

Amy L. Throckmorton, Ph.D. – Curriculum Vitae

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EDUCATION

- Ph.D. Biomedical Engineering, University of Virginia, May 2006.
Dissertation Title: Computational Design and Experimental Validation of an Axial Flow Ventricular Assist Device (VAD) for Infants and Children.
Advisors: Dr. Paul Allaire, Dr. Houston Wood in Mechanical and Aerospace Engineering.
- M.S. Biomedical Engineering, University of Virginia, May 2002.
- B.S. Chemical Engineering, University of Virginia, May 1998.

PROFESSIONAL EXPERIENCE AND APPOINTMENTS

- 9/2009 to Present: **Qimonda Assistant Professor**, Mechanical Engineering, School of Engineering, Virginia Commonwealth University, Richmond, VA.
- 8/2007 to Present: **Assistant Professor**, Mechanical Engineering, School of Engineering, Virginia Commonwealth University, Richmond, VA.
- 7/2006 to 7/2007: **Postdoctoral Research Fellow**, Department of Cardiothoracic Surgery, James Whitcomb Riley Hospital for Children, Indiana University School of Medicine, Indianapolis, IN.
- 8/2000 to 5/2006: **Research Assistant**, Biomedical Engineering, University of Virginia. Research performed in the Mechanical and Aerospace Engineering Department.
- 8/2000 to 5/2004: **Teaching Assistant**, Biomedical Engineering, University of Virginia. ENGR 162 Introduction to Engineering, Fall 2000
BIOM 691/603/301 Human Physiology, Fall 2001, '02, '04
BIOM 411/611 Bioinstrumentation II, Spring 2004
- 1/1999 to 7/2000: **Senior Project Engineer**, Hercules Chemical Specialties Company, Franklin Plant, Courtland, VA. Responsible for \$2 million in capital project funding.
- 7/1998 to 1/1999: **Project Engineer**, Hercules Chemical Specialties Company, Franklin Plant, Courtland, VA.
- 6/1997 to 8/1997: **Engineering Intern**, Mechanical and Electrical Engineering, Ross Industries Incorporated, Midland, VA.

HONORS AND AWARDS

- 1998 Virginia Engineering Foundation Award for Research in Biomimetics
- 1999 Hercules Accountability Award - Highest Honor at Plant Level
- 2002-5 Biomedical Engineering GAANN Fellowship for Research in Vascular Engineering
- 2003 Virginia Engineering Student Council Graduate Student Travel Award
- 2003-5 ASAIO Biomedical Engineering Fellowship sponsored by The Whitaker Foundation
- 2004 Andy Ford Research Award for Excellence and Innovation in the Field of Pediatric Cardiovascular Disease
- 2004 ASAIO 50th Annual Conference Award Winner for Best Poster Presentation
- 2004 Distinguished Virginia Engineering Foundation Fellowship
- 2005 Biomedical Engineering Award at the 1st International Conference on Pediatric Mechanical Circulatory Support and Pediatric Cardiopulmonary Perfusion
- 2006 Outstanding Biomedical Engineering Student Award at the University of Virginia
- 2006 Helmut Reul Young Investigator Award – 2nd Place Finish – at the 14th Annual International Society for Rotary Blood Pump Conference in Leuven, Belgium
- 2007 John A. Waldhausen Young Investigator Award at the 3rd International Conf. on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion
- 2008 Fellow, Center for the Study of Biological Complexity, VCU
- 2008 Nominee, Qimonda Assistant/Associate Professorship in the School of Engineering at Virginia Commonwealth University
- 2008 Nominee, VCU School of Engineering Parents Council Award for Excellence in Undergraduate Research and Teaching
- 2009 Ralph E. Powe Junior Faculty Enhancement Award, Selected as 1 of 2 to represent VCU in this Competition, National Competition, 1 of 30 Selected out of 118 applicants,
- 2009-12 Qimonda Assistant Professorship in the School of Engineering at VCU
- 2009 Virginia Outstanding Faculty Nominee in the SCHEV Rising Star Category for VCU
- 2010 Student-Choice Certificate of Recognition from the VCU Engineering Student Council
- 2010-11 Member, Board of Directors, American Society for Artificial Internal Organs (ASAIO)
- 2011 Distinguished Service Award, Richmond Technical Center, Division of Career and Technical Education, Richmond Public Schools

INVENTION DISCLOSURES

United States Patent and Trademark Office

Title: Noninvasive Counterpulsation Device, System and Computer Program Product

Assignee: Provisional Patent through University of Virginia Patent Foundation

U.S. Provisional Patent Application Serial No. 61/025,486

Filing Date: 1/10/2008

Approval Date: 2/1/2008

World International Patent Office

Title: Axial-Flow Blood Pump with Magnetically Suspended, Radially and Axially Stabilized Impeller

Patent Number: WO/2005/030296

International Application No.: PCT/US2004/031582

Publication Date: 07/04/2004

International Filing Date: 27/9/2004

United States Patent and Trademark Office

Title: Streamlined Unobstructed One-Pass Axial-Flow Pump

Assignee: Medforte Research Foundation, Univ. of Virginia Patent Foundation

Patent Number: 7229258

Application No.: 10/950,176

Filing Date: 9/24/2004

Approval Date: June 12, 2007

ARCHIVAL JOURNAL PUBLICATIONS

(30 in total, 16-1st authorships, H-Index of 10)

1. S.G. Chopski*, E. Downs**, C.M. Haggerty, A.P. Yoganathan, and A.L. Throckmorton. "PIV Measurements of an Idealized Total Cavopulmonary Connection with Mechanical Circulatory Assistance." *Artif Organs*, *In press*.
2. A.L. Throckmorton, J.P. Carr, S.A. Tahir, R. Tate, E.A. Downs**, S.S. Bhavsar*, Y. Wu, J.D. Grizzard, and W.B. Moskowitz. "Mechanical Cavopulmonary Assistance of a Patient-Specific Fontan Physiology: Numerical Simulations, Lumped Parameter Modeling, and Suction Experiments." *Artif Organs*, *In Press*.
3. A.L. Throckmorton, J.Y. Kapadia*, S.G. Chopski*, S.S. Bhavsar*, W.B. Moskowitz, S.D. Gullquist, J.J. Gangemi, C.M. Haggerty, and A.P. Yoganathan. "Numerical, Hydraulic, and Hemolytic Evaluation of an Intravascular Axial Flow Blood Pump to Mechanically Support Fontan Patients." *Ann Biomed Engr* 2011; 39(1): 324-336.
4. A.L. Throckmorton, J.Y. Kapadia*, J.P. Carr, C.M. Powell, R.D. Tate, and D.V. Traynham. "Flexible Impeller Pump for Intravascular Cavopulmonary Assistance of the Fontan Physiology." *Cardiovascular Engineering and Technology* 2011; 1(4): 244-255.
5. A.L. Throckmorton, T.M. Wittenschlaeger, J.Y. Kapadia*, T.J. Medina, H.Q. Hoang, and S.S. Bhavsar*. "Filament Support Spindle for an Intravascular Cavopulmonary Assist Device." *Artificial Organs* (2.131) 2010; 34(11): 1039-1044.
6. S.S. Bhavsar*, W.B. Moskowitz, and A.L. Throckmorton. "Interaction of an Idealized Cavopulmonary Circulation with Mechanical Circulatory Assist using an Intravascular Rotary Blood Pump." *Artificial Organs* 2010 (2.131); 34(10): 816-827.

Legend or Notation: Undergraduate Student, Graduate Student*, Medical Student**

7. J.Y. Kapadia*, K.C. Pierce, A.K. Poupore, and A.L. Throckmorton. “Hydraulic Testing of Intravascular Axial Flow Blood Pump Designs with a Protective Cage of Filaments for Mechanical Cavopulmonary Assist.” *ASAIO J* (1.631) 2010; 56: 17-23.
8. S.S. Bhavsar*, J.Y. Kapadia*, S.G. Chopski*, and A.L. Throckmorton. “Intravascular Mechanical Cavopulmonary Assistance for Patients with Failing Fontan Physiology.” *Artificial Organs* (2.131) 2009; 33(11): 977-987.
9. A.L. Throckmorton and R.A. Kishore. “Design of a Protective Cage of Filaments for an Axial Flow Blood Pump for Intravascular Cavopulmonary Assist.” *Artificial Organs* (2.131) 2009; 33(8): 611-621.
10. A.L. Throckmorton, J.Y. Kapadia*, and D. Madduri*. “Mechanical Axial Flow Blood Pump to Support the Cavopulmonary Circulation.” *Int J Artif Organs* (1.299) 2008; 31(11): 970-982.
11. A.L. Throckmorton and S.G. Chopski*. “Pediatric Circulatory Support Systems: Current Strategies and Future Directions. Biventricular and Univentricular Mechanical Assistance.” *ASAIO J* (1.631) 2008; 54: 491-497.
12. A.L. Throckmorton, K.K. Ballman, C.D. Myers, S.H. Frankel, J.W. Brown, and M.D. Rodefeld. “Performance of an Expandable Propeller Pump for Cavopulmonary Assist in a Univentricular Fontan Circulation.” *Ann Thorac Surg* (2.689) 2008; 86: 1343-47.
13. A.L. Throckmorton and A. Untaroiu. “CFD Analysis of a Mag-Lev Ventricular Assist Device for Infants and Children: Fourth Generation Design.” *ASAIO J* (1.631) 2008; 54: 423-431.
14. A.L. Throckmorton, C.D. Myers, K.K. Ballman, S.H. Frankel, K. Litwak, and M.D. Rodefeld. “Mechanical Cavopulmonary Assist for the Univentricular Fontan Circulation using a Novel Folding Propeller Blood Pump.” *ASAIO J* (1.631) 2007; 53: 734-741.
15. A.L. Throckmorton, A. Untaroiu, P.E. Allaire, H.G. Wood, D.S. Lim, M.A. McCulloch, and D.B. Olsen. “Numerical Design and Experimental Hydraulic Testing of an Axial Flow VAD for Infants and Children.” *ASAIO J* (1.631) 2007; 53: 754-761.
16. A.L. Throckmorton, A. Untaroiu, D.S. Lim, H.G. Wood, and P.E. Allaire. “Fluid Force Predictions and Experimental Measurements for a Magnetically Levitated Pediatric VAD.” *Artificial Organs* (2.131) 2007; 31(5): 359-368.
17. A.L. Throckmorton, D.S. Lim, M.A. McCulloch, W. Jiang, X. Song, P.E. Allaire, H.G. Wood, and D.B. Olsen. “Computational Design and Experimental Performance Testing of an Axial Flow Pediatric VAD.” *ASAIO J* (1.631) 2005; 51: 629-635.

Legend or Notation: Undergraduate Student, Graduate Student*, Medical Student**

18. A. Untaroiu, H.G. Wood, P.E. Allaire, A.L. Throckmorton, S.W. Day, S.M. Patel, P. Ellman, C.G. Tribble, and D.B. Olsen. "Computational Design and Experimental Testing of a Novel Axial Flow LVAD" *ASAIO J* (1.631) 2005; 51: 702-710.
19. S.M. Patel, A.L. Throckmorton, A. Untaroiu, P.E. Allaire, H.G. Wood, and D.B. Olsen. "The Status of Failure and Reliability Testing of Artificial Blood Pumps." *ASAIO J* (1.631) 2005; 51: 440-451.
20. A. Untaroiu, A.L. Throckmorton, H.G. Wood, P.E. Allaire, and D.B. Olsen. "Numerical and Experimental Analysis of an Axial Flow LVAD: The Influence of the Diffuser on the Overall Pump Performance." *Artificial Organs* (2.131) 2005; 29(7): 581-91.
21. S.M. Patel, P.E. Allaire, H.G. Wood, A.L. Throckmorton, C.G. Tribble, and D.B. Olsen. "Methods of Failure and Reliability Assessment of Mechanical Heart Pumps." *Artificial Organs* (2.131) 2005; 29(1): 15-25. *Recognized as one of the top 10 articles viewed online in 2005 at Blackwell Synergy Pub.*
22. H.G. Wood, A.L. Throckmorton, A. Untaroiu, and X. Song. "The Medical Physics of Ventricular Assist Devices." *Rep. Prog. Phys.* (12.090) 2005; 68: 1-32. *Recognized as one of the most frequently downloaded papers of 2005 by the journal.*
23. X. Song, A.L. Throckmorton, H.G. Wood, and D.B. Olsen. "Transient and Quasi-steady Computational Fluid Dynamics Study of a Left Ventricular Assist Device." *ASAIO J* (1.631) 2004; 50: 410-417.
24. A.L. Throckmorton, A. Untaroiu, P.E. Allaire, H.G. Wood, G.P. Matherne, D.S. Lim, B.B. Peeler, and D.B. Olsen. "Computational Analysis of an Axial Flow Pediatric Ventricular Assist Device." *Artificial Organs* (2.131) 2004; 28(10): 881-891.
25. X. Song, A.L. Throckmorton, H.G. Wood, J.F. Antaki, and D.B. Olsen. "Quantitative Evaluation of Blood Damage in a Centrifugal VAD by Computational Fluid Dynamics." *J Fluids Engineering* (0.628) 2004; 126: 410-418.
26. X. Song, H.G. Wood, P.E. Allaire, A. Untaroiu, S.W. Day, A.L. Throckmorton, and D.B. Olsen. "Design and Transient CFD Study of a Continuous Axial Flow VAD." *ASAIO J* (1.631) 2004; 50: 215-224.
27. X. Song, A.L. Throckmorton, H.G. Wood, J.F. Antaki, and D.B. Olsen. "CFD Prediction of Blood Damage in a Centrifugal Pump." *Artificial Organs* (2.131) 2003; 27(10): 938-941.
28. A.L. Throckmorton, H.G. Wood, S.W. Day, X. Song, P.C. Click, P.E. Allaire, and D.B. Olsen. "Design of a Continuous Flow Pediatric Ventricular Assist Device." *Int J Artif Organs* (1.299) 2003; 26(11): 1015-31.
29. X. Song, A.L. Throckmorton, A. Untaroiu, S.M. Patel, P.E. Allaire, H.G. Wood, and D.B. Olsen. "Axial Flow Blood Pumps." *ASAIO J* (1.631) 2003; 49: 355-364.

Legend or Notation: Undergraduate Student, Graduate Student*, Medical Student**, High-school student^ξ

30. *A.L. Throckmorton*, P.E. Allaire, H.P. Gutgesell, G.P. Matherne, D.B. Olsen, H.G. Wood, J.H. Allaire, and S.M. Patel. "Pediatric Circulatory Support Systems." *ASAIO J* (1.631) 2002; 48: 216-221.

JOURNAL ARTICLES IN PREPARATION (4 in total)

1. *A.L. Throckmorton*, *J.P. Carr*, *J. Bryant*, *D. Lawson*, W.B. Moskowitz, J.J. Gangemi, C.M. Haggerty, A.P. Yoganathan. "Uniquely Shaped Cardiovascular Stents Enhance the Pressure Generation of Intravascular Blood Pumps." *J Thoracic Cardiovasc Surg*, Submission in May 2011.
2. *A.L. Throckmorton*, *S.A. Tahir*, *J.P. Carr*, and *S. Lopes*[§]. "Transient Analysis of a Magnetically Levitated Pediatric VAD for Circulatory Flow Augmentation in Infants and Children." *Computers in Biology and Medicine*, Submission in March 2011.
3. *S.A. Tahir*, W.B. Moskowitz, and *A.L. Throckmorton*. "Patient-Specific Modeling of the Fontan Physiology and Mechanical Cavopulmonary Assistance." *IEEE Biomedical Engineering*, Submission in July 2011.
4. *S.G. Chopski** and *A.L. Throckmorton*. "Stereo-PIV Measurements of a Patient-Specific Fontan Physiology with Mechanical Circulatory Assistance." *J Pediatrics*, Submission in August 2011.

CRITICALLY REVIEWED CONFERENCE SLIDE PRESENTATIONS (21 in total)

1. *A.L. Throckmorton*, *J.P. Carr*, *J. Bryant*, *D. Lawson*, *S.G. Chopski**, W.B. Moskowitz, J.J. Gangemi, *C.M. Haggerty**, and A.P. Yoganathan. "Uniquely Shaped Cardiovascular Stents Enhance Pressure Generation of Minimally-Invasive Intravascular Blood Pumps." 57th Annual Conference of the American Society for Artificial Internal Organs in Washington, D.C., USA, June 10-12, 2011.
2. *A.L. Throckmorton*, *J.P. Carr*, *S.A. Tahir*, *R. Tate*, *E.A. Downs****, *S.S. Bhavsar**, Y. Wu, J.D. Grizzard, and W.B. Moskowitz. "Mechanical Cavopulmonary Assistance of a Patient-Specific Fontan Physiology: Numerical Simulations, Lumped Parameter Modeling, and Suction Experiments." 7th International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion in Philadelphia, PA, USA, May 5 – 7, 2011.
3. *S.G. Chopski**, *E.A. Downs****, *S.S. Bhavsar**, *J.Y. Kapadia**, C. Haggerty, A.P. Yoganathan, and *A.L. Throckmorton*. "Particle Image Velocimetry Measurements of an Idealized Total Cavopulmonary Connection with Mechanical Circulatory Assistance in the Inferior Vena Cava." 6th International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion in Boston, MA, USA, May 6 – 8, 2010. ***Selected for 2010 Bioengineering Student Award.***

4. A.L. Throckmorton, J.Y. Kapadia*, T.M. Wittenschlaeger, T.J. Medina, H.Q. Hoang, and S.S. Bhavsar*. “Filament Support Spindle for an Intravascular Cavopulmonary Assist Device.” 6th International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion in Boston, MA, USA, May 6 – 8, 2010.
5. S.S. Bhavsar*, J.Y. Kapadia*, S.G. Chopski*, and A.L. Throckmorton. “Intravascular Mechanical Cavopulmonary Assistance for Patients with Failing Fontan Physiology.” 5th International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion in Dallas, TX, USA, May 28 – 30, 2009. ***Selected for 2009 Bioengineering Student Award.***
6. J.Y. Kapadia*, S.S. Bhavsar*, S.G. Chopski*, S. Gullquist, W. Moskowitz, A. Yoganathan, and A. Throckmorton. “Mechanical Cavopulmonary Assist using an Intravascular Axial Flow Blood Pump.” 55th Annual Conference of the American Society for Artificial Internal Organs in Dallas, TX, USA, May 28 – 30, 2009. ***Selected for Honorable Mention for ASAIO Paul Malchesky student award.***
7. C.D. Myers, K.K. Ballman, L. Riegle, K. Mattix, A.L. Throckmorton, and M.D. Rodefeld. “Mechanisms of Systemic Adaptation to Univentricular Fontan Physiology.” 48th Annual Meeting of the Midwest Society for Pediatric Research in Indianapolis, IN, USA, October 18 – 19, 2007.
8. A.L. Throckmorton, C. Myers, K. Ballman, S. Frankel, K. Litwak, and M.D. Rodefeld. “Mechanical Cavopulmonary Assist for the Univentricular Fontan Circulation Using a Novel Folding Propeller Blood Pump.” 3rd International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion in Hershey, PA, USA, May 17 - 19, 2007.
9. A.L. Throckmorton, C. Myers, K. Ballman, S. Frankel, K. Litwak, and M.D. Rodefeld. “Cavopulmonary Assist: Circulatory Support for the Univentricular Fontan Circulation using a Folding Propeller Blood Pump.” 54th Annual Conference of the American Society for Artificial Internal Organs in Chicago, IL, USA, June 7 - 9, 2007.
10. A.L. Throckmorton, D.S. Lim, A. Untaroiu, P.E. Allaire, H.G. Wood, and D.B. Olsen. “Hydraulic Performance Testing and CFD Predictions for an Axial Flow VAD for Infants and Children.” 14th Congress of the International Society for Rotary Blood Pumps, August 31-September 2, 2006, Leuven, Belgium. ***2nd Place Winner for the Distinguished Helmut Reul Young Investigator Award.***
11. M. Glausser, A. Untaroiu, A.L. Throckmorton, L. Zongli, P.E. Allaire, and H.G. Wood. “A Suspension System Design Model Incorporating Fluid Perturbations for a Magnetically Levitated Axial Blood Pump.” 14th Congress of the International Society for Rotary Blood Pumps, August 31-September 2, 2006, Leuven, Belgium.
12. A. Untaroiu, H.G. Wood, A.L. Throckmorton, P.E. Allaire, and D.B. Olsen. “CFD Numerical Estimation of Blood Damage in LEV-VAD Axial Flow Left Ventricular Assist Device.” 14th

Congress of the International Society of Rotary Blood Pumps, August 31-September 2, 2006, Leuven, Belgium.

13. A.L. Throckmorton, A. Untaroiu, D.S. Lim, S.M. Patel, H.G. Wood, P.E. Allaire, and D.B. Olsen. "Transient Flow Numerical Simulation of an Axial Flow Pediatric VAD for Infants and Children." 51st Annual Conference of the American Society for Artificial Internal Organs in Washington, DC, USA, June 9 - 11, 2005.
14. A.L. Throckmorton, D.S. Lim, A. Untaroiu, S.M. Patel, H.G. Wood, P.E. Allaire, and D.B. Olsen. "Experimental Measurements of Hydraulic Performance for an Axial Flow Pediatric VAD to Support Design Predictions." 1st International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion in Hershey, PA, USA, May 19 - 21, 2005.
15. A. Untaroiu, A.L. Throckmorton, H.G. Wood, S.M. Patel, P.E. Allaire, C.G. Tribble, and D.B. Olsen. "Computational and Experimental Design Validation of the First Prototype of the LEV-VAD Axial Flow Blood Pump." 13th Congress of the International Society for Rotary Blood Pumps in Tokyo, Japan, September 14 -16, 2005.
16. S.M. Patel, P.E. Allaire, H.G. Wood, J.P. Lewis, A. Untaroiu, A.L. Throckmorton, and D.B. Olsen. "Predicting VAD Reliability Through Systematic Component Modeling." 13th Congress of the International Society for Rotary Blood Pumps in Tokyo, Japan, September 14 - 16, 2005. **3rd Place Winner of Distinguished Helmut Reul Young Investigator Award.**
17. A. Untaroiu, A.L. Throckmorton, S.M. Patel, H.G. Wood, P.E. Allaire, and D.B. Olsen. "LEV-VAD Axial Flow Blood Pump - The Influence of the Diffuser on Overall Device Performance." 2004 1st Annual Summit on Heart Failure and Rotary Blood Pumps in Cleveland, Ohio, USA, October 7 - 10, 2004.
18. A. Untaroiu, A.L. Throckmorton, X. Song, H.G. Wood, P.E. Allaire, and D.B. Olsen. "Design Requirements for an Axial Flow Blood Pump-Challenges Facing a Blood Pump Designer." 2003 11th Congress of the International Society of Rotary Blood Pumps in Bad Oeynhausen, Germany, August 31 – September 2, 2003.
19. A.L. Throckmorton, A. Untaroiu, X. Song, H.G. Wood, P.E. Allaire, and D.B. Olsen. "Design of an Axial Flow Pediatric Left Ventricular Assist Device." 2003 11th Congress of the International Society of Rotary Blood Pumps in Bad Oeynhausen, Germany, August 31 – September 2, 2003.
20. A. Untaroiu, X. Song, H.G. Wood, P.E. Allaire, A.L. Throckmorton, and D.B. Olsen. "Design and Numerical Analysis of a Novel Axial Flow Left Ventricular Assist Device." 2003 11th Congress of the International Society of Rotary Blood Pumps in Bad Oeynhausen, Germany, August 31 – September 2, 2003.
21. A. Untaroiu, X. Song, H.G. Wood, P.E. Allaire, A.L. Throckmorton, and D.B. Olsen. "Performance Analysis of a Novel Axial Flow Left Ventricular Assist Device," 2003 30th

Annual European Society of Artificial Organs Conference in Aachen, Germany, September 3-6, 2003.

CRITICALLY REVIEWED AND PUBLISHED CONFERENCE ABSTRACTS WITH POSTER PRESENTATIONS (27 in total)

1. A.L. Throckmorton, J.P. Carr, and S.A. Tahir. “Transient Fluid Analysis of a Magnetically Levitated Pediatric Ventricular Assist Device: Rotational Interfaces and Time Varying Boundary Conditions.” 57th Annual Conference of the American Society for Artificial Internal Organs in Washington, D.C., USA, June 10-12, 2011.
2. S.S. Bhavsar*, W.B. Moskowitz, B. Kuebler***, J.M. Adams, and A.L. Throckmorton. “Use of External Pressure Application to Augment Fontan Hemodynamics.” 56th Annual Conference of the American Society for Artificial Internal Organs in Baltimore, MD, USA, May 27 – 29, 2010. *Selected for ASAIO Fellowship award sponsored by Levitronix.*
3. A.L. Throckmorton, T.M. Wittenschlaeger, S.S. Bhavsar*, E.W. Jenkins, and S.G. Chopski*. “Computational Assessment of Twisted Cage Filaments for an Intravascular Axial Flow Blood Pump for Cavopulmonary Assistance.” 56th Annual Conference of the American Society for Artificial Internal Organs in Baltimore, MD, USA, May 27 – 29, 2010.
4. S.S. Bhavsar*, E.A. Downs**, E.W. Jenkins, S.G. Chopski*, J.D. Grizzard, W.B. Moskowitz, and A.L. Throckmorton. “3-D Reconstructed Patient-Specific Cavopulmonary Connection with Mechanical Assistance in the Inferior Vena Cava.” 56th Annual Conference of the American Society for Artificial Internal Organs in Baltimore, MD, USA, May 27 – 29, 2010.
5. A.L. Throckmorton, J. Kapadia*, and A. Untaroiu. “Numerical Model of the Univentricular Fontan with Mechanical Cavopulmonary Assist.” 54th Annual Conference of the American Society for Artificial Internal Organs in San Francisco, CA, USA, June 19 - 21, 2008.
6. A.L. Throckmorton, K.K. Ballman, C.D. Myers, J.W. Brown, and M.D. Rodefeld. “Performance and Hemolysis Testing of an Expandable Propeller Pump to provide Cavopulmonary Assist in a Univentricular Fontan Circulation.” STS 44th Annual Meeting in Fort Lauderdale, Florida, January 28-30, 2008.
7. C.D. Myers, K.K. Ballman, A.L. Throckmorton, and M.D. Rodefeld. “Cerebral Oximetry Accurately Reflects Dynamic Changes in Oxygen Saturation in the Superior and Inferior Vena Cava in Awake Sheep.” 48th Annual Meeting of the Midwest Society for Pediatric Research in Indianapolis, IN, USA, October 18 – 19, 2007.
8. C.D. Myers, K.K. Ballman, A.L. Throckmorton, and M.D. Rodefeld. “An Animal Model of Univentricular Fontan Circulation: Stable Fontan Conversion Following Systemic Venous Preconditioning.” Inaugural Meeting of the World Society for Pediatric and Congenital Heart Surgery in Washington, D.C., USA, May 3 – 4, 2007.
9. S.W. Day, X. Song, A.L. Throckmorton, J.B. Kirk, and D.B. Olsen. “Comparison of Blood Damage Predictions from Fluid Measurements and Computations to In Vitro and In Vivo

Observations in a Centrifugal Blood Pump.” 52nd Annual Conference of the American Society for Artificial Internal Organs in Chicago, IL, USA, June 8 - 10, 2006.

10. *A.L. Throckmorton*, D.S. Lim, A. Untaroiu, P.E. Allaire, H. G. Wood, and D.B. Olsen. “Comparison of CFD Predictions to Experimental Testing Results for an Axial Flow VAD for Infants and Children.” 52nd Annual Conference of the American Society for Artificial Internal Organs in Chicago, IL, USA, June 8 - 10, 2006.
11. A. Untaroiu, *A.L. Throckmorton*, P.E. Allaire, H. G. Wood, and D.B. Olsen. “Performance Assessment of a Left Ventricular Assist Device Under Transient Flow Conditions.” 52nd Annual Conference of the American Society for Artificial Internal Organs in Chicago, IL, USA, June 8 - 10, 2006.
12. A. Untaroiu, H.G. Wood, *A.L. Throckmorton*, P.E. Allaire, and D.B. Olsen. "CFD Modeling of Transient Flow in the LEV-VAD Axial Flow Blood Pump." 13th Congress of the International Society for Rotary Blood Pumps in Tokyo, Japan, September 14 -16, 2005.
13. *A.L. Throckmorton*, D.S. Lim, A. Untaroiu, S.M. Patel, H.G. Wood, P.E. Allaire, and D.B. Olsen. "Hydraulic Performance Testing of an Axial Flow Pediatric VAD to Support Design Predictions." 13th Congress of the International Society for Rotary Blood Pumps in Tokyo, Japan, September 14 -16, 2005.
14. S.M. Patel, P.E. Allaire, H.W. Penrose, A. Untaroiu, *A.L. Throckmorton*, H.G. Wood, and D.B. Olsen. "Increasing VAD Reliability Through Motor Fault Tolerance." 51st Annual Conference of the American Society for Artificial Internal Organs in Washington, DC, USA, June 9 - 11, 2005.
15. S.M. Patel, P.E. Allaire, J.P. Lewis, A. Untaroiu, *A.L. Throckmorton*, H.G. Wood, and D.B. Olsen. "A Reliability Model for a Ventricular Assist Device." 51st Annual Conference of the American Society for Artificial Internal Organs in Washington, DC, USA, June 9 - 11, 2005.
16. A. Untaroiu, *A.L. Throckmorton*, S.M. Patel, H.G. Wood, P.E. Allaire, and D.B. Olsen. "LEV-VAD: Computational Design and Experimental Testing." 51st Annual Conference of the American Society for Artificial Internal Organs in Washington, DC, USA, June 9 - 11, 2005.
17. *A.L. Throckmorton*, A. Untaroiu, S.M. Patel, D.S. Lim, H.G. Wood, P.E. Allaire, and D.B. Olsen. "Transient Flow CFD Simulations of an Axial Flow Pediatric Ventricular Assist Device." 1st International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion in Hershey, PA, USA, May 19 - 21, 2005.
18. *A.L. Throckmorton*, D.S. Lim, A. Untaroiu, S.M. Patel, H.G. Wood, P.E. Allaire, and D.B. Olsen. "Hydraulic Performance Characterization of an Axial Flow Pediatric VAD Prototype." 51st Annual Conference of the American Society for Artificial Internal Organs in Washington, DC, USA, June 9 - 11, 2005.

19. S.M. Patel, A.L. Throckmorton, A. Untaroiu, P.E. Allaire, H.G. Wood, and D.B. Olsen. "Failure and Reliability Assessment of Mechanical Heart Pumps." 2004 1st Annual Summit on Heart Failure and Rotary Blood Pumps in Cleveland, Ohio, USA, October 7 - 10, 2004.
20. S.M. Patel, P.E. Allaire, H.G. Wood, A.L. Throckmorton, and D.B. Olsen. "Failure and Reliability Assessment of Mechanical Heart Pumps." 50th Anniversary Conference of the American Society for Artificial Internal Organs in Washington, DC, USA, June 17-19, 2004: ASAIO J 50(2):116.
21. X. Song, A.L. Throckmorton, and H.G. Wood. "Studies of Blood Trauma in the Blood Related Mechanical Devices." 50th Anniversary Conference of the American Society for Artificial Internal Organs in Washington, DC, USA, June 17-19, 2004.
22. A.L. Throckmorton, A. Untaroiu, P.E. Allaire, H.G. Wood, and D.B. Olsen. "Optimized Design of an Axial Flow VAD for Infants and Children." 50th Anniversary Conference of the American Society for Artificial Internal Organs in Washington, DC, USA, June 17-19, 2004: 50(2): 152.
23. A. Untaroiu, A.L. Throckmorton, H.G. Wood, P.E. Allaire, and D.B. Olsen. "Numerical and Experimental Analysis of an Axial Flow VAD." 50th Anniversary Conference of the American Society for Artificial Internal Organs in Washington, DC, USA, June 17 -19, 2004: ASAIO J 50(2):121.
24. A.L. Throckmorton, A. Untaroiu, X. Song, H.G. Wood, P.E. Allaire, D.S. Lim, and D.B. Olsen. "Optimized Design of an Axial Flow Ventricular Assist Device for Pediatric Cardiac Failure Patients." 1st International Conference of Heart Failure in Children and Young Adults in Houston, Texas, USA, December 3 - 6, 2003.
25. A.L. Throckmorton, A. Untaroiu, X. Song, H.G. Wood, P.E. Allaire, and D.B. Olsen. "Design of an Axial Flow Pediatric Ventricular Assist Device," 2003 30th Annual European Society of Artificial Organs in Aachen, Germany, September 3 -6, 2003.
26. A.L. Throckmorton, H.G. Wood, S.M. Patel, and D.B. Olsen. "Design of Centrifugal Blood Pumps." Fall Meeting of the Biomedical Engineering Society, October 2001, Raleigh-Durham, North Carolina.
27. A.L. Throckmorton, P.E. Allaire, H.P. Gutgesell, G.P. Matherne, D.B. Olsen, H.G. Wood, J.H. Allaire, and S.M. Patel. "Pediatric Assist Devices - A Literature Review." 9th Congress of the International Society of Rotary Blood Pumps, August 2001, Seattle, Washington.

OTHER CONFERENCE ABSTRACTS NOT CRITICALLY REVIEWED (1 in total)

1. A.L. Throckmorton, A. Untaroiu, P.E. Allaire, H.G. Wood, D.S. Lim, and D.B. Olsen. "Optimized Design of an Axial Flow VAD for Pediatric Cardiac Failure Patients." Annual University of Virginia Children's Medical Center Research Day, in Charlottesville, Virginia, May 20, 2004.

RECENT TECHNICAL REPORTS (6 in total)

1. *A.L. Throckmorton* (2010). Mechanical Cavopulmonary Assist for the Neonatal Single Ventricle Physiology. Final Report under Jeffress Memorial Trust Grant Number: J-874 (Phase I and II). Richmond, VA: Virginia Commonwealth University.
2. *A.L. Throckmorton* (2009). BRIGE: Reversing the Fontan Paradox: Univentricular Circulation with Mechanical Cavopulmonary Assist. Annual Report under National Science Foundation BRIGE Program, Award: EEC-0823383. Arlington, VA: Virginia Commonwealth University.
3. *A.L. Throckmorton* (2009). American Heart Association. Cavopulmonary Assist for the Univentricular Fontan Circulation. Annual Report under AHA Beginning Grant-in-Aid Program, Award: 0865320E. Dallas, TX: Virginia Commonwealth University.
4. *A.L. Throckmorton* (2010). American Heart Association. Cavopulmonary Assist for the Univentricular Fontan Circulation. Final Report under AHA Beginning Grant-in-Aid Program, Award: 0865320E. Dallas, TX: Virginia Commonwealth University.
5. *A.L. Throckmorton* (2010). Oak Ridge Associated Universities (ORAU). Cavopulmonary Assist for the Univentricular Fontan Circulation. Final Report under ORAU Ralph E. Powe Faculty Enhancement Award. Oak Ridge, TN: Virginia Commonwealth University.
6. *A.L. Throckmorton* (2010). BRIGE: Reversing the Fontan Paradox: Univentricular Circulation with Mechanical Cavopulmonary Assist. Final Report under National Science Foundation BRIGE Program, Award: EEC-0823383. Arlington, VA: Virginia Commonwealth University.

APPROVED AND ACTIVE PROTOCOLS FROM VCU INSTITUTIONAL REVIEW COMMITTEES

1. *A.L. Throckmorton* (2008). "Bovine Blood Collection for Hemocompatibility Evaluations of Biodevices for Circulatory Flow Augmentation." Approved IACUC Study: AM10184. Richmond, VA: Virginia Commonwealth University. Continued.
2. *A.L. Throckmorton* (2008). "Retrospective Study for Imaging Data of Vessel Configurations in Patients with Single Ventricle Physiology." Approved IRB Study: HM11360. Richmond, VA: Virginia Commonwealth University. Continued.
3. *A.L. Throckmorton* (2009). "Clinical Measurement of Pressure Augmentation in the Systemic Venous Circulation using Medical Anti-Shock Trousers." Approved IRB Study: HM11906. Richmond, VA: Virginia Commonwealth University. Continued.
4. *A.L. Throckmorton* (2011). "Pilot Study of External Pulsation Treatment for Fontan Patients." Approved IRB Study: HM13521. Richmond, VA: Virginia Commonwealth University. New.

GRANTS AND CONTRACTS

At the Virginia Commonwealth University

ACTIVE (2 grant)

Role: Co-Director
Collaborator(s): Rosalyn Hobson (VCU) – Co-Director
Agency: United States Department of Education, Graduate Assistance in Areas of National Need (GAANN Program) Grant Number: P200A090260
Title: Interdisciplinary Graduate Engineering Education and Research (I-GEEAR)
Initiation Date: 08/15/09 Termination Date: 08/14/12
Total Award Amount Requested: \$922,919
Throckmorton share of funding: \$369,168 (10% effort as cost-share, 40% instit. credit)

Role: Co-Investigator
Collaborator(s): William Moskowitz, VCU (PI)
Agency: AD Williams Research Program – Internal VCU
Title: Controlled Blade Pitch-Adaptation for Intravascular Blood Pumps
Initiation Date: 05/1/2011 Termination Date: 04/31/2012
Total Award Amount Requested: \$15,000 (Throckmorton share of funding: \$0)

PENDING

Role: P.I.
Collaborator(s): William Moskowitz (VCU, Pediatric Cardiology), Ajit Yoganathan (Ga. Tech), Vig Kasirajan (VCU), James Gangemi (UVA), 3D Design and Manufacturing, Applied Rapid Technologies, Nitinol Development Corporation
Agency: The Children's Heart Foundation
Title: Novel Percutaneous Blood Pump for Fontan Patients
Initiation Date: 01/1/2012 Termination Date: 12/31/2013
Total Award Amount Requested: \$200,000 (Throckmorton share of funding: \$200,000)

Role: P.I.
Collaborator(s): William Moskowitz (VCU, Pediatric Cardiology), Ajit Yoganathan (Ga. Tech), Ramana Pidaparti (VCU), 3D Design and Manufacturing, Applied Rapid Technologies, Nitinol Development Corporation
Agency: National Institutes of Health, NHLBI
Title: Uniquely Shaped Stents and Blade Pitch-Adaptation for Intravascular Blood Pumps
Initiation Date: 07/1/2012 Termination Date: 6/30/2014
Total Award Amount Requested: \$410,597 (Throckmorton share of funding: \$371,905)

Role: P.I.
Collaborator(s): Ellen J. Bass (UVA), Vig Kasirajan (VCU), Suzie Harton (VCU), Michael Thibault (VCU), Levitronix LLC
Agency: National Institutes of Health, NHLBI
Title: Integration of Formal Methods and Human Factors for Blood Pumps

Initiation Date: 07/1/2012 Termination Date: 6/30/2014
Total Award Amount Requested: \$397,479 (Throckmorton share of funding: \$237,073)

Role: P.I.
Collaborator(s): N/A
Agency: National Science Foundation
Title: CAREER: Integration of Controlled Blade Pitch Adaptation: A New Design Spin for Heart Pumps
Initiation Date: 02/01/12 Termination Date: 1/31/2017
Total Award Amount Requested: \$400,000 (Throckmorton share of funding: \$400,000)

COMPLETED

Role: P.I.
Collaborator(s): Ajit Yoganathan (Ga. Tech); Alex Untaroiu (UVA);
Scott Gullquist (VCU-MCV); Rosalyn Hobson (VCU – Educational mentor).
Agency: National Science Foundation (Grant Number: EEC-0823383)
Title: BRIGE: Reversing the Fontan Paradox: Univentricular Circulation with Mechanical Cavopulmonary Assist
Initiation Date: 08/01/08 Termination Date: 7/31/10
Total Award Amount Requested: \$172,317
Throckmorton share of funding: \$172,317

Role: P.I.
Collaborator(s): Ajit Yoganathan (Ga. Tech); Alex Untaroiu (UVA);
Scott Gullquist (VCU-MCV); Ben Peeler (UVA/VCU-MCV).
Agency: American Heart Association Beginning Grant-in-Aid (Grant Number: 0865320E)
Title: Cavopulmonary Assist for the Univentricular Fontan Circulation
Initiation Date: 07/01/08 Termination Date: 6/30/10
Total Award Amount Requested: \$132,000
Throckmorton share of funding: \$132,000

Role: P.I.
Collaborator(s): William Moskowitz (VCU), Alex Untaroiu (UVA), Dave Modlin (3D Design and Manufacturing), and Sonna Patel (FDA)
Agency: Oak Ridge Associated Universities Ralph E. Powe Junior Faculty Enhancement Award
Title: Cavopulmonary Assist for the Failing Fontan Cardiophysiology
Initiation Date: 06/01/09 Termination Date: 05/31/10
Total Award Amount Requested: \$10,000
Throckmorton share of funding: \$10,000

Role: P.I.
Collaborator(s): None
Agency: Jeffress Memorial Trust (Phase II Continuance)
Title: Mechanical Cavopulmonary Assist for the Neonatal Single Ventricle Physiology
Initiation Date: 01/01/09 Termination Date: 12/31/09

Total Award Amount Requested: \$10,000
Throckmorton share of funding: \$10,000

Role: P.I.

Collaborator(s): Gary Bowlin, VCU BME
Agency: Jeffress Memorial Trust (Grant Number: J-874)
Title: Mechanical Cavopulmonary Assist for the Neonatal Single Ventricle Physiology
Initiation Date: 01/01/08 Termination Date: 12/31/08
Total Award Amount Requested: \$30,000
Throckmorton share of funding: \$30,000

Role: P.I.

Collaborator(s): None
Agency: Internal VCU – Center for Teaching Excellence
Title: Visualization and Computation for 21st Century Junior Engineers
Initiation Date: 01/01/08 Termination Date: 08/15/08
Total Award Amount Requested: \$1,595
Throckmorton share of funding: \$1,595

Role: P.I.

Collaborator(s): Hooman Tafreshi, VCU Mechanical Engineering
Agency: Internal VCU – Qimonda Pilot Project for Junior Faculty in the SoE
Title: PIV Measurements of Mechanical Cavopulmonary Assist in the Univentricular Fontan Circulation
Initiation Date: 04/01/08 Termination Date: 03/31/09
Total Award Amount Requested: \$5,000
Throckmorton share of funding: \$5,000

Role: Co-P.I. (Rosalyn Hobson, PI)

Agency: National Science Foundation (Grant Number: HRD-0318258)
Title: ADVANCE Leadership Award: Collaborative Research: Leadership Skills and Community Building Program for Junior Women Engineering Faculty in Engineering
Initiation Date: 10/1/2003, Co-PI status on 7/25/2008 Termination Date: 10/31/2009
Total Award Amount Requested: \$190,613

At the Indiana University School of Medicine

COMPLETED (1 grant)

Role: Co-P.I.

Collaborator(s): Mark Rodefeld (Indiana, PI)
Agency: Indiana University Purdue University in Indianapolis
Title: Expandable Blood Pump for Cavopulmonary Assist in the Fontan Circulation
Initiation Date: 01/01/07 Termination Date: 12/31/07
Total Award: \$29,035

GRADUATE STUDENT RESEARCH SUPERVISION

Medical Student - Research Assistant

Emily Downs, joined laboratory for Summer research in 2009, University of Virginia Medical Student, M.D. Class of 2012. University of Michigan, Ann Arbor, MI: B.S.E. in Biomedical Engineering, B.M. in Oboe Performance.

Masters Advisor

COMPLETED (3 students)

Jugal Kapadia, December 2009. “Development of a Mechanical Cavopulmonary Assist Device for the Failing Fontan.” Members: Amy Throckmorton (Advisor), Karla Mossi (ME), William Moskowitz (MCV), Defense held on Monday, October 12, 2009. *Immediately after graduation, Jugal worked for me as Lab Director and refined his skills in CFD. In August of 2010, he began employment as a research engineer for Jarvik Heart Incorporated in New York, NY. Now, as of February 2011, he is working as a Test Engineer for Advanced Bionics LLC in Valencia, CA.*

Steven Chopski, May 2010. “Particle Image Velocimetry Measurements of the Total Cavopulmonary Connection with Circulatory Flow Augmentation.” Members: Amy Throckmorton (Advisor), James McLeskey (ME), William Moskowitz (MCV), Defense held on Thursday, April 22, 2010. *Steven is continuing his graduate studies in pursuit of the Ph.D. under my direction.*

Sonya Bhavsar, May 2010. “Development of Mechanical Cardiovascular Assist Devices for Fontan Patients: Two Novel Approaches.” Members: Amy Throckmorton (Advisor), Karla Mossi (ME), William Moskowitz (MCV), Defense held on Thursday, April 22, 2010. *Sonya is continuing her graduate studies in the Department of Applied Medical Engineering at the Helmholtz Institute of RWTH Aachen University & Hospital.*

IN PROGRESS (4 graduate students)

Steven Chopski, Mechanical Engineering, M.S. 2010, Ph.D. expected in May 2013

Dhyaa Kafagy, Mechanical Engineering, Ph.D. expected in May 2014

Michael Sciolino, Mechanical Engineering, M.S. expected in May 2012

Joseph Hernandez, Biomedical Engineering, M.S. expected in May 2012

DISSERTATION / THESIS COMMITTEE MEMBER (2 additional students, 3 of my own)

Atheer M. Almasri, “Mechanical Behavior and Length Adaptation of Rabbit Bladder Smooth Muscle,” Ph.D. in Mechanical Engineering, December 2009. Role: Committee Member, Members: John Speich (Advisor), Paul Ratz (MCV), Ramana Pidaparti (ME), Karla Mossi (ME), Amy Throckmorton (ME), Dates: Proposal Defense, Monday, May 11th, 2009; Dissertation Defense, Wednesday, Oct. 28, 2009.

Antonio R. Walker, "Development of a Method for Evaluating Mechanical Heart Valve Performance in an Automated Mock Circulatory Loop," M.S. in Biomedical Engineering, August 2010. Role: Committee Member, Members: Jerry Miller (Advisor, BNE), Ding-Yu Fei (BME), and Amy Throckmorton (ME), Date: Thesis Defense on Friday, August 13th, 2010. More work required for signature.

Mentoring Highlights

Steven Chopski was honored with a 2010 Biomedical Engineering Student Award at the 6th International Conference of Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion for his manuscript and presentation entitled, "PIV Measurements of an Idealized Total Cavopulmonary Connection with Mechanical Circulatory Assistance in the IVC." This award included a monetary prize of \$500 and an engraved plaque.

Sonya Bhavsar was the recipient of an American Society for Artificial Internal Organs (ASAIO) Fellowship for her poster presentation entitled, "Use of External Pressure Application To Augment Fontan Hemodynamics." This awarded included a monetary prize of \$500 and certificate.

Sonya Bhavsar became the first engineering graduate student to receive the 2010 Susan Kennedy Award at the University level.

Sonya Bhavsar was honored with the 2009 Bioengineering Student Award at the 5th International Conference of Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion for her manuscript and presentation entitled, "Intravascular Mechanical Cavopulmonary Assistance for Patients with Failing Fontan Physiology." This award included a monetary prize of \$500 and an engraved plaque.

Jugal Kapadia was awarded an Honorable Mention at the 55th Annual Conference of the American Society for Artificial Internal Organs (ASAIO) for his Top ASAIO For Young Innovators abstract and presentation entitled, "Mechanical Cavopulmonary Assist using an Intravascular Axial Flow Blood Pump." This award includes a monetary prize of \$200 and a certificate of achievement.

Sonya Bhavsar and Steven Chopski became recipients of the VCU GAANN Fellowship as part of the I-GEEAR program at VCU. This funding was provided by the Department of Education Graduate Assistance in Areas of National Need (GAANN) to educate doctoral students who are interested in seeking positions in academia post-graduation. Sonya and Steven were selected in the first round of nominations out of 16 competitive applicants. There are currently 8 GAANN fellows, and another round of competition will be held in February of 2010.

UNDERGRADUATE STUDENT RESEARCH AND INTERNSHIP SUPERVISION

Senior Capstone Design Projects

2007 to 2008 – Primary advisor, Spring 2008; Co-advised with Bob Mattauch Fall 2007
ME Students: Stephanie Cutler (team leader), Joseph Rainey, and Tecora Ruffin. “Thrills and Chills for All the Masses: Adjustable Seat Roller Coaster Seat and Restraint System.” This project sought to develop a new seat design for a steel coaster that will improve comfort and accommodate riders of larger sizes (both heights and weights). Contact Hours: 38 hours (through May 2008)

2009 – Primary advisor, Spring and Fall 2009 (out of sequence project)
ME Students: Tom Wittenschlaeger (team leader), Tanisha Medina, and Hien Hoang. “Blood Pump Cage Development for use in Fontan Patients.” This project seeks to develop a novel cavopulmonary assist device through numerical analyses and experimental prototype testing. Contact Hours: 34 hours (through December 2009)

2009 to 2010 – Primary advisor, Fall 2009 and Spring 2010
ME Students: Rob Saxman (team leader), Colin West, Ignacio Landeros, Jeremy Clarke, Aaron Pierce. “Collapsible Percutaneously Inserted Axial Heart Pump.” This project seeks to develop the unique collapsible feature of an axial flow cavopulmonary assist device through numerical analyses and experimental prototype testing. Contact Hours: 38 hours (through May 2010)

2010 to 2011 – Primary advisor, Fall 2009 and Spring 2010
ME Students: Terrell Ward (team leader), Chris Kimberlin, Kevin Clark, John Monroe, and John Hazelwood. “Solar Powered Water Purification System.” This project seeks to develop a compact, high throughput water purification system that is powered by solar panel and could be used for disaster relief or in third world countries. Contact Hours: 40 hours (through May 2011)

2010 to 2011 – Primary advisor, Fall 2009 and Spring 2010
ME Students: James Carr (team leader), James Bryant, and Darryl Lawson. “Filament Design Optimization for Axial Blood Flow.” This project seeks to design and optimize a protective cage of filaments for use on a cavopulmonary assist device to support Fontan patients. Contact Hours: 31 hours (through May 2011)

Undergraduate & High-School Internships (18 students)

MECHANICAL ENGINEERING STUDENTS

1. Tom Wittenschlaeger, joined laboratory for Summer research in 2009.
2. Nathan Lam, joined laboratory for Summer research in July 2009.
3. Duncan Buie, joined laboratory for Summer research in July 2009.
4. Edward Jenkins, joined laboratory for Fall research in September 2009 and continued during the Spring semester of 2010.

5. James Carr, joined laboratory for Spring research in January 2010 and continued until Spring 2011.
6. Ryan Tate, joined laboratory for Summer internship in 2010 and continued during the Fall 2010.
7. Donald Traynham, joined laboratory for Summer internship in 2010 and continued during the Fall 2010.
8. Sharjeel Tahir, joined laboratory for Fall internship in 2010, Spring 2011.
9. John Hazelwood, joined laboratory for Summer internship in 2011
10. Jonathan Monroe, joined laboratory for Summer internship in 2011

BIOMEDICAL ENGINEERING STUDENTS

1. Celeste Austin, joined laboratory for Summer and Fall research in 2009
2. Steven Chopski, joined laboratory for Summer research in 2008
3. Nika Bejou, joined laboratory and assisted with research on counterpulsation, Spring 2008

SUMMER SCHOLARS – HOWARD HUGHES MEDICAL INSTITUTE AT VCU

1. Amy Poupore, joined laboratory for Summer research in 2009, Biology major
2. Kathryn Pierce, joined laboratory for Summer research in 2009, Biology major
3. Chelsea Powell, joined laboratory for Summer research in 2010, Biomedical engineering major

VCU – IIT KHARAGPUR SUMMER RESEARCH PROGRAM

1. Ravi A. Kishore, joined laboratory for Summer research in 2008, IIT Roorkee Campus

RICHMOND TECHNICAL CENTER GOVERNOR’S SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS PROGRAM FOR UNDERREPRESENTED GROUPS

1. Syndee Lopes, RTC High-school student; joined laboratory for Spring and Summer research in 2011

Undergraduate and Graduate Student Recommendation Letters

1. Eddie McCumiskey: 2008 VCU Outstanding GTA Award; he was awarded a second place finish.
2. Joseph Saylor, Undergraduate: Two NASA Internships
3. Anthony Laschon, Undergraduate: Three Scholarship Letters, Weber Metals Scholarship Program, ASME Auxiliary, Inc. Undergraduate Scholarship (Awarded), American Railway Engineering and Maintenance of Way Association (AREMA) Scholarship
4. Tyler Morris, Undergraduate: Reference for summer internship at Areva NP, in Lynchburg, VA
5. Sonya Bhavsar, Graduate Student, 2009 VCU Graduate Student Scholarship.
6. Ian Brown, Undergraduate: VCU Eugene P. Trani Leadership Scholarship for the School of Engineering
7. Bobby Lehman, Undergraduate: VCU Eugene P. Trani Leadership Scholarship for the School of Engineering
8. Sony Bhavsar, Graduate Student, 2009 I-GEEAR GAANN Fellowship Application, Awarded
9. Steven Chopski, Graduate Student, 2009 I-GEEAR GAANN Fellowship Application, Awarded

10. (4) Ian Brown, Undergraduate: Graduate Studies at the University of Virginia, the University of Washington, North Carolina State, Virginia Commonwealth University.
11. Thomas Winter, Undergraduate: Acceptance into the International Student Exchange Program (ISEP) to study abroad at Växjö University in Sweden.
12. Lauren Edgerton, Undergraduate: Reference for her summer intern position at the Naval Surface Warfare Center in Dahlgren, Virginia.
13. Daniel Carlisle, Undergraduate: Reference for summer intern positions; application in process.
14. Sonya Bhavsar, Graduate Student: Recommendation for 2010 Susan Kennedy Award at the University level.
15. Chris Kimberlin, Undergraduate: Reference for summer intern positions; application in process.
16. Blake Casavant, Undergraduate: Reference for summer intern positions; application in process. Reference letter for 2010 ASME Undergraduate Scholarship.
17. Casey Ferguson, Undergraduate: 2010 VCU STEM Scholarship Recommendation Letter.
18. Christopher Drueke, Undergraduate: Recommendation letter for 2010 Malcolm Pirnie Summer Internship.
19. Dillard "Curtis" Patton, Undergraduate: 2010 VCU STEM Scholarship Recommendation Letter. He won this scholarship.
20. Robert Skalet, Undergraduate: 2010 VCU STEM Scholarship Recommendation Letter.
21. Ryan Andrews, Undergraduate: 2010 VCU STEM Scholarship Recommendation Letter.
22. Antonio Walker, Graduate Student: Reference and recommendation letter for employment at Novan in the Raleigh-Durham Area.
23. James Daniel, Undergraduate: Reference for 2010 VCU Continuing Student Scholarship.
24. Stephen Henning, Undergraduate: Reference and recommendation for summer internship position.
25. Sonya Bhavsar, Graduate Student: Recommendation for 2010 VCU School of Engineering Outstanding Graduate Teaching Assistant.
26. Amr Hamadi, Undergraduate: Reference for 2010 VCU Continuing Student Scholarship.
27. Stefan Harris, Undergraduate: Reference for 2010 VCU Continuing Student Scholarship.
28. Mathew Burnette, Undergraduate: Reference for 2010 VCU Tutor program
29. Devon Miller, Undergraduate: Recommendations letters (4) for graduate programs in Nuclear Engineering (2010); ANS Scholarship (1).
30. Ryan Tate, Undergraduate: Recommendation letter for graduate school at VCU (2010).
31. James Carr, Undergraduate: Recommendation letters (5) for graduate programs in Mechanical Engineering (2010).
32. Ravi Kishore, former summer intern student: Recommendation letters (8) for graduate programs in Mechanical Engineering (2010).
33. Darryl Lawson, Undergraduate: Recommendation letter for Navy Internship (2011).
34. Brandon Atwater, Undergraduate: Recommendation letter for internship at Applied Research Laboratory at Johns Hopkins (2011).
35. Devon Miller, Undergraduate: Recommendation for Outstanding Senior Award 2011.
36. Marissa Shaffer, Undergraduate: Recommendation for ASCO Scholarship, 2011.
37. Kacey Pierce, Undergraduate: Recommendation for Medical School, 2011.

COURSE TEACHING

Graduate Teaching

EGRM 630: Advanced Biofluid Mechanics, Fall 2008. 6 students, Total Contact Hours: 82.

ENGR 591: Special Topics: Biofluid Mechanics, Summer 2008. 1 student; Total Contact Hours: 36.

ENGR 692: Independent Study: Special Topics: Thermal & Biofluid Mechanics, Spring 2011: 2 students; Total Contact Hours: 38.

Undergraduate Teaching

Spring 2008: EGRM 215: Engineering Visualization and Computation, 117 undergraduate students, 4 1 hr-50 min workshop / lab sessions, Supervised Three Teaching Assistants: Eddie McCumiskey (GTA), Fil Amaral (grader), and Joey Garthaffner (grader). Total Contact Hours: 122.

Spring 2009: EGRM 215: Engineering Visualization and Computation, 113 undergraduate students, 4 1 hr-50 min workshop / lab sessions. Supervised Four Teaching Assistants: Sonya Bhavsar (GTA), Fil Amaral (grader), Devon Miller (grader), and Joseph Saylor (grader). Total Contact Hours: 108.

Summer 2009: ENGR 492: Independent Study: Advanced Engineering Computation and Visualization, 1 student; Total Contact Hours: 22.

Fall 2009: ENGR 301: Fluid Mechanics, 103 undergraduate students. Supervised Two Teaching Assistants: George Scott (GTA) and Mohamed Samaha (GTA). Total Contact Hours: 134.

Spring 2010: EGRM 215: Engineering Visualization and Computation, 162 undergraduate students, 5 1 hr-50 min workshop / lab sessions. Supervised Four Teaching Assistants: Sonya Bhavsar (GAANN GTA), Devon Miller (grader), Joseph Saylor (grader), and Amr Hamadi (grader). Total Contact Hours: 166.

Spring 2011: EGRM 215: Engineering Visualization and Computation, 140 undergraduate students, 4 1 hr-50 min workshop / lab sessions. Supervised Four Teaching Assistants: Michael Sciolino (GTA), Steven Chopski (GAANN GTA), Devon Miller (grader), Brian Mullsteff (grader), and James Carr (grader). Total Contact Hours: 168.

PROFESSIONAL LEADERSHIP AND SERVICE ACTIVITIES

Service to the School of Engineering at VCU

- Committee Member, Qimonda Chair Selection Committee, March 2011 – May 2011. Members: Jennifer Wayne (chair), Mohamed Gad-el-Hak, Hooman Tafreshi, Raj Rao, Amy Throckmorton, Paul Wetzel, Hu Yang, Lorraine Parker.
- Committee Member, Qimonda Chair Selection Committee, Jan. 2010 – April 2010. Members: Worth Longest (chair), Gary Bowlin, Kayvan Najarian, Alex Docef, Hooman Tafreshi, Raj Rao, Amy Throckmorton.
- Faculty Advisor, New Student Organization, American Society for Artificial Internal Organs (ASAIO) For Young Innovators (FYI) Student Chapter at VCU, the first of its kind across the country.
- Faculty Advisor, New Student Organization, Internal Combustion Concept and Design Association at VCU.

Service to the Mechanical Engineering Department at VCU

- Member of Committees, Accreditation Board for Engineering and Technology (ABET), 2011
 - *General Group Committee*: Jim McLeskey (Chair), Amy Throckmorton, Worth Longest, Frank Gulla, and Karla Mossi
 - *Thermal-fluid Sciences Committee*: Worth Longest (Chair), Amy Throckmorton, Hooman Tafreshi, Mohamed Gad-el-Hak, Manu Mital, and Jim McLeskey
- Committee Member, Faculty Search for a Full-time Collateral Assistant/Associate Professor in Mechanical and Nuclear Engineering, March 2011 – Present, Members: Manu Mital (chair), John Speich, Sama Bilbao y Leon, Rama Pidaparti, Gary Atkinson, Amy Throckmorton.
- Committee Member, Faculty Search for Two Open Faculty Position (all levels) to Develop the Nuclear Engineering Track, Summer 2009 – Fall, Members: Worth Longest (chair), Jim McLeskey, Ramana Pidaparti, Hooman Tafreshi, Amy Throckmorton: Hired Brian Hinderliter and Sama Bilbao Y Leon.
- Committee Member, Faculty Search for Open Faculty Position (tenure-track position at the assistant professor rank or higher, and a non-tenure-track position at the teaching assistant professor rank or higher) to Develop the Nuclear Engineering Track, September 2008 – July 2009, Members: Worth Longest (chair), Gary Tepper, Ramana Pidaparti, Amy Throckmorton: Hired Ross Anderson.
- Member of the Ad Hoc Committee in the search of a new administrative assistant for the Mechanical Engineering Department, March 2008
- New Student Orientation, Summer 2008, Student Advising, Met with new freshmen/transfer students, Met with 15 new freshmen students, 8:15 am until 11 am.
- New Student Orientation, June 30, 2009, Student Advising, Met with 15 new freshmen students, 8:15 am until 11 am.

The Practice of One's Profession

Society Boards

- Member, Board of Directors, American Society for Artificial Internal Organs (ASAIO),
5/30/2010 – 6/12/2011

Editorships / Editorial Boards

- Member of the Editorial Board for the *ASAIO Journal*: 2007 to Present
- Member of the Publication committee of the Editorial Board for the *ASAIO Journal*: 2008-2009
- Member of the Editorial Board for the journal *Artificial Organs*: 2008 to Present

Invited Talks

- Invited Conference Speaker, June 1, 2011, “World Conference on Mathematical Modeling and Computer Simulation in Cardiovascular & Cardiopulmonary Dynamics” held at the College of William & Mary, 31 May - 3 June 2011.
- Distinguished Lecturer Series, Speaker, November 30, 2009, Department of Mechanical Engineering, Virginia Commonwealth University, “Biodevices for Circulatory Flow Augmentation in the Fontan Physiology.”
- Invited Seminar Speaker on November 30, 2009, Department of Biology, Virginia Commonwealth University, Richmond, Virginia; “Biodevices for Circulatory Flow Augmentation in the Fontan Physiology.”
- Invited Conference Speaker, October 15, 2009, Virginia Commonwealth University, “Modeling the Heart in 3D: VCU/NIH-NHLBI Fall 2009 Conference.” October 14 – 17, 2009.
- Seminar speaker on March 19, 2009, Department of Mechanical and Aerospace Engineering, University of Virginia, Charlottesville, Virginia; “Biodevices for Circulatory Flow Augmentation in Pediatric Patients.”
- Seminar speaker on December 10, 2008, 6th Annual Research Review, Center for the Study of Biological Complexity, Virginia Commonwealth University; “Biodevices for Circulatory Flow Augmentation in Pediatric Patients”.
- “Biodevices for Circulatory Flow Augmentation” – Invitation from Regents’ Professor Ajit Yoganathan at Georgia Tech in Atlanta, Georgia. Delivered talk on 11/28/2007.
- Seminar speaker on March 20, 2007, Mechanical and Aerospace Engineering, University of Virginia, Charlottesville, Virginia; “Mechanical Cavopulmonary Assist for the Univentricular Fontan Circulation using a Folding Propeller Blood Pump”.
- Working Luncheon Speaker at the American Society for Artificial Internal Organs (ASAIO) For Young Innovators (fyi) – Academics vs. Industry, at the 53rd Anniversary Conference of ASAIO in Chicago, IL, USA, June 7 - 9, 2007.

Reviewer for National Conferences

- Reviewer for Bioengineering Abstracts, Jan. 20 – 22, 2010, 56th Annual Conference of the American Society for Artificial Internal Organs in Baltimore, MD, USA, May 27 – 29, 2010. 79 abstracts for this track of the conference.
- Reviewer for Cardiovascular Design Abstracts, Jan. 20 – Feb. 12, 2010, 2010 Summer Bioengineering Conference of the American Society of Mechanical Engineers, Naples, FL, USA, June 16-19, 2010.
- Reviewer for Cardiovascular Design Abstracts, Jan. 26 – Feb. 9, 2011, 2011 Summer Bioengineering Conference of the American Society of Mechanical Engineers, Farmington, PA, USA, June 22-25, 2011.
- Reviewer for Bioengineering Abstracts, Jan. 29 – Feb. 11, 2011, 57th Annual Conference of the American Society for Artificial Internal Organs in Washington, DC, USA, June 10 – 12, 2011. 74 abstracts for this track of the conference. Assigned abstracts to slide and poster sessions.

Professional Society Memberships

- American Society for Artificial Internal Organs (ASAIO), 2004 to Present
- American Society of Mechanical Engineers (ASME), 2007 to Present
- Biomedical Engineering Society (BMES), 2008 to Present
- International Society for Pediatric Mechanical Cardiopulmonary Support, Fellow and Founding Member, 2010 to Present

Professional Society Leadership Roles and Committee Assignments

- Chair, Bioengineering Track, 2011-2012 Program Planning Committee for the American Society for Artificial Internal Organs (ASAIO), in San Francisco, CA, USA.
- Associate Chair, Bioengineering Track, 2010-2011 Program Planning Committee for the American Society for Artificial Internal Organs (ASAIO), in Washington, DC, USA.
- Co-Moderator at the 57th Annual Conference of the American Society for Artificial Internal Organs (ASAIO), in Washington, DC, USA, June 10-12, 2011, for the Bioengineering slide session #3 entitled "Biological Approaches to Organ Replacement."
- Program Planning Committee Member, ASAIO, 5/2011 – 6/2012.
- Co-Moderator at the 56th Annual Conference of the American Society for Artificial Internal Organs (ASAIO), in Baltimore, MD USA, May 27 – 29, 2010, for the Bioengineering slide presentation session entitled "Artificial Organ Development."
- Co-Moderator at the 6th International Conference on Pediatric Mechanical Circulatory Support, in Boston, MA USA, May 5 – 8, 2010, for the Engineering portion of the entitled "Regular Slide Presentations #4" session.
- Co-Moderator at the 55th Annual Conference of the American Society for Artificial Internal Organs (ASAIO), in Dallas, TX USA, May 28 – 30, 2009, for the poster session entitled "Moderated Poster Session 2-C: Bioengineering." (Substitute for Dr. Ashraf Khir who was unavailable; Assigned by Karen Burke, Executive Director of ASAIO).
- Co-Chair and Moderator at the 5th International Conference on Pediatric Mechanical Circulatory Support, in Dallas, TX USA, May 28 – 30, 2009, for the session entitled "Slide Presentation #2: CPB and Bioengineering"
- Co-Moderator at the 55th Annual Conference of the American Society for Artificial Internal Organs (ASAIO), in Dallas, TX USA, May 28 – 30, 2009, for the session entitled "Slide Presentation #11: Bioengineering Session"
- 2009 Member of Program Planning Committee for 55th Annual Conference of the American Society for Artificial Internal Organs (ASAIO)
- Working Luncheon #2 Host at the 54th Annual Conference of the American Society for Artificial Internal Organs (ASAIO) in San Francisco June 19-21, 2008
- Co-Moderator at the 54th Annual Conference of the American Society for Artificial Internal Organs (ASAIO) in San Francisco June 19-21, 2008, for slide session entitled, "Bioengineering".
- Co-Moderator at the 54th Annual Conference of ASAIO in San Francisco June 19-21, 2008, for poster presentations entitled, "Cardiac 10".
- ASAIO Website Section Editor for the Government Research Funding Opportunities, 3/2008 to Present.
- ASAIO Website Section Editor for the Project Bionics, Artificial Organs Education, Government and Funding, and Research Reports, 10/2007 to Present

- Executive Committee Member for ASAIO For Young Innovators (fyi), 10/2007 to 1/2008.
- Member of Marketing & Membership Committee, ASAIO, 4/2005 – 4/2007.
- Co-Founder & Vice President of ASAIO For Young Innovators (fyi), New Student Chapter within ASAIO, 12/2004 – 4/2007.
- Website Developer for ASAIOfyi, 12/2004 – 8/2007
- Co-Moderator for Poster Session #2 at the 3rd International Conference on Pediatric Mechanical Circulatory Support Systems and Pediatric Cardiopulmonary Perfusion in Hershey, PA, USA, May 17 - 19, 2007.
- Invitation to serve as a Participant on a Symposium on Pediatric Mechanical Circulatory Support at the Joint Congress of the JSAO – IFAO in Osaka, Japan, October 28 – 31, 2007.
- Program Planning Committee Member, ASAIO, 6/2006 - 6/2007
- Co-Moderator at the 53rd Annual Conference of ASAIO in Chicago, IL, USA, June 7 - 9, 2007, for the session entitled "Pediatric Circulatory Support".
- Co-Moderator at the 53rd Annual Conference of ASAIO in Chicago, IL, USA, June 7 - 9, 2007, for the session entitled "Bioengineering".
- Co-Moderator at the 53rd Annual Conference of ASAIO in Chicago, IL, USA, June 7 - 9, 2007, for the session entitled "Cardiac #3".
- Co-Moderator at the 53rd Annual Conference of ASAIO in Chicago, IL, USA, June 7 - 9, 2007, for the session entitled "Cardiac #4".

Reviewer for Journals (11 journals)

2008 – Present	International Journal of Artificial Organs
2008 – Present	Journal of Biomechanical Engineering
2008 – Present	Annals of Biomedical Engineering
2008 – Present	Journal of Medical Devices
2008 – Present	Journal, Methods of Information in Medicine
2006 – Present	ASAIO Journal
2004 – Present	Artificial Organs Journal
2009 – Present	Journal of Fluids Engineering
2010 – Present	Medical Engineering and Physics Journal
2010 – Present	Journal of Cardiovascular Engineering and Technology
2011 – Present	Future Cardiology

(14 reviews – 2007-2008; 15 reviews – 2008-2009; 10 reviews – 2009-2010;
16 reviews – 2010-2011 to-date; 2 reviews – 2011-2012)

Grant Review

- Panel Reviewer, National Science Foundation in Arlington, Virginia, on June 26-27, 2008
- Panel Reviewer, National Institutes of Health, in Rockville, Maryland, on Oct. 14-15, 2010.
- Panel Reviewer, National Science Foundation in Arlington, Virginia, on May 11-12, 2011.

Class Lectures

- Class Lecturer on October 25, 2010, Mechanical Engineering Freshmen Class, EGRM 101, James McLeskey, “Biodevices for Circulatory Flow Augmentation in Pediatric Patients.” Both sections of his 101 course.
- Class Lecturer on October 19, 2009, Mechanical Engineering Freshmen Class, EGRM 101, James McLeskey, “Biodevices for Circulatory Flow Augmentation in Pediatric Patients.”

- Class Lecturer on November 1, 2008, Mechanical Engineering Freshmen Class, EGRM 101, James McLeskey, “Biodevices for Circulatory Flow Augmentation in Pediatric Patients.”

Professional Development

- Workshop for Young Women Faculty, “Defining Our Way: Navigating the Tenure Process,” VCU School of Engineering, The Jefferson Hotel, Richmond, VA, 6/5/2008 – 6/7/2008.
- Center for Teaching Excellence at VCU, Summer Institute on Teaching and Learning, 5/12/2008 to 5/16/2008.
- Workshop on Computer Methods for Cardiovascular Devices, U.S. Food and Drug Administration, National Heart Lung and Blood Institute, and National Science Foundation, Bethesda, MD, March 18 – 19, 2008.
- ADVANCE Leadership Workshop, Sponsored by the National Science Foundation, Carolina Beach, NC, 7/31/2007 – 8/3/2007.
- Co-Organized and Attended, ADVANCE Leadership Workshop, Sponsored by the National Science Foundation, Virginia Beach, VA 7/20/2009 – 7/25/2009.
- VCU Center for Teaching Excellence New Faculty Mentorship Program 2007, Faculty Mentor: Dr. Jennifer Wayne, Professor of Biomedical Engineering.

Leadership, Citizenship, Mentoring, Public Service

- Invited Talk to the Graduating Class of the Virginia Governor’s Academy for Engineering Studies, Lloyd C. Bird High-school, May 31, 2011: “Navigating Your Pathway to Success: Today’s Junior Engineer – Tomorrow’s Future.”
- VCU Faculty Support for the Richmond Technical Center STEM Program
 - Member of Technical Advisory Board for the STEM Program
 - Attended Open House on 2/24/2011 in support of program’s efforts
 - Attended Project-Lead-the-Way (PLTW) certification review on Tuesday, June 14, 2011.
 - Mentor for Sydnee Lopes, a STEM high-school student at RTC, 2011
- Richmond Technical Center STEM Program – Presentation to more than 90 underrepresented STEM high-school students about mechanical and biomedical engineering research. January 20, 2011.
- Richmond Technical Center STEM Program – Presentation to more than 20 underrepresented STEM high-school students about bioengineering-related research. August 9, 2011.
- Representative Judge from VCU for the Coaster Building Contest for the Math & Science Day at King’s Dominion, May 16, 2008 and May 15, 2009.
- Kempsville High School, Virginia Beach Public School System – Presentation to more than 50 Gifted and Talented Students about the “Wonder of Engineering and Biomedical Engineering Research”, October 2, 2007.
- Kempsville High School, Virginia Beach Public School System – Presentation to more than 50 Gifted and Talented Students about “Engineering the American Dream”, March 9, 2009.

- Charlottesville / Albemarle Rescue Squad EMT-Basic: Cumulative Volunteer Hours, 4000 hours, 2002 – 2006.
- Hercules Incorporated, Chemical Specialties Company Service Positions, Wildlife Habitat Hercules Team Leader; Hercules Environmental Team Member; United Way Hercules Team Treasurer, 1998 – 2000.