**Alejandro Roldán-Alzate**

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# Education

**Ph.D. Mechanical Engineering** (University of Wisconsin-Madison) 08/2008 Advisor: Prof. Tim A. Osswald

Dissertation: “Simulation of Physiological Flows” GPA: 3.65/4.00

**M.E. Polymer Engineering and Science** (University of Wisconsin-Madison) 05/2005 Advisor: Prof. Tim A. Osswald

GPA: 3.65/4.00

**B.S. Biomedical Engineering** (*Escuela de Ingeniería de Antioquia* –

*Universidad CES* - Medellín, Colombia) 09/2002 Thesis: “*Modelo Físico del Sistema Cardiovascular*” (Physical Model of

the Cardiovascular System) GPA: 4.1/5.0

# Awards and Honors

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| --- | --- |
| * Summa Cum Laude Merit Award   “Quantification of Hepatic Blood Flow in Portal Hypertension Using | 2013 |
| 4D-Flow MRI: A Meal Challenge Study”, ISMRM 21st Annual Meeting |  |
| * Summa Cum Laude Merit Award   “Comprehensive Assessment of Diffuse Liver Disease with Quantitative | 2013 |
| MRI Biomarkers of Steatosis, Fibrosis and Portal Flow: A Biopsy |  |
| Correlation Study”, ISMRM 21st Annual Meeting |  |
| * Summa Cum Laude Merit Award   “Noninvasive Estimation of Pulmonary Vascular Resistance with 4D | 2012 |
| Flow-Sensitive MRI in a Canine Model of Acute Pulmonary Arterial |  |
| Hypertension”, ISMRM 20th Annual Meeting |  |
| * Summa Cum Laude Merit Award   “Complex and Magnitude MRI for Quantification of Hepatic Steatosis – | 2012 |
| Correlation with MR Spectroscopy and Biopsy”, ISMRM 20th Annual |  |
| Meeting |  |

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| * Lauterbur Award   Society of Computed Body Tomography and Magnetic Resonance | 2011 |
| * Merck travel award American Thoracic Society | 2010 |
| * Travel Award   Pittsburg International Lung Conference | 2009 |
| * Wang Distinguished Wisconsin Graduate Fellowship | 2005 - 2007 |
| * “Ramón Atalaya” Award   *XX Congreso Colombiano de Cardiología y Cirugía Cardiovascular* (XX | 2003 |
| Colombian Congress of Cardiology and Cardiovascular Surgery), |  |
| Cartagena, Colombia |  |
| * “Luis de Greiff” Award   Best engineering undergraduate thesis: “*Modelo Físico del Sistema* | 2003 |
| *Cardiovascular* (Physical Model of the Cardiovascular System)” |  |
| *Sociedad Antioqueña de Ingenieros y Arquitectos* (Antioquian Society of |  |
| Engineers and Architects) |  |
| * Honored Undergraduate Thesis   “*Modelo Físico del Sistema Cardiovascular* (Physical Model of the | 2002 |
| Cardiovascular System)”, *Escuela de Ingeniería de Antioquia* – |  |
| *Universidad CES* |  |

**Grant Support**

## Active

Tittle: Multidisciplinary K12 Urologic Research Career Development Program Dale Bjorling (PI)

Sponsor: NIH/NIDDK K12DK100022

Award: $158,545

Award Dates 08/01/16-06/30/20 Role: Scholar

Title: Advanced MRI of Uteroplacental Flow, Perfusion, Oxygenation, and Inflammation Shah, Dinesh (Co-PI) and Wieben, Oliver (Co-PI)

Sponsor: NIH U01 Award: $4,023,484

Award Dates: 09/17/15-08/31/20 Role: Co-Investigator

Title: Accelerated Nuero-MRA using compressed sensing and constrained reconstruction

Johnson, Kevin (Co-PI) and Turski, Patrick (Co-PI) Sponsor: NIH R01

Award: $1,392,303

Award Dates: 08/01/15-05/31/20Role: Co-Investigator

Title: Functional and Molecular Diversity in the Tumor Microenvironment Underlies Therapeutic Response and Resistance

Jarrard/Beebe/Lang (Co PIs) Sponsor: DOD

Award: $1,683,00

Award Dates: 08/01/16-07/31/20 Role: Co-Investigator

Completed

Title: Comprehensive Non-invasive Assessment of Extracardiac Total Cavo-Pulmonary Connection using 4D Flow MRI

Roldán-Alzate, Alejandro (PI)

Sponsor: American Heart Association (Scientist Development Grant) Award: PRJ85VH $306,125

Award Dates: Jul 2014 - Jul 2018 Role: Principal Investigator

Title: Quantitative Hemodynamics of the Liver with 4D Flow MRI Reeder, Scott (Co-P) and Wieben, Oliver (Co-PI)

Sponsor: NIH/DHHS R01DK096169-01 Award: PRJ66GE $218,367

Award Dates: April 2012 - April 2016 Co-PIs: Scott Reeder and Oliver Wieben Role: Co-Investigator

Pending

R21 NS066982 (Roldan) 10/01/2019-10/01/2021 3.0 calendar NIH/NHLBI $275,000

Noninvasive Assessment of Changes in Bladder Anatomy and Function in Aging Women with Underactive Bladder.

This project seeks to assess the age related changes in bladder anatomy and function by establishing MRI biomarkers.

R21 NS066982 (Johnson/Roldan) 10/01/2019-10/01/2021 3.0 calendar NIH/NHLBI $275,000

Quantitative Methods for Noninvasive Assessment of Brain Motion and Fluid Flow

This project seeks to harness opportunities in MRI technology to dramatically improve the quantitative accuracy and comprehensiveness of brain biomechanical measures.

# Publications

## Journal articles

1. Rutkowski DR, Barton, GP, Aggarwal N, François CJ*,* **Roldán-Alzate A**.Sex Differences in Cardiac Flow Dynamics of Healthy Volunteers*. Radiology: Cardiothoracic Imaging [Accepted for Publication]*
2. Rutkowski DR, Medero R, Ruesink T*,* **Roldan-Alzate A.**Modeling Physiological Flow Variation in Fontan Models with 4d Flow Mri, Particle Image Velocimetry, and Arterial Spin Labeling*. J Biomech Eng. 2019 Oct 1. doi: 10.1115/1.4045110. [Epub ahead of print] PubMed PMID: 31596919.*
3. Rutkowski DR**,** Wells SA, Johnson B, Huang W, Jarrard DF, Lang JM, Cho S, **Roldán-Alzate A**. Mri-based cancer lesion analysis with 3d printed patient specific prostate cutting guides. Am J Clin Exp Urol. 2019 Aug 15;7(4):215-222. eCollection 2019. PubMed PMID: 31511828; PubMed Central PMCID: PMC6734042.
4. Liu TT, Thomas S, Mclean DT, **Roldan-Alzate A**, Hernando D, Ricke EA, Ricke WA. Prostate enlargement and altered urinary function are part of the aging process. Aging (Albany NY). 2019 May 13;11(9):2653-2669. doi: 10.18632/*aging*.101938. PubMed PMID: 31085797; PubMed Central PMCID: PMC6535061.
5. Liu TT, Rodgers AC, Nicholson TM, Macoska JA, Marker PC, Vezina CM, Bjorling DE, **Roldán-Alzate A**, Hernando D, Lloyd GL, Hacker TA, Ricke WA*. Ultrasonography of the Adult Male Urinary Tract for Urinary Functional Testing. J Vis Exp. 2019 Aug 14;(150). doi: 10.3791/59802. PubMed PMID: 31475976.*
6. McLean DT,Rutkowski DR, Liu T, Hernando D, Ricke WA, **Roldán-Alzate A.**

MRI-based method for lower urinary tract dysfunction in adult male mice. Am J Clin Exp Urol 2019;7(3):153-158 www.ajceu.us /ISSN:2330-1910/AJCEU0097273

1. Pewaworuk R, **Roldán-Alzate A**. 4D Flow MRI Estimation of Boundary Conditions for Patient Specific Cardiovascular Simulation. Annals of Biomedical Engineering, Vol. 47, No. 8, August 2019 pp. 1786–1798 https://doi.org/10.1007/s10439-019-02285-2
2. Rutkowski DR, Barton G, François CJ, Bartlett HL, Anagnostopoulos PV, **Roldán- Alzate A**. Analysis of cavopulmonary and cardiac flow characteristics in fontan Patients: Comparison with healthy volunteers. J Magn Reson Imaging. 2019 Jan 11. doi: 10.1002/jmri.26583
3. Rutkowski DR, Garcia FJ, **Roldán-Alzate A**. MRI-based modeling of spleno-mesenteric confluence flow. Journal of Biomechanics 88 (2019) 95–103
4. Rutkowski DR, Sun D, Anderson PA, **Roldán-Alzate A**. A Method to Design and Manufacture Low Cost Patient Specific Templates for Spinal Surgery. Journal of 3D Printing in Medicine. https://doi.org/10.2217/3dp-2018-0019 2018
5. Motosugi U, **Roldán-Alzate A**, Bannas P, Said, A, Kelly S, Wieben, O, Reeder, SB. Utility of 4D flow MRI as a marker for risk stratification of gastroesophageal varices in patients with liver cirrhosis. Radiology https://doi.org/10.1148/radiol.2018180230
6. Ruedinger K, Zhou, H, Trampe, B, Heiser, T, Iruretagoyena, JI, **Roldán-Alzate, A**. Modeling Fetal Heart Hemodynamics from Prenatal Echocardiography with 4D Flow MRI. Circulation: Cardiovascular Imaging. 2018;11:e007705
7. Ruesink TA, Medero, R, Rutkowski DR, **Roldan-Alzate A**. In-Vitro Validation of Regional 4D Flow MRI Pulse Wave Velocity. Cardiovasc Eng Technol. 2018 Sep 14. doi: 10.1007/s13239-018-00377-z
8. Medero R, Holfman C, **Roldán-Alzate A**. Comparison of 4D Flow MRI and Particle Image Velocimetry Using an In Vitro Carotid Bifurcation Model. Ann Biomed

Eng. 2018 Aug 15. doi: 10.1007/s10439-018-02109-9.

1. Rutkowski D , Francois, CJ, **Roldán-Alzate, A**.Respiratory Variation in Ventricular Hemodynamics of Healthy Volunteers using 4D MRI. Journal of Cardiac Magnetic Resonance in Review.
2. Frydrychowicz A, **Roldan-Alzate A**, Winslow E, Consigny D, Campo CA, Motosugi U, Johnson KM, Wieben O, Reeder SB. Comparison of Radial 4D Flow-MRI with Perivascular Ultrasound to Quantify Blood Flow in the Abdomen and Introduction of a Porcine Model of Pre-hepatic Portal Hypertension. European Radiology, 2017;

27:12 Pages: 5316-5324. DOI: 0.1007/s00330-017-4862-4

1. Ruedinger K, Rutkowski D, Schafer S, **Roldan-Alzate A**, Oberstar E, Strother, C Impact of image reconstruction parameters when using 3D DSA reconstructions tomeasure intracranial aneurysms. *J NeuroIntervent Surg* doi:10.1136/neurintsurg-2017- 013080
2. Medero R, García-Rodríguez S, Anagnostopoulos PV, François CJ, **Roldán-Alzate A.** Patient-Specific in-Vitro Models for Hemodynamic Analysis of Congenital Heart Disease - Additive Manufacturing Approach. Journal of Biomechanics 10.1016/j.jbiomech.2017.01.048
3. Rutkowski D, Fernandez L, Reeder SB, **Roldan-Alzate A**. Comprehensive Hemdodynamics of Living Donor Liver Transplant Using 4D Flow MRI and Computational Fluid Dynamics. Computer Methods in Biomechanics and Biomedical Engineering. <http://dx.doi.org/10.1080/21681163.2017.1278619>
4. Hussaini SF**,** Rutkowski DR, **Roldan-Alzate A,** Francois CJ. Left and Right Ventricular Kinetic Energy using Time-Resolved versus Time-Average Ventricular Volumes. Journal of Magnetic Resonance Imaging. 2016 Aug 9. doi: 10.1002/jmri.25416
5. Bannas P, **Roldan-Alzate A,** Johnson KM, Woods MA, Ozkan O, Motosugi U, Wieben O, Reeder SB, Kramer H. Longitudinal Monitoring of Hepatic Blood Flow before and after TIPS by Using 4D-Flow MR Imaging. Radiology. Epub ahead of print, PMCID pending.
6. **Roldan-Alzate A,** Francois CJ, Wieben O, Reeder SB. Emerging Applications of Abdominal 4D Flow MRI. Gastrointestinal Imaging • Review. AJR 2016; 207:1–9. DOI:10.2214/AJR.15.15995.
7. Kellawan JM, Schrauben EM, Harrell JW, Hoffman CA, **Roldán-Alzate A**, Schrage WG and Wieben O.. Simultaneous quantification of blood flow in major intracranial arteries during hypercapnia using 4D flow MRI. e-pub AJNR.
8. Bannas P, Hernando D, Motosugi U, **Roldán-Alzate A** and Reeder SB. Emerging quantitative MRI biomarkers of diffuse liver disease. Clinical Liver Disease December 2014, 4(6); 129-132.
9. **Roldán-Alzate A**, García-Rodríguez S, Anagnostopoulos PV, Srinivasan S, Wieben O, François CJ. Hemodynamic study of TCPC using in vivo and in vitro 4D Flow MRI and numerical simulation. J Biomech. 2015 May 1;48(7):1325-30. doi: 10.1016/j.jbiomech.2015.03.009. Epub 2015 Mar 19. PMID: 25841292. PMCID: PMC4406283.
10. Jeong D, **Roldán-Alzate A**, Srinivasan S, Anagnostopoulos PV, Schiebler ML, Wieben O, and Francois CJ. Ventricular kinetic energy in repaired Tetralogy of Fallot: a prospective cohort study assessed with 4D flow magnetic resonance imaging. J Thorac Cardiovasc Surg 2014 Dec 4 [Epub ahead of print]. PMCID: PMC Journal in Process].
11. Belloﬁore A, Henningsen J, Lepak CG, Tian L, **Roldán-Alzate A**, Kellihan HB, Consigny DW, Francois CJ, Chesler NC. A Novel in Vivo Approach to Assess Radial and Axial Distensibility of Large and Intermediate Pulmonary Artery Branches. Journal of Biomechanics. In review
12. Tian L, Henningsen J, Bellofiore A, Forouzan O, Kellihan HB, **Roldán-Alzate A**, Consigny DW, Gunderson MC, Dailey SH, François CJ, Chesler NC. Pulmonary Artery Relative Area Change Is Inversely Related to Ex Vivo Measured Arterial Elastic Modulus in the Canine Model of Acute Pulmonary Embolization. Journal of Biomechanics. Journal of Biomechanics; 47(12) 2014.
13. **Roldán-Alzate A**, Frydrychowicz A, Said A, Johnson KM, Wieben O, Reeder SB. Portal Hypertension: Quantification of Changes in Hepatic Blood Flow with 4D Flow MRI After a Meal Challenge. Journal of Maginetic Resonance Imaging, E-pub
14. Alex J Barker, **Alejandro Roldán-Alzate**, Pegah Entezari, Sanjiv J. Shah, Naomi C Chesler, Oliver Wieben, Michael Markl, Christopher J François. 4D Flow Assessment of Pulmonary Artery Flow and Wall Shear Stress in Adult Pulmonary Arterial Hypertension: Results from Two Institutions. Magnetic Resonance in Medicine; doi: 10.1002/mrm.25326, 2014
15. Markovic LE, Kellihan HB, **Roldán-Alzate A**, Drees R, Bjorling DE, François CJ. Advanced Multimodality Imaging of An Anomalous Vessel Between the Ascending Aorta and Main Pulmonary Artery in a Dog. Journal of Veterinary Cardiology; 16, 59- 65, 2014.
16. Swift AJ, Wild JM, Nagle SK, **Roldán-Azate A**, François CJ, Fain S, Johnnson KM, Jarjour N, van Beek E, Wang K, Schiebler M. Quantitative MR Imaging of Pulmonary Arterial Hypertension: A Practical Approach to the Current State of the Art. Journal of Thoracic Imaging; 29(2): 68–79, 2014
17. **Roldán-Alzate A**, Frydrychowicz A, Johnson KM, Kellihan H, Chesler N, Wieben O, François CJ. Non-Invasive Assessment of Cardiac Function and Pulmonary Vascular Resistance in a Canine Model of Acute Thromboembolic Pulmonary Hypertension Using 4D Flow MRI. Journal of Cardiac Magnetic Resonance; 16:23, 2014.
18. Foruzan O, Flink E, Thate N, Haske A, Tongkeum L, **Roldán-Alzate A**, François CJ, Wieben O and Chesler N. Low Cost MRI-Compatible Stepper Exercise Device for Use in Cardiac Stress Tests. ASME – Journal of Medical Devices. In Press, early view online available 2014
19. Schiebler ML, Bhalla S, Runo J, Jarjour N, **Roldán-Azate A**, Chesler N, François CJ. Magnetic Resonance and Computed Tomography Imaging of the Structural and Functional Changes of Pulmonary Arterial Hypertension. Journal of Thoracic Imaging; 28:178–195, 2013.
20. Landgraf BR, **Roldán-Alzate A**, Johnson KM, François CJ, Wieben O, Reeder SB. Effect of Temporal Resolution on 4D Flow MRI in the Portal Circulation. Journal of Magnetic Resonance Imaging; 39(4): 819-826 2013.
21. **Roldán-Alzate A**, Frydrychowicz A, Niespodzany E, Landgraf BR, Wieben O, Johnson KM, Reeder SB. In vivo Validation of 4D Flow MRI for Assessing the Hemodynamics of Portal Hypertension. Journal of Magnetic Resonance Imaging; 37(5):1100-8, 2013.
22. Bellofiore A, **Roldán-Alzate A**, Besse M, Kellihan HB, Consigny DW, François CJ, Chesler NC. Impact of Acute Pulmonary Embolization on Arterial Stiffening and Right Ventricular Function in Dogs. Annals of Biomedical Engineering; 41(1):195-204, 2013.
23. Artz NS, Hines CDG, Brunner S, Agni R, Kuhn J-P, **Roldán-Alzate A**, Chen G-H, Reeder SB. Quantification of Hepatic Steatosis with Dual-Energy CT: Comparison with Tissue Reference Standards and Quantitative MRI in the ob/ob Mouse. Investigative Radiology; 47(10):603-10, 2012.
24. Tabima DM, **Roldán-Alzate A**, Wang Z, Hacker TA, Molthen RC, Chesler NC. Persistent Vascular Collagen Accumulation Alters Hemodynamic Recovery from Chronic Hypoxia. Journal of Biomechanics; 45(5):799–804, 2012.
25. Frydrychowicz A, Landgraf BR, Niespodzany E, Verma RW, **Roldán-Alzate A**, Johnson KM, Wieben O, Reeder SB. 4D Velocity Mapping of the Hepatic and Splanchnic Vasculature with Radial Sampling at 3T: A Feasibility Study in Portal Hypertension. Journal of Magnetic Resonance Imaging; 34(3):577–584, 2011.
26. Chesler NC, **Roldán A**, Vanderpool RR, Naeije R. How to Measure Pulmonary Vascular and Right Ventricular Function, IEEE Engineering in Medicine and Biology Society; 1:177-180, 2009.
27. **Roldán A**, Weiben O, Haughton V, Chesler N, Osswald T. Characterization of CSF Hydrodynamics in the Presence and Absence of Tonsilar Ectopia by Means of Computational Flow Analysis (CFA). American Journal of Neuroradiology; 30:941- 946, 2009.
28. García S, **Roldán A**, Osswald T. Thin-Wall Injection Molding – A Dimensional Analysis and Scaling Analysis Approach. J of Plastics Technology; 4(5), 2008.
29. Bustamante J, Barros JF, **Roldán A**, García S. Modelo Físico del Sistema Cadiovascular – DYNASYM. Revista Colombiana de Cardiología; 11(3):150-156, 2003.

## Peer reviewed conference papers Scientific Oral Presentations

1. Rutkowski DR, François, C. J, Wieben O, **Roldán-Alzate, A** Respiratory changes in pulmonary flow distribution in fontan circulation: A comparison between “5-D” MRI and CFD Simulation. Summer Biomechanics, Bioengineering and Biotransport Conference (SB3C2017) June 21 – 24, Tucson, AZ.
2. Garcia-Rodriguez S, Medero R, Francois CJ, **Roldán-Alzate A** Computational Fluid Dynamics of Aortic Dissection: 4D Flow MRI-Based Inlet Boundary Conditions. Summer Biomechanics, Bioengineering and Biotransport Conference (SB3C2017) June 21 – 24, Tucson, AZ.
3. Rutkowski D, Fernandez L, Reeder SB, **Roldan-Alzate A**. Patient Specific Virtual Surgery for Living Donor Liver Transplant: Right vs. Left Lobectomy. ISMRM – Flow and Motion Workshop 2016. San Francisco, CA, Oct 20 - 23.
4. Rutkowski D, Fernandez L, Reeder SB, **Roldan-Alzate A**. Patient Specific Virtual Surgery Models Using Meal Challenge Vessel Strain Values. Society of Magnetic Resonance Angiography (SMRA2016) Chicago, IL, Sept 21- 23.
5. Medero R, Rutkowski D, Weathers M, Johnson K, **Roldan-Alzate A**. Comparison of In Vitro 4D Flow MRI and CFD to Stereoscopic Particle Image Velocimetry. Society of Magnetic Resonance Angiography (SMRA2016) Chicago, IL, Sept 21- 23.
6. Rutkowski D, Fernandez L, Reeder SB, **Roldan-Alzate A**. Patient Specific Virtual Surgery for Living Donor Liver Transplant: Right vs. Left Lobectomy. Flow and Motion Workshop – ISMRM
7. Borden Z, **Roldan-Alzate A**, Francois CJ. In vitro validation of Cartesian 4D flow mapping using patient-specific 3D printed total cavo-pulmonary connection models. International Society for Magnetic Resonance in Medicine Annual Meeting 2016. Singapore, Asia. May 7, 2016.
8. Garcia-Rodriguez S, **Roldan-Alzate A**, Reeder SB, Wieben O, Francois CJ. Diurnal Variation of Renal Blood Flow using 4D flow MRI. International Society for Magnetic Resonance in Medicine Annual Meeting 2016. Singapore, Asia. May 7, 2016.
9. **Roldan-Alzate A**, Garcia-Rodriguez S, Francois CJ. Comprehensive Analysis of Total Cavo-Pulmonary Connection Hemodynamics With in Vivo And in Vitro 4d Flow MRI and Computational Fluid Dynamics. 8th International Biofluid Symposium to be held in Caltech, Pasadena, February 12-14, 2016.
10. **Roldan-Alzate A**, Fernandez L, Reeder SB. Hemodynamic Changes in the Portal Circulation in Living Related Liver Donors Assessed by 4D flow MRI. International Society for Magnetic Resonance in Medicine Annual Meeting 2016. Singapore, Asia. May 7, 2016.
11. **Roldán-Alzate A**, Said A, Campo C, Johnson KM, Francois, CJ. Wieben O, and Reeder SB. Non-Invasive Characterization and Staging of Portal Hypertension using 4D Flow MRI. ISMRM 23nd Annual Meeting & Exhibition; Toronto, Canada, 2015.
12. **Roldán-Alzate A**, Campo C, Johnson KM, Wieben O, and Reeder SB. Diurnal Variation of Portal Hemodynamics with 4D flow MRI. ISMRM 22nd Annual Meeting & Exhibition; Milan, Italy, 2014.
13. **Roldán-Alzate A**, Campo C, Johnson KM, Wieben O, and Reeder SB. Repeatability of 4D flow MRI Quantification of Venous and Arterial flow in the Abdomen. ISMRM 22nd Annual Meeting & Exhibition; Milan, Italy, 2014.
14. **Roldán-Alzate A**, Frydrychowicz A, Wieben O, Reeder SB. Quantification of Hepatic Blood Flow in Portal Hypertension Using 4D-Flow MRI: A Meal Challenge Study. ISMRM 21st Annual Meeting & Exhibition; Salt Lake City, UT, USA, 2013.
15. **Roldán-Alzate A**, Muñoz del Río A, Agni R, Said A, Wieben O, Reeder SB. Comprehensive Assessment of Diffuse Liver Disease with Quantitative MRI Biomarkers of Steatosis, Fibrosis and Portal Flow: A Biopsy Correlation Study. ISMRM 21st Annual Meeting & Exhibition; Salt Lake City, UT, USA, 2013.
16. **Roldán-Alzate A**, Frydrychowicz A, Reeder SB, Wieben O. Quantification of Blood Flow in the Portal Circulation Before and After and Intervention. SCMR-ISMRM Workshop: Exploring New Dimensions of Cardiovascular Flow and Motion; Orlando, FL, USA, 2012.
17. **Roldán-Alzate A**, François CJ, Niespodzany E, Kellihan H, Chesler NC, Frydrychowicz A, Wieben O, Johnson KM. Assessment of Right Ventricular and Pulmonary Hemodynamics in Pulmonary Artery Hypertension. MRA 23rd Annual International Conference; Banff, Canada, 2011.
18. **Roldán-Alzate A**, Frydrychowicz A, Wieben O, Reeder SB. Comprehensive Anatomic and Hemodynamic Evaluation of Portal Hypertension with 4D Flow Phase Contrast MRI. SCBT-MR Annual Meeting; Washington D.C., MD, USA, 2011.
19. **Roldán-Alzate A**, Niespodzany E, Kellihan H, Chesler NC, Frydrychowicz A, Wieben O, Johnson KM, Reeder SB, CJ François. Assessment of Right Heart Flow Patterns and Main Pulmonary Artery Hemodynamics in Pulmonary Artery Hypertension Using 4D PC MRI. SCBT-MR Annual Meeting; Washington D.C., MD, USA, 2011.
20. **Roldán-Alzate A**, Frydrychowicz A, Niespodzany E, Landgraf BR, Wieben O, Reeder SB. 4D MR Velocity Mapping Using PC VIPR to Measure Blood Flow In Portal Hypertension. ISMRM 19th Annual Meeting & Exhibition; Montréal, Canada, 2011.
21. **Roldán-Alzate A**., Vanderpool RR, Chesler, NC. The Effects of Pulmonary Vascular Collagen Accumulation on Right Ventricular Afterload Investigated Using a

Genetically Engineered Mouse Model. ATS International Conference, New Orleans, LA, USA, 2010.

1. **Roldán A**, Haughton V, Osswald TA, Chesler N. Computational Analysis of Cerebrospinal Fluid Flow in the Normal and Obstructed Subarachnoid Space. ASME Summer Bioengineering Conference; Marco Island, FL, USA, 2008.
2. **Roldán A**, Haughton V, Osswald TA, Chesler, N. Cause of Hyperkinetic CSF Flow in Chiari I Malformation: Effect of Subarachnoid Space Dimensions on CSF Flow through the Foramen Magnum. ASNR 46th Annual Meeting & NER Foundation Symposium; New Orleans, LA, USA, 2008.
3. **Roldán A**, Wentland A, Weiben O, Haughton V, Osswald TA. Cerebrospinal Fluid Flow in the Chiari I Malformation Modeled with Computational Flow Dynamics. ASNR 45th Annual Meeting; Chicago, IL, USA, 2007.

## Other

1. Garcia-Rodriguez S, Leschke, J, Francois CJ, **Roldan-Alzate A**,. Computational Fluid Dynamics of Pulmonary Circulation Before and After Induced Pulmonary Hypertension: 2D Flow and 4D Flow MRI-Based Boundary Conditions ISMRM 25th Annual Meeting and Exhibition, Honolulu, HI. (E-Poster)
2. Medero R, **Roldán-Alzate A.** Comparison of 4D Flow MRI and Tomographic Particle Image Velocimetry. ISMRM 25th Annual Meeting and Exhibition, Honolulu, HI. (E- Poster)
3. Rutkowski DR, François, C. J, **Roldán-Alzate, A**. Respiratory changes in pulmonary flow distribution in Fontan circulation using "5-D" flow MRI. ISMRM 25th Annual Meeting and Exhibition, Honolulu, HI. (E-Poster)
4. Rutkowski DR, Reeder SB., **Roldán-Alzate, A.** Comprehensive Hemodynamics of Living Donor Liver Transplantion Using MRI-based In-Vitro Experiments and Computational Simulation. ISMRM 25th Annual Meeting and Exhibition, Honolulu, HI. (Poster)
5. Medero R, **Roldán-Alzate A.** In Vitro Comparison of 4D Flow MRI to Stereo Particle Image Velocimetry**.** Society for Magnetic Resonance Angiography 28th Annual Conference. Chicago IL, Sept 21st – 23rd (Poster)
6. Medero R, García-Rodríguez S, Anagnostopoulos PV, François CJ, **Roldán-Alzate A.** In Vitro Comparison of 4D Flow MRI to Stereo Particle Image Velocimetry**.** Society for Magnetic Resonance Angiography 28th Annual Conference. Chicago IL, Sept 21st – 23rd (Poster)
7. **Roldan-Alzate A**, Schrauben E, Wieben O, and Francois CJ. Kinetic Energy Distributions in Fontan Circulation - Evaluation of Respiration Effects. International Society for Magnetic Resonance in Medicine Annual Meeting 2016. Singapore, Asia. May 7, 2016. (Poster).
8. Garcia-Rodriguez S, Wrobel J, Francois CJ, **Roldan-Alzate A**. 4D Flow MRI Improves Computational Fluid Dynamics Analysis of Aortic Dissection. International Society for Magnetic Resonance in Medicine Annual Meeting 2016. Singapore, Asia. May 7, 2016.
9. Francois CJ, Borden Z, Garcia-Rodriguez S**,** Wrobel J, **Roldan-Alzate A**, Effects of 3D-printing technology on flow measurements in patient-specific models of total cavo- pulmonary connection. International Society for Magnetic Resonance in Medicine Annual Meeting 2016. Singapore, Asia. May 7, 2016.
10. Medero R, García-Rodríguez S, Anagnostopoulos PV, François CJ, **Roldán-Alzate A.** Patient-Specific in-Vitro Models for Hemodynamic Analysis of Congenital Heart Disease - Additive Manufacturing Approach**.** Summer Biomechanics, Bioengineering and Biotransport Conference (SB3C2016) National Harbor, MD, June 29-July 2nd.
11. Rutkowski D, Fernandez L, Reeder SB, **Roldan-Alzate A**. Comprehensive Hemdodynamics of Living Donor Liver Transplant. Summer Biomechanics, Bioengineering and Biotransport Conference (SB3C2016) National Harbor, MD, June 29-July 2nd.
12. Shrauben EM, Francois, CJ, Wieben O **Roldán-Alzate A**. 4D flow MRI of the Great Vessels during Respiration Plateaus. ISMRM 23rd Annual Meeting & Exhibition; Toronto, Canada, 2015.
13. **Roldán-Alzate A**, Weins CN, Johnson KM, Mcmillan AB, Wieben O, Sirlin C, and Reeder SB. Quantification of Hepatic Blood Flow in Obese Patients using 4D-flow MRI. ISMRM 23nd Annual Meeting & Exhibition; Toronto, Canada, 2015.
14. **Roldán-Alzate A**, García-Rodriguez S, Steffens TG, Johnson KM, Wieben O, Anagnostopoulos PV, and CJ François. Comprehensive Analysis of Total Cavo- Pulmonary Connection Hemodynamics with In Vivo and In Vitro 4D Flow MRI and Computational Fluid Dynamics. ISMRM 22nd Annual Meeting & Exhibition; Milan, Italy, 2014.
15. **Roldán-Alzate A**, García-Rodriguez S, Rivera L, Wieben O, Anagnostopoulos PV, and CJ François. Hemodynamic Study of TCPC Using In Vivo and In Vitro 4D Flow MRI and Numerical Simulation. SCMR 17th Annual Scientific Sessions; New Orleans, LO, USA, 2014.
16. Wieben O, **Roldán-Alzate A**, Reeder SB, Schiebler ML, Nagle SK, Aecher CW, Landgraf BR, François CJ. 4D Flow MRI for Non-Invasive Assessment of Mesenteric Ischemia. ISMRM 21st Annual Meeting & Exhibition; Salt Lake City, UT, USA, 2013.
17. Bellofiore A, **Roldán-Alzate A**, Reeder SB, Runo J, Keevil JG, François CJ, Chesler NC. Non-Invasive Metrics of Right Ventricular Function in Pulmonary Hypertension. Poster presentation, ATS International Conference, Philadelphia, PA, USA, 2013.
18. Nett E, Rivera L, García-Rodríguez S, **Roldán-Alzat**e **A**, Wieben O, Johnson K. Pressure Difference Measurements in Stenotic Flow Phantom: Comparison of 4D Flow MRI, Computational Fluid Dynamics, and Pressure Wire Measurements. ISMRM 21st Annual Meeting & Exhibition; Salt Lake City, UT, USA, 2013.
19. **Roldán-Alzate A**, Kilgas PC, Johnson KM, Wieben O, François CJ. Analysis of Right Ventricular Kinetic Energy in an Acute PAH Animal Model Using 4D Flow MRI. ISMRM 21st Annual Meeting & Exhibition; Salt Lake City, UT, USA, 2013.
20. François CJ, **Roldán-Alzate A**, Wentland AL, Kellihan HB, Chesler NC, Wieben O. 4D Flow-Sensitive MRI Pulmonary Artery Pulse Wave Velocity in Pulmonary Arterial Hypertension. ISMRM 21st Annual Meeting & Exhibition; Salt Lake City, UT, USA, 2013.
21. **Roldán-Alzate A**, Frydrychowicz A, Chesler NC, Wieben O, François CJ. 4D Flow- Sensitive MR Estimation of Pulmonary Vascular Resistance. SCMR 16th Annual Scientific Sessions; San Francisco, CA, USA, 2013.
22. Bellofiore A, Besse M, **Roldán-Alzate A**, Kellihan HB, Consigny DW, François CJ, Nagle SK, Chesler NC. Impact of Acute Pulmonary Artery Stiffening on Right Ventricular Function in a Canine Model. ATS International Conference; San Francisco, CA, USA, 2012.
23. Lepak CG, Bellofiore A, **Roldán-Alzate A**, Kellihan HB, Consigny DW, François CJ, Chesler NC. Distribution of Radial and Axial Distensibility in Canine Pulmonary Vasculature. Aspen Lung Conference 56th Annual Meeting; Aspen, CO, USA, 2012.
24. Bellofiore A, **Roldán-Alzate A**, Besse M, Kellihan HB, Consigny DW, François CJ, Chesler NC. Right Ventricular Response to Pulmonary Arterial Stiffening in a Canine Model of Acute Embolization. Podium presentation, ASME Summer Bioengineering Conference; Fajardo, Puerto Rico, 2012.
25. **Roldán-Alzate A**, Wieben O, Frydrychowicz A, Chesler NC, François CJ. Pulmonary Arterial Distensibility – 2D Phase Contrast vs 2D bSSFP. SCMR 15th Annual Scientific Sessions; Orlando, FL, USA, 2012.
26. Frydrychowicz A, Reeder SB, **Roldán-Alzate A**, Consigny D, Johnson KM, Wieben O. Radial 4D Flow MRI for Quantification of Hepatic Blood Flow in Portal Hypertension. MRA 23rd Annual International Conference; Banff, Canada, 2011.
27. Frydrychowicz A, Winslow E, Consigny D, Niespodzany E, Bultman E, **Roldán- Alzate A**, Johnson KM, Wieben O, Reeder SB. In-vivo Validation of 5-Point PC-VIPR for Hemodynamic Assessment of the Hepatic and Splanchnic Hemodynamics in Swine. ISMRM 19th Annual Meeting & Exhibition; Montréal, Canada, 2011.
28. Frydrychowicz A, **Roldán-Alzate A**, Landgraf BR, Niespodzany E, Verma RW, Wieben O, Reeder SB. Analysis of Radially Undersampled 4D Velocity Mapping (PC VIPR) for Comprehensive Imaging in Portal Hypertension. ISMRM 19th Annual Meeting & Exhibition; Montréal, Canada, 2011.
29. François CJ, **Roldán-Alzate A**, Niespodzany E, Chesler NC, Frydrychowicz AP. Abnormal Right Heart Flow Patterns in Pulmonary Artery Hypertension Visualized with 4D Flow-Sensitive MRI. ISMRM 19th Annual Meeting & Exhibition; Montréal, Canada, 2011.
30. **Roldán-Alzate A**, Niespodzany E, Frydrychowicz AP, Consigny D, Chesler NC, François CJ. 4D PC MRI to Investigate the Hemodynamics of Acute Thromboembolic Pulmonary Hypertension in a Dog Model. ISMRM 19th Annual Meeting & Exhibition; Montréal, Canada, 2011.
31. **Roldán-Alzate A**, Kellihan H, Frydrychowicz A, Consigny DW, François CJ, Chesler NC. Acute Thromboembolic Pulmonary Hypertension in a Dog Model – Correlation of Right Ventricular Ejection Fraction and Pulmonary Arterial Distensibility Measured by MRI. ATS International Conference; Denver, CO, USA, 2011.
32. **Roldán-Alzate A**, Reeder SB, Keevil JG, Runo JR, Chesler NC. Low MPA Relative Cross Sectional Area Change Correlates with Decreased RV Function. ATS International Conference; New Orleans, LA, USA, 2010.
33. **Roldán-Alzate A**, Reeder SB, Keevil JG, Runo JR, Chesler NC. Low Relative Area Change of Main PA Correlates with High PA Pressure in Patients with Pulmonary Arterial Hypertension. Pittsburgh International Lung Conference; Pittsburgh, PA, USA, 2009.
34. Molthen R, Baumgart S, **Roldán A**, Vanderpool RR, Chesler NC. The Role of the Type I Procollagen Gene (Col1a1) and Oxidative Stress on the Pulmonary Circulation. BMES Conference; Pittsburgh, PA, USA, 2009.
35. Moses L, Baumgart S, **Roldán A**, Vanderpool RR, Molthen R, Chesler NC. The Role of Collagen in Hypertension Induced Stiffness of Pulmonary Arteries. BMES Conference; Pittsburgh, PA, USA, 2009.
36. **Roldán-Alzate A**, Reeder SB, Keevil JG, Runo JR, Chesler NC. Magnetic Resonance Imaging Provides Non-Invasive Assessment of Pulmonary Hypertension Severity by Low Relative Area Change of the Pulmonary Artery. ISMRM 17th Annual Meeting & Exhibition; Honolulu, HI, USA, 2009.
37. **Roldán A**, Runo J, Osswald TA, Keevil J, Reeder S, Chesler N. Relative Area Change of Main Pulmonary Artery Correlates with Mean Pulmonary Pressure. European Congress of Radiology; Vienna, Austria, 2009.
38. **Roldán A**, Sweitzer NK, Osswald TA, Chesler NC. Fluid Structure Interaction Analysis of Blood Flow Thorugh Mechanical Heart Valves. ASME Summer Bioengineering Conference; Marco Island, FL, USA, 2008.
39. **Roldán A**, Haughton V, Osswald TA, Chesler N. Cerebrospinal Fluid Flow in the Chiari I Malformation – Computational Approach Using MR-Based Geometries. Sixth International Bio-Fluid Mechanics Symposium and Workshop; Pasadena, CA, USA, 2008.
40. **Roldán A**, Osswald TA, Haughton V. CSF Flow in the Chiari I Malformation Modeled with Computational Fluid Dynamics. Syringomyelia 2007; Rugby, England, 2007.
41. **Roldán A**, Sweitzer NK, Osswald TA, Chesler NC. Numerical Simulation of Blood Flow through Mechanical Heart Valves Using Meshless Techniques. ASME Summer Bioengineering Conference; Keystone, CO, USA, 2007.
42. **Roldán A**, Wentland A, Weiben O, Haughton V, Osswald TA, Chesler NC. CFD Modeling for Patient-Specific Analysis of Cerebrospinal Fluid Flow. ASME Summer Bioengineering Conference; Keystone, CO, USA, 2007.
43. **Roldán A**, Wentland A, Weiben O, Block WF, Klaers JL, Haughton V, Osswald TA. Numerical Modeling of CSF Flow in Patient - Specific Anatomical Models. Joint Annual Meeting ISMRM-ESMRMB; Berlin, Germany, 2007.
44. Farhoud M, Wentland AL, Wieben O, Klaers JL, Block WF, Jung Y, **Roldán A**, Haughton VM. Physical Models of Cerebrospinal Fluid Flow in Patients with Chiari I Malformation. Joint Annual Meeting ISMRM-ESMRMB; Berlin, Germany, 2007.
45. **Roldán A**, Chesler NC, Osswald TA. Residence Time Distribution Analysis in Prosthetic Heart Valves Using the Boundary Elements Method. BMES Annual Fall Meeting; Chicago, IL, USA, 2006.
46. **Roldán A**, Chesler NC, Bustamante J, Osswald TA. Simulation of Blood Flow and Deformations of Mechanical Heart Valves Using Boundary Integral Techniques. XXth Congress of the ISB and 29th Annual Meeting of the ASB; Cleveland, OH, USA, 2005.
47. García S, **Roldán A**, Hernández JP, Osswald TA. Dimensional Analysis and Scaling Approach for Thin-Wall Injection Molding. ANTEC 2004; Chicago, IL, USA, 2004.

# Invited Talks

1. Non–invasive patient-specific cardiovascular fluid dynamics. Applied

and Computational Mathematics Seminar. Madison, WI. February 19, 2016.

1. Clinical Applications of 2D & 4D Flow. Cardiovascular MRI: Vascular Flow & Angiography Course at ISMRM 2016. Singapore,

Asia, May 7th, 2016.

1. 2D/4D Flow Quantification. Cardiovascular Image Processing Course

at ISMRM 2016. Singapore, Asia, May 11th, 2016.

1. Non-Invasive Patient-specific Cardiovascular Fluid Dynamic –

Radiology Forum University of Yamanashi. Yamanashi, Japan, May 16th, 2016

1. Hemodynamics of Total Cavo-Pulmonary Connection in vivo and in vitro 4d Flow MRI and Computational Fluid Dynamics, 5th International Symposium on Engineering Frontiers in Congenital

Heart Disease. Orlando, FL, June 10th, 2016.

1. Hepatic and Portal Venous MRA & Flow. 28th Society for Magnetic

Resonance Angiography (SMRA) meeting. Chicago, IL, September 20th, 2016.

1. Biomecánica: Ingeniería e Innovación al servicio de la salud. Simposio internacional de Ingeniería*.* Universidad del Sinu

Monteria, Cordoba, Colombia. Apr. 10, 2014

1. Humanismo y Biomecánica - Calidad de Vida del Paciente. *I Congreso Internacional de Humanismo y Nuevas Tecnologías.*

Universidad Católica de Oriente, Rionegro, Antioquia, Colombia. Oct. 18, 2013

1. Segmentation and Corrections. *2nd CMR 4D Flow Workshop.*

University of Oxford, Oxford, UK. Sept. 23, 2013

1. Análisis No-Invasivo de Enfermedades Cardiovasculares Mediante Imágenes de Resonancia Magnética 4D – Flow. *IV Seminario Internacional de Actualización Biomédica.* Universidad Autónoma de

Occidente, Cali, Valle, Colombia. Sept. 6, 2013

1. Numerical Simulation of Physiological flows. *The Mohs Lectures by Placon – Rheology Research Center*. University of Wisconsin –

Madison. Feb. 27, 2009

1. Numerical Simulation of Physiological flows. *The Lindbergh Lecture*

*Series.* University of Wisconsin – Madison. Nov 13, 2008

# Other publications

1. Feiler D, Roldán A, Osswald TA. From Natural Rubber to Synthetic Rubber - the Road from the Amazon to Auschwitz. Educational Podcast, University of Wisconsin – Madison, 2007.

# Books and Book Chapters

1. Roldán-Alzate A, Chesler NC. Pulmonary Vascular Mechanics. In: Yuan, Garcia, Hales, Rich, Archer and West eds. Textbook of Pulmonary Vascular Disease, Springer- Verlag, New York, NY 2010.
2. Naranjo A, Noriega M, Sierra JD, Roldán A, Osswald TA. Testing and Characterization of Plastics - Industrial Applications. Hanser Publishers, 2008.

# Research Experience

|  |  |
| --- | --- |
| **Assistant Professor**  Departments of Mechanical Engineering and Radiology University of Wisconsin – Madison | 8/2015 |
| **Cardiovascular Modeling Scientist**  Department of Radiology, University of Wisconsin – Madison | 9/2010 – 8/2015 |
| **Research Associate**  Vascular Tissue Biomechanics Laboratory  Department of Biomedical Engineering, University of Wisconsin - Madison | 8/2008 - 8/2010 |
| **Research Assistant**  Polymer Engineering Center  Department of Mechanical Engineering, University of Wisconsin - Madison | 8/2003 - 8/2008 |
| **Research Assistant**  Laboratorio de Hidráulica  Escuela de Ingeniería de Antioquia – Universidad CES Medellín, Colombia | 1/2003 - 5/2003 |

**Teaching Experience**

|  |  |
| --- | --- |
| * Instructor, Fluid Mechanics ME363 University of Wisconsin – Madison | Fall 2015 |
| Department of Mechanical Engineering |  |
| * Guest Lecturer, Non-Invasive Assessment of Hemodynamics in Cardiovascular Diseases | 12/2013 |
| Introduction to Human Biomechanics Course |  |
| Biological Sciences Department, Edgewood College |  |
| Madison, Wisconsin, USA |  |
| * Visiting Professor   Instituto de Alta Tecnología Médica de Antioquia | 9/2012 |
| Medellín, Antioquia, Colombia |  |
| * Instructor, Material Science of Polymers for Engineers Universidad Autónomal del Norte | 7/2012 |
| Barranquilla, Atlántico, Colombia |  |
| * Instructor, Material Science of Polymers for Engineers Universidad Nacional de Colombia | 7/2012 |
| Palmira, Valle del Cauca, Colombia |  |
| * Instructor, Biomechanics of Fluids and Solids – International Engineering Seminar | 7/2011 |
| Universidad Nacional de Colombia |  |
| Bogotá, Cundinamarca, Colombia |  |
| * Guest Lecturer, Biofluids Symposium Escuela de Ingeniería de Antioquia | 8/2010 |
| Envigado, Antioquia, Colombia |  |
| * Instructor, Biomechanics of Fluids and Solids – International Engineering Seminar | 7/2010 |
| Universidad Nacional de Colombia |  |
| Medellín, Antioquia, Colombia |  |
| * Instructor, Material Science of Polymers for Engineers – IV International Engineering Seminar | 6/2010 |
| Universidad Nacional de Colombia |  |
| Leticia, Amazonas, Colombia |  |
| * Instructor, Polymers 101 Resilient Technology | 5/2007 |
| Wausau, WI, USA |  |

* Guest Lecturer, Computational Fluid Dynamics for Physiological Flows 4/2007 Biofluidics Course

Department of Biomedical Engineering, University of Wisconsin - Madison

* Guest Lecturer, Polymer Testing 4/2006, 4/2007, 4/2008 Engineering Design with Polymers Course

Department of Mechanical Engineering, University of Wisconsin - Madison

* Instructor Summers 2004, 2005

Plastics Summer Camp

University of Wisconsin - Madison

* Teaching assistant 2004-2006

Manufacturing Processes Course

Department of Mechanical Engineering, University of Wisconsin - Madison

# Mentoring

* David Rutkowski, Graduate Student Mechanical Engineering August 2015 – Present
* Rafael Medero, Graduate Student Mechanical Engineering August 2015 – Present
* Benjamin Ratliff, Undergraduate Research Assistant (BME) May 2015 - Present
* Neil Doll, Graduate Student Mechanical Engineering June 2014 – present
* Matthew Smith, Shapiro Fellow Summer 2014
* Scott Grogan, Shapiro Fellow Summer 2014
* Syed Hussaini, Shapiro Fellow Summer 2014
* Phillip Kilgas, Research Assistant 2012 – present
* Camilo Campo, Undergraduate Scholar URS 2013 – present
* Daniel Gutiérrez Barragán, Undergraduate Research Assistant 2010
* Somana Dharam, Undergraduate Scholar URS 2010
* Lindsey Moses, Undergraduate Research Assistant 2009

# Other Professional Activities

* Reviewer of grant proposals for the Colombian national science foundation (Colciencias)
* **Journal reviews**: ASME Journal of Biomechanical Engineering 2012 - present IEEE Transactions to Medical Imaging 2013 - present

Revista Ingeniería Biomédica 2010 – present

American Journal of Neuroradiology 2015 – present Int. J. of Computer Assisted Radiology and Surgery 2014 – present

# Computer & Laboratory Skills

*Software*

* + Windows Office, LaTex, Adobe Illustrator
  + Medical Images: Mimics, ImageJ, Ensight, OsiriX
  + CAD: SolidWorks, Geomagic
  + Programing: Fortran, Matlab
  + Data acquisition: LabVIEW
  + FEM analysis: Ansys, Abaqus
  + CFD analysis: Fluent, Comsol

*Laboratory*

* + Mechanical testing
  + Data acquisition
  + Polymer processing
  + Biomethodology of the Lab Mouse
  + Isolated lung surgical procedure
  + Magnetic resonance, ultrasound and computed tomography image processing

*Languages*

* + - Spanish (native language)
    - English (fluent)

# Associations

American Thoracic Society 2010 – present

International Society of Magnetic Resonance in Medicine 2007 – present Society of Computed Body Tomography and Magnetic Resonance 2011 – present

Society of Cardiovascular Magnetic Resonance 2011 – present