David S. Molony, Ph.D.

Postdoctoral Fellow, Division of Cardiology, School of Medicine
Emory University
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EDUCATION

Doctor of Philosophy *Oct 2005-Jan 2010*
Department of Mechanical & Aeronautical Engineering
University of Limerick, Ireland
Dissertation title: *'Fluid-structure Interaction in Patient-specific Abdominal Aortic Aneurysms Treated with an Endovascular Stent-graft'*

Bachelor of Engineering *Sep 2001-May 2005*
Department of Mechanical & Aeronautical Engineering
University of Limerick, Ireland

RESEARCH EXPERIENCE

Post-doctoral Fellow *July 2015-present*
Division of Cardiology, School of Medicine
Emory University
Advisor: Habib Samady, M.D. *Jan 2011-June 2015*

Post-doctoral Fellow
Wallace H. Coulter Department of Biomedical Engineering
Georgia Institute of Technology
Advisor: Don Giddens, Ph.D.

Graduate Research Student *Sep 2005-Jan 2010*
Centre for Applied Biomedical Engineering Research
Department of Mechanical & Aeronautical Engineering
University of Limerick, Ireland
Advisors: Tim McGloughlin, Ph.D. and Michael Walsh, Ph.D.

TEACHING EXPERIENCE

Course Instructor
BMED 3300 - Biotransport *May 2014-Jul 2014*
Wallace H. Coulter Department of Biomedical Engineering
Georgia Institute of Technology

Facilitator
BMED 1300 - Problems in BME I *Aug 2013-May 2014*
Wallace H. Coulter Department of Biomedical Engineering
Georgia Institute of Technology

Undergraduate Teaching Assistant *Sep 2006-May 2008*
Department of Mechanical & Aeronautical Engineering
University of Limerick, Ireland

AWARDS & HONORS

Coursera - Neural Networks and Deep Learning	*Sep 2017*
Coursera – Stanford Machine Learning	*Dec 2015*
American Heart Association Postdoctoral Fellowship	*Aug 2013-Jul 2015*
Petit Scholar Mentor	*Jan-Dec 2014*
Gandy Diaz Teaching Fellowship	*Aug 2013-May 2014*
Engineers Ireland Biomedical Research Medal Runner-up	*Jan 2010*

SCIENTIFIC & PROFESSIONAL ACTIVITIES

Journal Reviewer for *Annals of Biomedical Engineering, Cardiovascular Engineering & Technology, Computers in Biology and Medicine, International Journal of Computer Assisted Radiology and Surgery, Journal of Biomechanics, Journal of Biomechanical Engineering – transactions of the ASME, Journal of Medical Devices – transactions of the ASME, , Journal of the American College of Cardiology – Cardiovascular Interventions, Journal of Endovascular Therapy, Medical & Biological Engineering & Computing, Medical Engineering & Physics, Proceedings of IMECHE Part H – Journal of Engineering in Medicine, PLOS Computational Biology,* Jan 2009-present
Selection Committee for Petit Scholar students, Georgia Tech, August 2014
Laser safety officer, University of Limerick, Jan 2008-Jan 2010
Member of Biomedical Engineering Society (BMES)

INVITED SEMINARS/SYMPOSIA

1. Georgia Institute of Technology, Atlanta, USA, May 2009
2. Georgia Institute of Technology, Atlanta, USA, May 2013
3. Optics in Cardiology, Rotterdam, Netherlands, April 2017

PUBLICATIONS

1. **Molony, D.S.**, Callanan, A., Morris, L.G., Doyle, B.J., Walsh, M.T., McGloughlin, T.M., 2008 "Geometrical Enhancements for Abdominal Aortic Stent-grafts" *J Endovasc Ther*, Vol 15(5), pp. 518-529

2. **Molony, D.S.**, Callanan, A., Kavanagh, E.G., Walsh, M.T., McGloughlin, T.M., 2009, "Fluid-structure interaction of a patient-specific abdominal aortic aneurysm treated with a endovascular stent-graft" *Biomed Eng Online*, Vol. 8, pp. 1-12

3. **Molony, D.S.**, Kavanagh, E.G., Madhavan, P., Walsh, M.T., McGloughlin, T.M., 2010, "A Computational Study of the Magnitude and Direction of Migration Forces in Patient-specific Abdominal Aortic Stent-grafts" *Eur J Vasc Endo Surg*, Vol. 40(3), pp. 332-339

4. Corbett, T.J., **Molony, D.S.**, Callanan, A., McGloughlin, T.M., 2011, "The effect of vessel material properties and pulsatile wall motion on the fixation of a proximal stent of an endovascular graft" *Med Eng & Physics*, Vol. 33(1), pp. 106-111

5. **Molony, D.S.**, Broderick, S., Callanan, A., McGloughlin, T.M., Walsh, M.T., 2011, "Fluid-structure interaction in Healthy, Diseased and Endovascularly Treated Abdominal Aortic Aneurysms" *Stud Mechanobiol Tissue Eng Biomater*, Vol 7, pp. 163-179

6. Gogas, B.D., King, S.B., Timmins, L.H., Passerini, T., Piccinelli, M., Veneziani, A., Kim, S., **Molony, D.S.**, Giddens, D.P., Serruys, P.W., Samady, H., 2013, "Biomechanical assessment of fully bioresorbable devices" *JACC:Card Interv*, Vol. 6(7), pp.760-761

7. Timmins, L.H., Gupta, D., Corban, M.T., **Molony, D.S.,** Oshinski, J.N., Samady, H., Giddens, D.P., 2014, "Co-localization of disturbed flow patterns and occlusive cardiac allograft vasculopathy lesion formation in heart transplant patients" *Cardiovasc Eng & Tech*, Vol 6(1), pp. 25-35

8. **Molony, D.S.,** Timmins, L.H., Rasoul-Arzumly, E., Samady, H., Giddens, D.P., 2014, "Investigation of the influence of side-branches on wall shear stress in coronary ultrasound arteries reconstructed from intravascular ultrasound" *Comp Bio Med*, pp. 41-52

9. Timmins, L.H., **Molony, D.S.,** Eshtehardi, P., McDaniel, M.C., Oshinski, J.N., Samady, H., Giddens, D.P., 2015, "Focal association between wall shear stress and coronary artery disease progression" *Ann Bio Eng*, Vol 43(1), pp. 94-106

10. **Molony, D.S.,** Timmins, L.H., Hung, O.H., Rasoul-Arzrumly, E., Samady, H., Giddens, P.G., 2015, "An assessment of intra-patient variability on observed relationships between wall shear stress and plaque progression in coronary arteries", *Biomed Eng Online*, Vol 14, S2

11. Hung, O.Y., **Molony, D.S.,** Corban, M.T., Rasoul-Arzrumly, E., Maynard, C., Eshtehardi, P., Dhawan, S., Timmins, L.H., Piccinelli, M., Ahn, S., Gogas, B.D., McDaniel, M.C., Quyyumi, A.A., Giddens, D.P., Samady, H., "Comprehensive assessment of coronary plaque progression with advanced intravascular imaging, physiological measures, and wall shear stress: A pilot double-blinded randomized controlled clinical trial of nebivolol versus atenolol in nonobstructive coronary artery disease", *J am Heart Assoc*, Vol 5, pp. e002764

12. Timmins, L.H., Suo, J., Eshtehardi, P., **Molony, D.S.,** McDaniel, M.C., Oshinski, J.O., Giddens, D.P., Samady, H., 2016, "Comparison of angiographic and IVUS derived geometric reconstructions for evaluation of the association of hemodynamics with coronary artery disease progression", *Int J Cardiovasc Img*, Vol 32, 1327

13. Timmins, L.H., **Molony, D.S**., Eshtehardi, P., Rasoul-Arzrumly E., Lam, A., Hung, O.Y., McDaniel, M.C., Oshinski, J.N., Giddens, D.P., Samady, H., 2016, "Quantification of the focal progression of coronary atherosclerosis through automated co-registration of virtual histology-intravascular ultrasound imaging data", *Int J Cardiovasc Img,* Vol 33(1), pp. 13-24

14. **Molony D.S.,** Timmins, L.H., Rasoul-Arzrumly, E., Giddens, D.P., Samady, H., 2016, "Evaluation of a framework for the co-registration of intravascular ultrasound and optical coherence tomography coronary artery pullbacks", *J Biomech*, Vol 49(16), p. 4048-4056

15. Timmins, L.H., **Molony, D.S.,** Eshtehardi, P., McDaniel, M.C., Oshinski, J.N., Giddens, D.P., Samady, H., 2016, "Oscillatory wall shear stress is a dominant flow characteristic affecting lesion progression patterns in patients with coronary artery disease", *J R Soc Interface*, Vol 14(127), 20160972

16. Samady, H., **Molony, D.S.** 2017, "The ongoing quest to predict plaque rupture", *J Am Coll Cardiol Img,* Vol 10(12), pp. 1484-1486

17. Guo, X., Giddens, D.P., **Molony, D.S.,** Yang, C., Samady, H., Zheng, J., Mintz, G.S., Maehara, A., Wang, L., Pei, X., Li, Z., Tang, D. 2017, "Combining IVUS and OCT for more accurate coronary cap thickness quantification and stress/strain calculations: A patient-specific 3D FSI approach", *J Biomech Eng,* Vol, 140(4) 041055

18. **Molony, D.S.,** Zhou, L., Park, J., Fleischer, C., Sun, H., Hu, X., Oshinski, J., Samady, H., Rezvan, A., Giddens, D.P. "Bulk flow and near wall hemodynamics of the rabbit aortic arch: A 4D PC-MRI study*", J Biomech Eng* (In press)

19. Kok, A.M., **Molony, D.S**., Timmins, L.H., Ko, Y., Boersma, E., Eshtehardi, P., Wentzel, J.J., Samady, H. 2017. "The influence of multidirectional shear stress on plaque progression and destabilization in human coronary arteries". *Eur Heart J*. (Under review)

20. Costopoulos, C., Timmins, L.H., Huang, Y., Hung, O.Y., **Molony, D.S.**, Davis, E., Brown, A., Teng, Z., Gillard, J., Samady, H., Bennett, M. 2017, "Combined plaque structural and wall shear stress in progression and regression of coronary atherosclerosis", *Circ*, (Under review)

21. Elliott, M.R., Kim, D., **Molony, D.S.**, Morris, L., Samady, H., Joshi, S., Timmins, L.H. "Establishment of an automated algorithm utilizing optical coherence tomography and micro-comuted tomography imaging to reconstruct the 3D deformed stent geometry ", *IEEE Trans Med Imaging*, (Accepted)

22. Kumar, A., Thompson, E.W., Lefieux, A., **Molony, D.S.**, Davis, E.L., Chand N., Fournier, S., Lee, H., Suh, J., Sato, K., Ko, Y., Molloy, D., Chandran, K., Hosseini, H., Gupta, S., Milkas, A., Gogas, B., Chang, H., Min, J.K., Fearon, W., Veneziani, A., Giddens, D.P., King III, S.B., De Bruyne, B., Samady, H. "High coronary wall shear stress in patients with stable CAD predicts subsequent myocardial infarction", *J Am Coll Cardiol*, (accepted)

23. Kumar A., Hung O.Y., Piccinelli, M., Eshtehardi P., Corban, M.T., Sternheim, D., Yang B., Lefieux, A., **Molony, D.S.**, Thompson, E.W., Zeng, W., Bouchi, Y., Gupta, S., Hosseini, H., Raad, M., Ko, Y., Liu, C., McDaniel, M.C., Gogas, B.D., Douglas, J.S., Quyyumi, A.A., Giddens, D.P., Veneziani, A., Samady, H. "Low coronary wall shear stress is associated with severe endothelial dysfunction in patients with non-obstructive coronary artery disease", J Am Coll Cardiol Cardio Inter, (accepted)

CONFERENCE PROCEEDINGS (lead author listed only)

1. **Molony, D.S.**, Devereux, P.D., Walsh, M.T., McGloughlin, T.M. "A computational study of mass transport at a graft/artery junction", Biomedical Engineering in Ireland, Galway, Ireland, 30 January, 2006.

2. **Molony, D.S.**, Doyle, B.J., Callanan, A., Morris, L.G., Walsh, M.T., McGloughlin, T.M. "A computational investigation of blood flow in realistic AAA stent-grafts", Biomedical Engineering in Ireland, Fermanagh, Ireland, 26 January 2007.

3. **Molony, D.S.**, Doyle, B.J., Callanan, A., Morris, L.G., Walsh, M., McGloughlin, T.M. "A computational investigation of blood flow in realistic AAA stent-grafts", ASME Summer Bioengineering Conference, Keystone, CO, June 2007.

4. **Molony, D.S.**, Callanan, A., Doyle, B.J., Walsh, M.T., McGloughlin, T.M. "Implications of Fluid Structure Interaction in abdominal aortic aneurysms", Biomedical Engineering in Ireland, Sligo, Ireland, 26 January, 2008.

5. **Molony, D.S.**, Callanan, A., Doyle, B.J., Morris, L.G., Walsh, M.T., McGloughlin, T.M. "Affect of abdominal aortic aneurysm stent-graft design on arterial haemodynamics", ASME Summer Biomengineering Conference, Marco Island, FL, June 2008.

6. **Molony, D.S.**, Callanan, A., Doyle, B.J., Walsh, M.T., McGloughlin, T.M. "Influence of modelling parameters on abdominal aortic aneurysms stent-grafts", European Society of Biomechanics, Lucerne, Switzerland, 6-9 July 2008.

7. **Molony, D.S.**, Walsh, M.T., McGloughlin, T.M. "Fluid-structure interaction of pre- and post-operative abdominal aortic aneurysms", Biomedical Engineering in Ireland, Limerick, Ireland, 30 January 2009.

8. **Molony, D.S.**, Walsh, M.T., McGloughlin, T.M. "Analysis of Post-operative Abdominal Aortic Aneurysm Repair: A Multi Patient-specific Study", ASME Summer Biomengineering Conference, Lake Tahoe, CA, June 2009.

9. **Molony, D.S.**, Walsh, M.T., McGloughlin, T.M. "Fluid-structure interaction of Pre- and Post-operative Abdominal Aortic Aneurysms", World Congress of Medical Physics and Biomedical Engineering, Munich, Germany, September 2009

10. **Molony, D.S.**, Walsh, M.T., McGloughlin, T.M. "Fluid-structure Interaction Evaluation of EVAR in AAA Patients", 6th World Congress of Biomechanics, Singapore, August 2010

11. **Molony, D.S.**, Nencka, A., Li, Z., Zhao, M., Giddens, D.P. "Hemodynamics of the rat aortic arch", ASME Summer Bioengineering Conference, Farmington, PA, June 2012

12. **Molony, D.S.,** Arepalli, C., Yang, Y., Tang, S., Oshinski, J.O., Tang, X., Veeraswamy, R., Stillman, A., Giddens, D.P. "A New Methodology for Evaluating the Relationship Between Wall Shear Stress and Carotid Artery Plaque", BMES Annual Fall Meeting, Atlanta, GA, October 2012

13. **Molony, D.S.**, Timmins, L.T., Eshtehardi, P., Samady, H., Giddens, D. "CFD and VH-IVUS Biomechanical Analysis of Coronary Artery Disease with One Year Follow-up", ASME Summer Bioengineering Conference, Sunriver, OR, June 2013

14. **Molony, D.S.,** Timmins, L.H., Razoul-Arzumly, E., Hung, O., Samady, H., Giddens D.P., "Investigating the Influence of Coronary Side-branches on the Relationship between Wall Shear Stress and Plaque Progression", Shear Stress Symposium, Montreal, Canada, March 2014

15. **Molony, D.S.,** Timmins, L.H., Razoul-Arzumly, E., Hung, O., Samady, H., Giddens, D.P., "A Prospective Study of the Relationship between Wall Shear Stress and Atherosclerotic Plaque Formation", World Congress of Biomechanics, Boston, MA, July 2014

16. **Molony, D.S.,** Timmins, L.H., Razoul-Arzumly, E., Hung, O., Samady, H., Giddens, D.P., "Does Coronary Side-branch Exclusion Alter Wall Shear Stress Predictions of Plaque Progression", Post World Congress Biomechanics Summit, Worcester, MA, July 2014

17. **Molony, D.S.,** Timmins, L.H., Rasoul-Arzrumly, E., Hung, O., Samady, H., Giddens, D.P., "Development of a Framework to Characterize Plaque Transformation: Combined Use of OCT and VH-IVUS", Summer Biomechanics, Bioengineering and Biotransport Conference, Snowbird, UT, June 2015

18. **Molony, D.S**., Rezvan, A., Timmins, L.H., Fleischer, C., Park, J., Zhou, L., Hu, X., Giddens, D.P., "4D Phase Contrast MRI Derived Hemodynamics of the Rabbit Aortic Arch", CFD in Medicine and Biology II, Albufeira, Portugal, September 2015

19. **Molony, D.S.,** Timmins., L.H., Rasoul-Arzrumly, E., Gogas, B., Hung, O.H., Joshi, U., Bouchi, Y., Samady, H., Giddens, D.P., "Hemodynamic analysis of Coronary Artery Disease Progression Through Combined IVUS and OCT Imaging" Shear Stress Symposium, Atlanta, GA, April 2016

20. **Molony, D.S.,** Timmins., L.H., Joshi, U., Bouchi, Y., Gogas, B., Samady, H., Giddens, D.P., "Wall shear stress and combined VH-IVUS and OCT analysis of Coronary Plaque Composition" Summer Biomechanics, Bioengineering and Biotransport Conference, National Harbor, MD, June 2016

21. **Molony, D.S.**, Zhou, L., Park, J., Sun, H., Fleischer, C., Oshinski, J., Hu, X., Samady, H., Rezvan, A., Giddens, D.P. "Analysis of the near wall and bulk flow aortic arch hemodynamics of New Zealand white rabbits" Shear Stress Symposium, Rotterdam, Netherlands, April 2017

22. **Molony, D.S.**, Zhou, L., Park, J., Fleischer, C., Oshinski, J., Hu, X., Samady, H., Rezvan, A., Giddens, D.P. "Comprehensive characterization of rabbit aortic arch hemodynamics from 4D PC-MRI derived CFD" Summer Biomechanics, Bioengineering and Biotransport Conference, Tucson, AZ, June 2017

23. **Molony, D.S.**, Hosseini, H., Samady, H. "Deep learning for IVUS segmentation" Shear Stress Symposium, Atlanta, GA, April 2018

24. **Molony, D.S.,** Zhou, L., Park, J., Fleischer, C., Sun, H., Hu, X., Oshinski, J., Samady, H., Rezvan, A., Giddens, D.P. "Statistical shape analysis assessment of the influence of aortic arch geometry on hemodynamics" World Congress of Biomechanics, Dublin, Ireland, July 2018

25. **Molony, D.S.,** Hosseini, H., Samady, H. "DeepIVUS: A machine learning framework for fully automatic IVUS segmentation" Transcatheter Cardiovascular Therapeutics (TCT), San Diego, CA, September 2018