Chair of Electrical and Computer Engineering; and Dr. Kemi Ladeji-Osias Assistant Professor of Electrical and Computer Engineering, School of Engineering).

The Professional Development and Instruction of Design Comparing both Distance Learning and Face-to-Face Delivery Methods (NSF EAGER $299,384 10/1/15 – 9/30/17 – PI: Leigh Abts). Note Co-PIs from Morgan State University (Dr. Craig Scott – Chair of Electrical and Computer Engineering; and Dr. Kemi Ladeji-Osias Assistant Professor of Electrical and Computer Engineering, School of Engineering).

Internet, Cloud and Private Network based Apps and System for Problem-Solving Learning Environments and Design (PSELD) Thinking Activities and Projects Leading to Academic and Workforce Recognition (University of Maryland Commercialization SEED Grant, IS-2014-156, $15,000 8/17/15 – 5/15/16 PI: Leigh Abts)

NSF I-Corp L, Design Thinking Mobile Apps for Instructors and Students ($50,000 9/12/14 – 05/31/15 – PI: Leigh Abts).

The CECS Student Success Scholarship Program, Lead University, Wright State University (NSF $57,0140 – 01/01/2014 to 12/31/18 – Evaluator: Leigh Abts).

A curriculum, instruction and workforce development model for Veterans to earn credit and pre-requisite skill certificates through an online, blended engineering mathematics course grounded in real world energy applications and the design process submitted by invitation only to the Department of Defense *Generation Learner* Advanced Distributive Learning (ADL) Broad Agency Announcement (BAA) 12-001-002 (DoD ADL $373,000 – 09/01/13 – 10/01/14 – PI: Leigh Abts).

The Development Diagnostic Assessment Strategies for *e*-portfolios based on the alignment of the Design Process Rubric to 21st Century Knowledge, Skills and Abilities (KSAs) submitted by invitation only to the National Science Foundations INSPIRE Track 1 Solicitation (NSF - $800,000 09/01/13 – 08/30/17 – PI: Leigh Abts).

Thinking Like an Engineer to Address Complex Problems Within the Education Enterprise (NSF – $49,967.00 – 03/01/13 – 02/28/15 – Co-PI: Leigh Abts)

National Model for an Energy 101 Course partnered with Association of Public Land Grant Universities (Association of Public Land Grant Universities – $70,195 – 05/11/12 – 05/10/13 Co-PI: Leigh Abts)

University of Virginia and University of Maryland EDDPSR Regional Workshop, ACC and ASEE Council of Dean's meetings 2011 – 2013 (Kern Family Foundation – $200,000 11/15/11 to 6/30/2013 – Co-PI: Leigh Abts)

Engineering Design Process Portfolio Scoring Rubric (EDPPSR) (NSF PRIME - $799,886, 10/01/11 to 9/30/16 – PI: Leigh Abts)

Engineering Design Process Portfolio Scoring Rubric (Kern Family Foundation - $73,000 from 01/12/11 to 09/30/11 – PI: Leigh Abts)

RET Site in Engineering: Connecting with Community Colleges (NSF - $299,727 from 01/01/11 to 12/31/13 – Co-PI: Leigh Abts)

RET Site in Engineering: Research Involving Design, Innovation and Invention Experiences for Teachers (NSF – $511,190 from 10/01/2007 to 09/30/2013 – PI: Dr. Abts, Co-PI: Dr. William Bentley; Co-PI: Dr. Sheryl Ehrman)

A National Model for Mathematics Engineering Education (NSF CCLI Phase III awarded to Wright State University – $67,000 from 08/01/2008 to 07/31/2014 – External Evaluator: Dr. Abts)

A Dynamic Tactile Interface of Visually Impaired and Blind People (NSF award to City College of New York – $329,170 from10/01/07 to 09/30/10 – Co-PI: Dr. Abts)

Tennessee Math Science Partnership – Pre-Engineering (Tennessee Department of Education awarded to Tennessee Technology University – $30,180 from 09/01/2008 to 12/31/2011 – External Evaluator: Dr. Abts)

Early College Program (Woodrow Wilson from funds provided by the Bill and Melinda Gates Foundation - $400,000 from 07/01/08 to 07/01/2011 – PI: Dr. Abts)

Engaging Engineers in Scholarship (EES) Fellows: A Scholarship Program for Engineering Freshmen and Transfer Students (NSF – $7,900 from 8/01/2009 to 7/31/14 – External Evaluator: Dr. Abts)

Department of Defense National Defense Education Programs (DoD - $100,000 from 10/01/10 to 09/30/11 – PI: Dr. Abts)

Department of Defense National Defense Education Programs (DoD - $100,000 from 07/01/09 to 09/30/10 – PI: Dr. Abts)

Department of Defense National Defense Education Programs (DoD - $100,000 from 01/30/09 to 06/30/09 – PI: Dr. Abts)

Digital Portfolio Rubrics –Design Process (Kern Family Foundation – $60,000 from 10/01/09 to 06/30/10 – PI: Dr. Abts)

The Successful Engineering Education and Development Support Program (NSF – $67,000 from 4/1/2010 to 6/30/13 – External Evaluator: Dr. Abts)

Creation of the modular concept to teach research (NSF Supplement to CISST ERC Core Grant - $538,000 from 09/01/01 to 11/30/02 – The award was made through the Core ERC Grant to Dr. Abts)

Formation of a new educational outreach center (NSF – $100,000 from 10/1/02 to 9/30/04 – PI: Dr. Abts)

Expansion of the Research Experience for Teacher programs across the United States (NSF 9731748 - $246,287 – PI: Dr. Abts; NSF 0327667 – $226,151 – PI: Dr. Abts; and NSF 0353188 – $82, 612 – Co-PI: Dr. Abts)

Team RET for teachers (NSF – $699,975 from 01/01/03 to 12/31/07 – PI: Dr. Abts)

Future Inventors, Researchers, Scientists and Teachers: An Urban Program of Johns Hopkins University and the National Inventors Hall of Fame (NSF – $195,187 from 10/01/04 to 9/31/07 – PI: Dr. Abts)

Broader Impact from Graduate Students Transferring Engineering Principles to K – 12 Education (NSF - $1,332,034.00 – first two years of $1,800,000 award from 5/01/05 to 4/30/08; Supplement for AP Engineering 2006 summer pilot – $50,000; Supplement for International Sensor Project - $64,703.00 – PI: Dr. Abts)

Native American RET and REU (NSF – $225,000 – from 01/01/03 to 12/31/07 – PI: Dr. Abts)

Center for American Indian Research Opportunity in Computing (NSF – $500,001 – from 02/23/06 to 02/23/09 – Co-PI: Dr. Abts)

SEEK – 16 (Strategies for Engineering Education K – 16) SUMMIT at the National Academy of Engineering (SEEK 16 – NSF CISST ERC Core Grant - $25,000; NSF TEAMRET - $10,000; PI: Dr. Abts)

Research Experiences for Undergraduates (NSF CISST ERC Core Grant – for 2002 - $65,510.00; Co – PI on the Supplement: Dr. Abts)

Research on the Effectiveness of the CISST RET Component (NSF 9731748 ERC Core Grant – for 2002 - $50,195.00; PI on the Supplement: Dr. Abts)

SELECTED INVITED PRESENTATIONS:

Abts, L. "Energy 101 by Design: Designing a Sustainable World and Designing Quantitative Solutions for Energy," Department of Energy Webinar, June 26, 2014.

Abts, L. "A hybrid Model for blended, online Mathematics, Science and Engineering Instruction and Assessment based on Design," AERA Presidential Session: New Ways to Evaluate Mathematics and Science Education, Philadelphia, PA, April 5th, 2014.

Abts, L. "Demystifying and Applying the Design Process to Impact Curriculum, Instruction and Assessment," Advance Distributed Learning Initiative National Meeting, March 13, 2014.

Abts, L. Ball, E. and Reshetar, R. "Portfolio and Rubrics for Assessing STEM Learning," presented at the AP Annual Conference, Las Vegas, Nevada, July, 2013.

Abts, L., "Harnessing the Power of Engineering to Improve STEM Education in K – 12 Schools," Congressional Briefing, hosted by ASME and Discover Magazine, Rayburn Building, Congressional Office Building, Washington, D.C., June 12, 2013.

Abts, L. **"**Designing a Sustainable World: A new I-course**,"** Engineering Sustainability Workshop, University of Maryland, April 22, 2013.

Abts, L. "Designing a Sustainable World," Department of Energy, Energy 101 Webinar, April 10, 2013.

Abts, L. and Reshetar, R. "Development of a Portfolio Assessment System for a Potential AP for Engineering Design," Association of Testing Professionals Innovation in Testing, Ft. Lauderdale, Florida, February, 2013.

Abts, L. "A Soft Systems Approach to Complex Educational Enterprise Problems – Educational Engineering," Presentation Carnegie Project on the Education Doctorate, October 3, 2012

Abts, Leigh, Goldberg, Gail, and Miller, M. "AP Engineering Design." Working meeting at College Board, Newtown, PA, July 24, 2012.

Groves, J., Reshetar, R. Schroll, M, and Abts, L., "The Development and Implementation of a Potential AP for Engineering Design Using a Rubric-Based e-portfolio," UTeachEngineering, University of Texas at Austin, July 28, 2012.

Groves, J., Reshetar, R. Schroll, M, and Abts, L., "The Development and Implementation of a Potential AP for Engineering Design Using a Rubric-Based e-portfolio," Engineering Deans Annual Meeting, Birds of a Feather Session Kauai, Hawaii, April 16, 2012.

Groves, J., Reshetar, R. Schroll, M, and Abts, L., "The Development and Implementation of a Potential AP for Engineering Design Using a Rubric-Based e-portfolio," Engineering Deans Annual Meeting, Main Plenary Session, Hawaii, April 16, 2012.

Abts, L. Analysis of the Barriers, Constraints, and Issues for Dual Credit and /or Advanced Placement® Pathway for Introduction to Engineering / Design," University of Virginia Workshop, Charlottesville, Virginia, December 1, 2011.

Abts, L. "Scientific Reasoning and the Design Process," Harford Community College Faculty, Harford, Maryland, October 28, 2011.

"The Critical 'Vowel' in STEM Pipeline," A. James Clark School of Engineering Dean's Advisory Council, University of Maryland, College Park, MD, August, 19, 2010.

"Engineering Studies: Preparation for AP® Mathematics and Science – Bridge between Scientific Reasoning and the Design Process," Tennessee Technology Teacher Institute, TN, July 17, 2008.

"STEM Literacy: Pathways to Education, Workforce and Innovation," Oak Ridge Associated Universities, Oak Ridge, TN, March 5, 2008.

"STEM Literacy: Pathways to Innovation," Woodrow Wilson Foundation Early College Convening, Princeton, NJ, February 7, 2008.

"Scientific Reasoning and the Design Process: Pathways to Innovation and Invention," Lemelson Foundation, Portland, OR, October 24, 2007.

"What is STEM Education," University of Maryland Leadership Meeting, College Park, MD, October 12, 2007.

"A Framework to Learn and Teach Science, Technology, Engineering and Mathematics (STEM) as a Metadiscipline," American Association for the Advancement of Science (AAAS), August 3, 2007.

"Secondary School and Beyond – Inspiring all Students," Third Annual Partners for Rigor through Relevancy Conference, Montgomery County District Headquarters, April 21, 2007.

"SEEK – 16 Pre-AP Workshop," University of Maryland, April 18, 2007.

"Advance Placement Research Project," Engineering Founders Society, Washington, DC, February 20, 2007.

"Advance Placement in Engineering Research Results," The College Board, New York, New York, December 22, 2006.

"Advance Placement in Engineering Research Project," American Society of Chemical Engineers, December 12, 2006.

"Advance Placement in Engineering Overview," Carnegie Mellon University, November 9, 2006.

"Advance Placement in Engineering Expert Interviews," Carnegie Mellon University, November 9, 2006.

"Trans-disciplinary Collaborations and Partnerships: Making the Whole Greater than the Sum of the Parts," Training Institute on Climate and Health in the Americas – Interdisciplinary Team Formation and Partnerships, Kingston, Jamaica, November 11, 2005.

"O'Where, O'Where have all the Engineers Gone?" Johns Hopkins Whiting School of Engineering Alumni Meeting, Albuquerque, New Mexico, May 24, 2005.

"The Art of Collaboration: Making the Whole Greater than the Sum of the Parts," Center for Computer-Integrated Surgical Systems and Technology Engineering Research Center, Johns Hopkins University, June 8, 2005.

"Bridging Education, Engineering, Research and Diversity Across Disciplines," Keynote Address, Maryland Technology Education Annual Meeting, Columbia, MD October 14, 2004.

"Bringing Education, Engineering, Research and Diversity Across K to G," National Science Foundation Engineering Directorate, August 2, 2004.

"REUTINA: Linking Engineering, Information Technology and Healthcare through a Research Experience," American Indian Higher Education Consortium, March 2003.

"REUTINA: Linking Diabetes Education and Research through Engineering," National Tribal College Meeting, December 2002.

POSTER SESSION

Yang, M. Abts, L., Goldberg, G., Schroll, M., Miller, M. "Increasing the Engineering Education Pipeline with a Rubric-Based Scoring System," American Psychological Profession, Division 5 (Evaluation, Measurement and Statistics), Hawaii, July, 2013.

PATENTS:

Provisional Patent, "Internet, Cloud and Private Network based Apps and System for Problem-Solving Learning Environments and Design (PSELD) Thinking Activities and Projects leading to Academic and Workforce Recognition," filed October 7, 2015.

Continuation in Part, Patent Pending, "Quality Management System and Problem Solving Learning Environments and Design for 21st Century Skills," filed on April 4th, 2014.

PCT International Continuation in Part, Patent Pending, "Quality Management System and Problem Solving Learning Environments and Design for 21st Century Skills," filed on April 4th, 2014.

Patent Pending, "Quality Management System and Problem Solving Learning Environments and Design for 21st Century Skills," filed on February 26th, 2014.

PCT International Patent Pending, "Quality Management System and Problem Solving Learning Environments and Design for 21st Century Skills," filed on February 26th, 2014.

Provisional Patent, Quality Management System (QMS) and Problem Solving Learning Environments and Design for 21st Century Skills referred to as University of Maryland Invention Disclosure IS-2013-022.

U.S. Patent No. 4,112,773 – Covers basic ultrasonic transmitter receiver unit directing its signal across the flow.

U.S. Patent No. 4,237,720 – Continuation of 4,112,773

U.S. Patent No. 4,214,484 – Covers the moat type means for a transducer unit.

U.S. Patent No. 4,339,944 – Covers a damping method means comprising a surrounding sidewall arrangement such that the lateral waves do not directly reflect to the transducer.

U.S. Patent No. 4,365,515 – Covers a plug type method of an ultrasonic transducer having its own three -dimensional lens.

U.S. Patent No. 4,381,674 – Covers a method of identification of identifying particles in an oil recovery system.

U.S. Patent No. 4,398,424 – Covers an energy-damping collar for a transducer unit.

U.S. Patent No. 4,455,873 – Covers a probe with an ultrasonic transmitter – receiver attached.

U.S. Patent No. 4,112,773 – Covers a method of determining the concentration of oil in a re-circulated flow of an oil recovery system.

Over 10 foreign patents issued

PUBLICATIONS:

Abts, L. R., *Analysis of the Barriers, Constraints and Issues for Dual Credit and / or an Advanced Placement® Pathway for Introduction to Engineering / Design*, American Society of Engineering Education, Vancouver, 2011.

Abts, L. R., et al. *Microparticle Detection with Focused Ultrasound*, Journal of Acoustical Society of America, 1976.

Abts, L. R., et al. *Detection of Microparticles in Flowing Blood using focused Ultrasound*, American Society of Artificial Internal Organs Abstracts, 1977.

Abts, L. R., et al. *Low Heparin Levels and Microemboli: Effects on the Johnson and Johnson Arterial Line Filter*, American Society of Extracorporeal Technologists, 1977.

Abts, L. R., et al. *The Efficiency of Removal of Microparticles by the Johnson and Johnson Arterial Line Filter*, American Society of Extracorporeal Technologists, 1977.

Abts, L. R., et al. *Microparticle Detection in a Flowing Stream*, International Congress on Acoustics Proceedings, Madrid, 1977.

Abts, L. R., et al. *An Equation of State for Muscle*, Federation American Society of Experimental Biologists Proceedings, Atlantic City, 1977.

Abts, L. R., et al. *Computerized Discrimination of Microemboli Extracorporeal Circuits*, American Journal of Surgery, April 1978.

Abts, L. R., et al. *Reflections from Microparticles in a Flowing Liquid*, Journal of Acoustical Society of America, 1978.

Abts, L. R., et al. The Detection of *Microparticles*, Electrochemical Society of Japan, 21st Annual Meeting, Tokyo, 1981.

Abts, L. R., et al. *The Detection of Microcontaminants in Semiconductor Process Fluids using an Acoustic Technology*, Solid State Technology, September 1982.

Abts, L. R. *Application of Acoustics to Detect and to Classify Contaminants within Liquids in Sealed Containers*, Spring Symposium of the Food and Pharmaceutical Industries of the Instrument Society of America, Indianapolis, April, 1986.

Abts, L. R. *Acoustic Inspection of Sealed Food Cans for Foreign Materials*, Advances in manufacturing Automation in t he Food and Pharmaceutical Industry Sponsored by the Instrument Society of America, Philadelphia, April 1987.

Abts, L. R., et al. *An Acoustic Inspection Method to Detect and Classify Particles within Sealed Plastic Containers*, International Conference on Liquid Bourne Particle Inspection and Metrology of the Parenteral Drug Association Proceedings, Washington D.C., May 1987.

HONORS AND AWARDS:

Honorable Mention, Student Paper Contest, *Biochemical and Mechanical Model for Muscle Contraction*, American Society of Experimental Biologists, New Orleans, 1975.

Invited Speaker, *Activated Clotting Time and Its Relationship to Heparin Levels*, American Society of Extracorporeal Technologists, Regional Meeting, Chicago, 1976.

Rhode Island Heart Association Young Investigator Grant for Microemboli Detection Project, 1976.

Rhode Island Heart Association Young Investigator Grant for Microemboli Project, 1976.

Leigh R. Abts, Ph.D. December 17, 2015